Consolidated Edison

Distributed System Implementation Plan

July 31, 2018

conEdison

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EXECUTIVE SUMMARY

Con Edison is excited to present its second distributed system implementation plan ("DSIP") to increase customer choice and promote a sustainable energy future. The DSIP supports the State's clean energy goals and the New York Public Service Commission's ("Commission") vision, under the Reforming the Energy Vision ("REV") initiative, of a robust market for distributed energy resources ("DER").[1]

The REV Initiative is part of New York State's broader energy policy landscape, which centers on reducing greenhouse gas ("GHG") emissions, growing the clean energy economy, and expanding customer choice. Quantitative targets in support of these policy goals were set in the 2015 State Energy Plan and included in related policy actions. The targets require significant expansion of renewable energy, energy storage, energy efficiency ("EE"), and electric vehicles ("EVs"). Together, these policy goals offer a high-level view of what State and local energy systems will look like in 2025 and beyond. Con Edison is participating in the ongoing proceedings related to EE, EVs, and energy storage and will evolve its plans to support the outcomes of those proceedings.

Significant DER growth

Con Edison has made significant progress in advancing the State's goals and building the capabilities for a distributed system platform ("DSP") that supports DER market growth. For example, since January 1, 2016, the amount of installed solar capacity connected to Con Edison's distribution system has doubled to over 200 MW_{AC} and is expected to reach 650 MW_{AC} by the end of 2023. The Company is also facilitating growth in other DER markets, including combined heat and power ("CHP"), which is expected to grow by nearly 50 percent by 2023 to 260 MW, and energy storage, which is currently poised for further growth. Additionally, the Company will drive increased peak savings from its demand-side management ("DSM") programs, contributing a total of nearly 800 MW in peak demand reduction by 2023.[2] The net effect is that DER, totaling over 1,700 MW in capacity, is expected to offset load increases driven by EVs and economic development, holding load growth relatively flat.

DSIP Outcomes

Improved developer experience:

- *More detailed, user-friendly hosting capacity maps*
- *Improved and streamlined interconnection process*
- *Easier access to more data*
- *Ongoing identification of lower-cost monitoring and control ("M&C") solutions*

More market opportunities:

- *More non-wires solutions ("NWS") solicitations*
- *Access to Value of DER ("VDER") value stack*
- *Piloting new technologies, customer engagement strategies, and business models*
- *Working with the New York Independent System Operator ("NYISO") and stakeholders to expand market participation*

Greater integration of DER into planning and operations:

- *More granular DER forecasting*
- *Formalization of NWS identification into capital planning*
- *Defined operational requirements for coordination among the DSP, NYISO, and DER aggregators*

[1] For purposes of this filing, DER is defined as end-use energy efficiency ("EE"), demand response, distributed storage, and distributed generation.

[2] This includes demand reduction from past achievements and excludes past and projected savings from programs administered by New York State Energy Research and Development Authority ("NYSERDA") and New York Power Authority ("NYPA").

Enhanced customer engagement tools and strategies

Con Edison is continuously looking for ways to work with its customers and provide solutions to their energy needs. The Company is committed to providing customers with the information, education, and tools to make more informed energy decisions, as well as finding new ways to meet and exceed customer expectations. Many of the Company's demonstration projects, such as Connected Homes and Building Efficiency Marketplace, are testing new strategies for increasing customer engagement and influencing customer behavior. To increase the participation of low and moderate income ("LMI") customers in DER programs, the Company is piloting a Shared Solar program and evaluating demonstration projects to test new business models focused on solutions for LMI customers. Additionally, the Company has several efforts underway to facilitate EV charging and promote EV adoption, including a new website that compares the cost of purchasing an EV to the cost of purchasing a similar gas-powered vehicle.[3] The rollout of smart meters also creates new opportunities to engage customers by expanding tools to increase energy awareness and promote market development.

> *HOME ENERGY REPORTS ("HERs")*
>
> Con Edison is now sending HERs to 1.1 million customers. The HERs offer personalized insights about energy consumption coupled with targeted offerings available through Con Edison's online marketplace.
>
> With over 1 million views and over 600,000 unique visits, the marketplace has generated more than 120,000 product sales and an estimated 72 GWh of lifetime energy savings from sales of smart thermostats and LED lightbulbs.

As of July 2, 2018, Con Edison has installed over 351,000 smart meters and is on track with ongoing deployment in Staten Island, Westchester County, Brooklyn, and Manhattan. Upon installation of the smart meters, Con Edison sends customers a welcome letter, alerts them to high bills, and provides access to enhanced data and tools, including personalized recommendations and bill analysis and data visualization, through an upgraded My Account web portal. The upgrade to My Account is part of the broader Digital Customer Experience ("DCX") initiative to provide a best-in-class customer experience by providing customers with better and more integrated information across the Company's website, e-mail, and mobile apps.

Expanded data sharing

The Company has increased the amount of customer and system data available to customers and authorized third parties, which helps developers with business case development and promotes customer choice. For example, Phase I of Green Button Connect ("GBC") allows authorized third parties to access the more granular customer data from smart meters in a usable format. Stakeholders responded positively to its initial release and the Company is upgrading GBC to incorporate additional features requested by stakeholders. By the end of 2018, Con Edison will offer customer usage data in near-real time (i.e., 30-35 minutes after the interval ends) and expand the available datasets available to customers and developers to include electric and gas utility bill costs, customer account information, installed capacity ("ICAP") tag, demand (kW), and tariffed service classifications. For system data, a centralized website directs third parties to Con Edison's hosting capacity map, which serves as the Company's system data portal and concentrates useful data useful at one site. The hosting capacity map includes an expanded range of data to give developers further insight into business opportunities, such as 8,760 load forecasts and queued and installed distributed generation ("DG") at

[3] https://cars.coned.com/

different points on the grid. During the DSIP timeframe, the Company will continue to improve data access and visualization, drawing on ongoing stakeholder engagement.

Continued market enablement

Con Edison is enabling market growth by expanding opportunities for DER to provide and be compensated for grid services. For example, Con Edison significantly ramped up its NWS activity by extending the original Brooklyn Queens Demand Management ("BQDM") program and releasing eight NWS solicitations for 160 MW of demand reduction since January 2017.[4] Additionally, the Company is innovating within its utility programs to drive increased savings and promote market transformation, thus creating new opportunities for EE and demand response ("DR") suppliers and developers. Innovation in pricing, such as the Value of DER ("VDER") tariff, are helping to align DER compensation with the value to the system. Rate pilots are testing customer responsiveness to new rate designs and improving the alignment between the price of electricity delivery and the actual cost of providing service. Further, the Company is facilitating energy storage by opening new opportunities for energy storage to support distribution system needs through tariffs, procurements, and programs. The Company is promoting EVs through system upgrades, demonstration projects, and rate design options. Additional electrification may further support the State's clean energy goals, while encouraging more efficient utilization of the overall system through a higher load factor. As the EE, EV, and energy storage proceedings develop, the Company will review and adjust its plans to support greater market enablement in line with the outcomes of those proceedings.

Additionally, the Joint Utilities and the New York Independent System Operator ("NYISO") formed a task force in the beginning of 2017 to define coordination protocols in order to promote DER integration and market services. As part of these efforts, the Joint Utilities, NYISO, and Department of Public Service ("DPS") Staff have coordinated on and documented operational requirements for topics including DER aggregation registration, pilot design coordination, dual participation in wholesale markets while providing distribution-level services. Specifically, the *DSP Communications and Coordination Manual*[5] describes how the DSP envisions coordinating with the NYISO, DER aggregators, and individual DER assets to preserve system safety and reliability while allowing DER to participate in markets and deliver value across various services. The *DSP-Aggregator Agreement for NYISO Pilot Program*[6] establishes operational coordination requirements between the DSP and DER aggregators for the purposes of the NYISO pilot program. The Joint Utilities hosted a stakeholder engagement session in October 2017 to communicate progress on these topics and to gather input on how to advance them further.

Implementation of DSP capabilities

Con Edison is building new DSP capabilities and driving benefits in three core areas: (1) facilitating expanded DER integration, (2) sharing information that helps third parties identify and evaluate business opportunities and helps customers understand their energy usage, and (3) expanding market services. For example, the Company is evolving its planning and operations to better integrate DER by:

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[4] Case 14-E-0302, *Petition for Extension of Time to Implement Brooklyn/Queens Demand Management Program* ("BQDM Proceeding"), Order Extending Brooklyn/Queens Demand Management Program (issued July 13, 2017) ("BQDM Extension Order").
[5] Joint Utilities of New York, *Draft Joint Utilities DSP Communications and Coordination Manual* (updated July 2018). http://jointutilitiesofny.org/wp-content/uploads/2018/07/JU-DSP-Communications-and-Coordination-Manual-DRAFT-2.pdf.
[6] Joint Utilities of New York, *Draft Joint Utilities DSP-Aggregator Agreement for NYISO Pilot Program* (updated July 2018). http://jointutilitiesofny.org/wp-content/uploads/2018/07/JU-DSP-Aggregator-Agreement-for-NYISO-Pilot-Program-DRAFT.pdf.

- Forecasting DER at more granular levels to more accurately reflect its impact on demand, which will be facilitated by smart meter data.
- Formalizing non-wires solutions ("NWS") identification and evaluation as part of the capital planning process, which resulted in eight new NWS solicitations totaling 160 MW since 2017.
- Publishing an enhanced hosting capacity map that provides a more comprehensive view of beneficial locations through identification of NWS and high-value locations, as indicated by Locational System Relief Values ("LSRV") areas, paired with hosting capacity information that signals where interconnection costs are expected to be lower.
- Improving the interconnection process to increase transparency and bring projects online more quickly.
- Facilitating energy storage by removing technical barriers to installation and testing different applications and business models through demonstration projects.

The result is a streamlined process for identifying DER opportunities and bringing new DER online, which is driving improvements in customer and developer satisfaction and facilitating greater DER deployment. According to feedback received in a developer focus group, developers generally feel Con Edison supports them, with most developers rating their overall satisfaction at 7 out of 10. While this is a good start, the Company will continue to working to improve satisfaction.

Modernization of the Grid

Our achievements since the last DSIP demonstrate the progress Con Edison has made in the past two years and sets a solid foundation for continued momentum. The next steps and future actions within this filing are consistent with the long-term vision of the Joint Utilities to enable markets, incorporate stakeholder feedback, and increase DER adoption. Achieving this long-term vision will increase customer satisfaction and overall system benefits. Customers will be able to more conveniently shop for third-party products and services that are tailored to meet their needs. Third parties will have access to multiple value streams, allowing them to leverage new technologies and drive innovation. Carbon emissions and localized pollution will decrease as clean technologies are developed. At the same time, new grid technologies offer increased visibility into and control of grid assets, which supports system reliability.

Central to achieving this vision is investment in advanced grid capabilities and enabling technologies. The Initial DSIP presented an initial technology roadmap to build DSP functionality by investing in data analytics, protective relays, Volt/VAR optimization ("VVO"), a demand response management system ("DRMS"), and a DER management system ("DERMS"). The Company is executing on its investment plan with several of the work streams initiated over the last two years continuing into this DSIP.

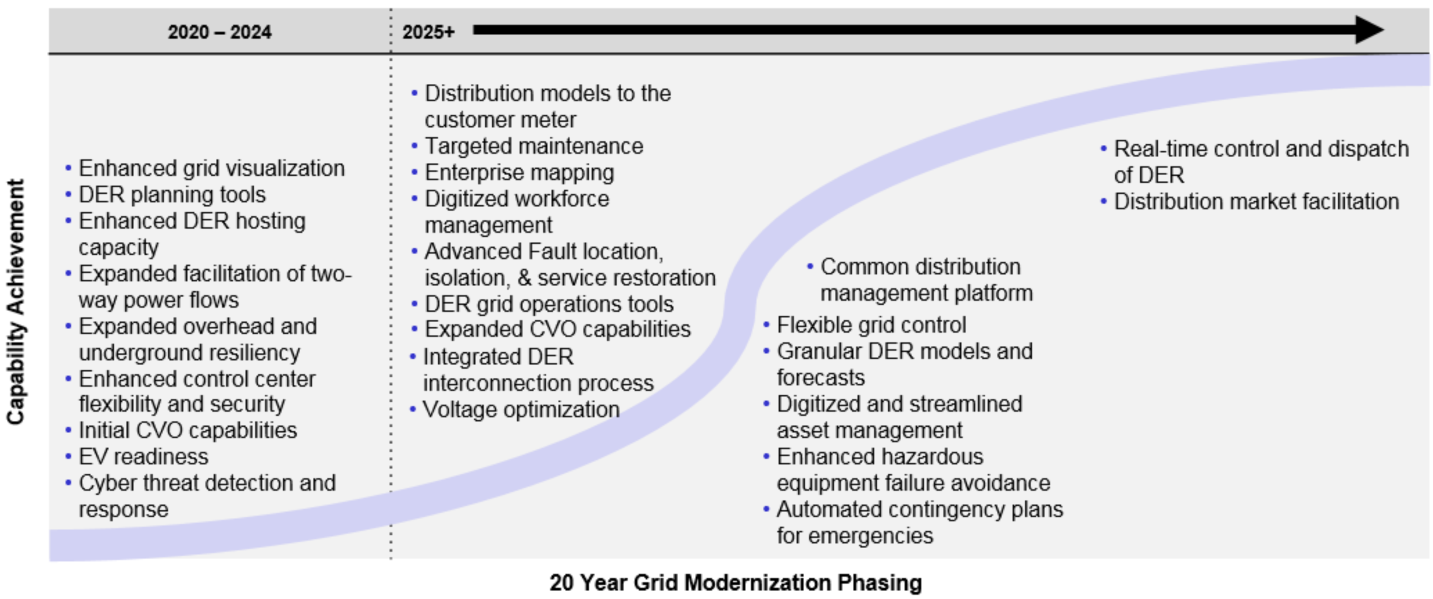
Con Edison's DSP investments are part of a holistic and comprehensive plan to modernize the grid. The Company's Grid Modernization Plan complements and expands upon DSP investments to improve capabilities and deliver benefits to customers in both the short term and the long term. Through strategic investments in foundational technologies and advanced capabilities, the Company seeks to evolve the electric system to cost-effectively deliver enhanced customer benefits by:

- Improving the safety of the public and utility workers.
- Empowering customers with more choices to meet their energy needs.
- Making our energy systems more resilient to extreme weather events and climate change.
- Enhancing visibility and intelligence to better plan and operate the grid.

- Integrating more DER for a cleaner energy future.

The Company's Grid Modernization Plan is based on a phased approach to grid modernization that includes a planned and logical sequence of investments that allows for iteration and optionality to integrate new technologies as they evolve, and can incorporate lessons learned from the many demonstration projects currently underway in New York and across the country. Figure 1 highlights the evolution of capabilities, with the early stages focused on foundational investments that will enable more sophisticated capabilities over time, including creating an integrated and comprehensive view of the Company's system, visible from modernized control centers, which will allow the Company to optimize operations, enhance security, and enable greater market functionality over the long term.

Figure 1: Capability Evolution over Time



One feature of Con Edison's Grid Modernization Plan is the use of sensing technology for greater situational awareness of the electric system, and data analytics and advanced management systems to more effectively plan and operate the system. Acceleration of sensing technologies, currently deployed on a targeted basis, will develop Con Edison's capabilities more quickly and align with investments in data analytics platforms and advanced grid management software. These field assets will provide actionable system data back to modern control centers to address system issues, improve operational awareness, and enable higher DER penetration and greater value from DER.

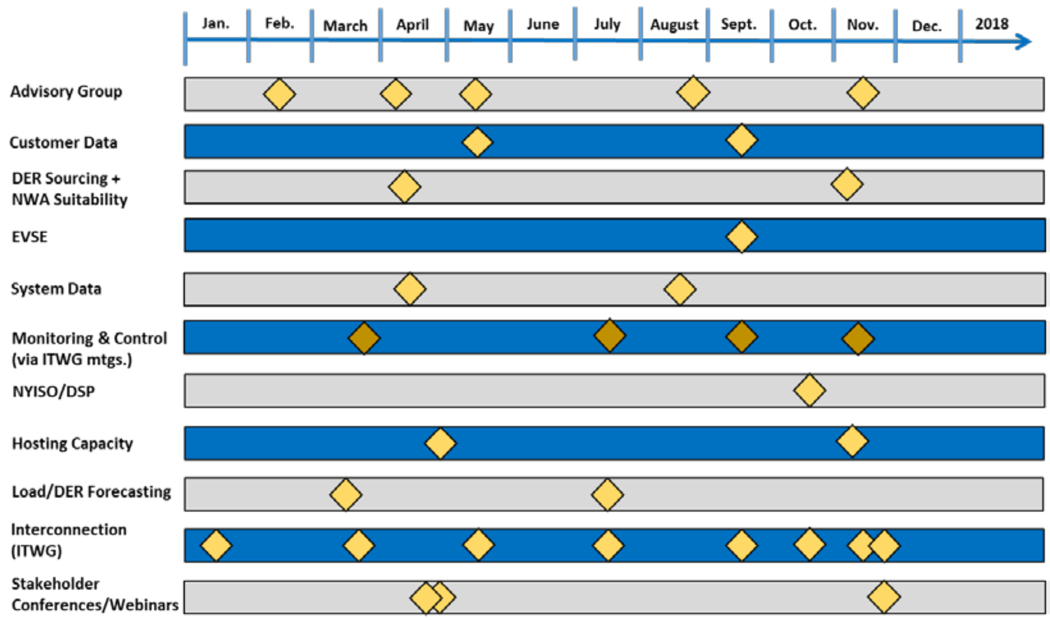
Ongoing stakeholder outreach

The Joint Utilities continued to collaborate on stakeholder engagement, both through the Advisory Group and stakeholder meetings held as part of working group activities.[7] The Advisory Group, made up of 15 representative companies, is an open forum for stakeholders who are actively engaged in the REV process and the DSIP filings to advise

[7] The Joint Utilities are Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Inc. ("CECONY"), New York State Electric & Gas Corporation, Niagara Mohawk Power Corporation d/b/a National Grid, Orange and Rockland Utilities, Inc. ("O&R"), and Rochester Gas and Electric Corporation.

the Joint Utilities on DSP implementation and stakeholder engagement. Figure 2 summarizes the 2017 stakeholder engagement schedule.

Figure 2: 2017 Stakeholder Engagement Efforts



Stakeholder outreach continued in 2018 and will be augmented with a meeting specific to Con Edison's and Orange & Rockland Utilities, Inc.'s ("O&R") DSIPs, as well as a broader Joint Utilities' stakeholder conference to discuss implementation efforts since the DSIP filings and preview plans for 2019.

Save the Date – Con Edison and O&R Stakeholder Session

September 10, 2018

Building on the structure established in 2016, Con Edison continues to collaborate with the Joint Utilities and coordinate on implementation issues through 10 topic-specific working groups.[8] These groups allow the Joint Utilities to share information and lessons learned and jointly develop tools and methodologies to achieve greater consistency and support statewide markets.

Conclusion

Con Edison's DSIP is a practical and actionable plan to enhance existing capabilities and develop new tools and processes to meet REV objectives and support the State's energy policy goals. The plan is drawn from ongoing collaboration with

[8] The working groups include Load and DER Forecasting, Hosting Capacity, Interconnection, Monitoring and Control, ISO-DSP Coordination, DER Sourcing/NWS Suitability Criteria, Electric Vehicle Supply Equipment ("EVSE"), Energy Storage, Customer Data, and System Data.

the Joint Utilities, including continued development of common standards, protocols, and processes that will support statewide markets and allow for greater convergence of capabilities over time.

This DSIP Update has benefited from a collaborative process with the Joint Utilities of New York, DPS Staff, and stakeholders. The Joint Utilities are working together to progress the DSPs as consistently as possible across the State while recognizing the inherent differences of each of the utility's systems. To facilitate the review of each utility's 2018 DSIP Update, the Joint Utilities presenting their plans in alignment with a standard table of contents and leveraging common language and figures. Where appropriate, the language and figures may be adapted to reflect the progress and plans of a specific utility.

1. PROGRESSING THE DSP

1.1. INTRODUCTION

Con Edison's second DSIP highlights major accomplishments since the June 2016 Initial DSIP and outlines the actions planned over the next five years to further develop the DSP and achieve REV objectives. As discussed throughout the filing, the Company has made significant progress in evolving the people, processes, and systems that underpin the DSP and adding new capabilities, particularly in DER integration. The Company will build on this progress over the next five years to facilitate DER market development and expand customer choice.

This filing responds to DPS Staff's whitepaper ("2018 DSIP Guidance"),[9] which clarifies the purpose of the DSIP filings and outlines the required contents. As stated in the 2018 DSIP Guidance, the purpose of the filing is to:

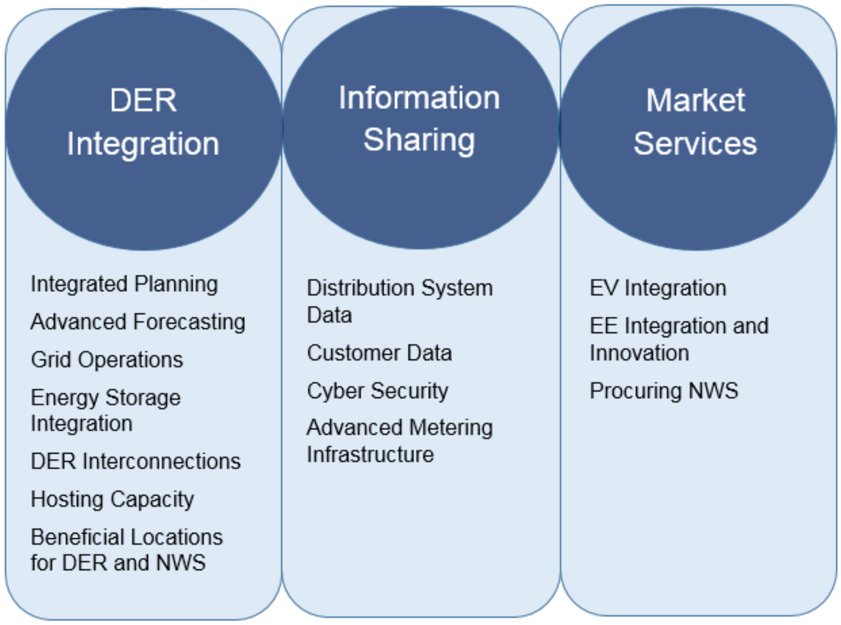
1) Report on the utility's progress.
2) Describe in detail the utility's plans for implementing all necessary policies, processes, resources, and standards.
3) Identify and describe how to access all the tools and information that DER developers and other third parties can use to understand utility system needs and potential business opportunities.
4) Describe how the utility's planning efforts are organized and managed.
5) Describe how the utility's implementation efforts are organized and managed.[10]

The Company developed this DSIP with these objectives in mind. Because the Initial DSIP provided a significant amount of background information on current practices and capabilities, this DSIP focuses on subsequent actions and results, with the aim of creating a useful reference guide to ongoing and future utility actions.

The DSIP is organized around the topics and outline of the 2018 DSIP Guidance. Figure 3 shows how these topics generally map to the three core aspects and primary value drivers of the DSP: (1) DER integration, (2) information sharing, and (3) market services, which are discussed in greater detail in subsequent sections. The topics outlined in the DSIP Guidance are not exhaustive—other topics, such as coordination with the NYISO and VDER tariff, are incorporated into other sections, as applicable, and are expected to be addressed more fully in the Market Design and Integration Report to be filed jointly following the individual DSIPs.

[9] Case 16-M-0411, *In the Matter of Distributed System Implementation Plans* ("DSIP Proceeding"), DPS Staff Whitepaper: Guidance for 2018 DSIP Updates (issued May 30, 2018) ("2018 DSIP Guidance").
[10] *Id.*, p. 4.

Figure 3: Mapping of 2018 DSIP Guidance Topics to Three DSP Aspects[11]



For each topic section, the DSIP provides general context and background information to orient the reader and presents an overview of achievements since the Initial DSIP and planned future actions. Each topic section also discusses implementation risks and the interface with stakeholders. These introductory sections are followed by responses to the itemized questions in the 2018 DSIP Guidance. To support information sharing while managing the volume of information provided in this DSIP, Con Edison directs readers, where applicable, to resources for additional information, such as those listed in Table 1. The Company provides a more detailed list of tools and resources as Appendix B.

Table 1: Examples of Additional Resources

Resource	Web Link
Con Edison's 2016 Initial DSIP	http://jointutilitiesofny.org/wp-content/uploads/2017/05/2ECF5647-BC11-4895-8DE8-7A3280E0E706-Con-Edison.pdf
Con Edison website	https://www.coned.com
Joint Utilities website	http://jointutilitiesofny.org/home/
REV Connect	https://nyrevconnect.com

[11] Some of the individual topics identified in the 2018 DSIP Guidance relate to more than one of the three aspects. For simplicity, each topic is mapped to its primary driver.

1.2. LONG-TERM VISION FOR THE DSP

Introduction

Over the next decade, New York's electricity system will become significantly cleaner and more efficient, flexible, reliable, and resilient. This transformation of the electricity system will play a central role in the decarbonization of the State's economy.

The Joint Utilities expect DER—end-use EE, DR, distributed storage, and DG[12]—will be a key part of this transformation. To facilitate adoption and grid integration of these resources, Con Edison and the Joint Utilities are developing DSPs that will offer DER products and services, creating new sources of value for customers and market participants.

As described in this filing, Con Edison has made substantial progress in implementing the initial stages of DSP functionality. Building upon this early progress requires a vision of how DSP functions and capabilities will evolve in the foreseeable future.

The creation of DSPs is occurring within the broader context of New York's energy policy goals and vision of a sustainable, low-carbon future. The Governor's 2018 State of the State address[13] reinforced and supplemented the quantitative clean energy targets the Commission adopted for this vision. These targets include significantly expanding renewable energy, energy storage, and EE, as shown in Figure 4. Additionally, the State has established goals for zero emission vehicles ("ZEV") and is actively promoting EV adoption and a build-out of EV charging infrastructure.[14]

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[12] Case 14-M-0101, *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision* ("REV Proceeding"), Order Adopting Regulatory Policy Framework and Implementation Framework (issued February 26, 2015) ("REV Track One Order"), p. 3.
[13] Governor Cuomo Unveils 20th Proposal of 2018 State of the State: New York's Clean Energy Jobs and Climate Agenda, available at: https://www.governor.ny.gov/news/governor-cuomo-unveils-20th-proposal-2018-state-state-new-yorks-clean-energy-jobs-and-climate
[14] Case 18-E-0138, *Proceeding on Motion of the Commission Regarding Electric Vehicle Supply Equipment and Infrastructure* ("EVSE Proceeding"), Order Instituting Proceeding (issued April 24, 2018) ("Instituting Order").

Figure 4: Key New York State Energy Policy Goals

Clean Energy
- 50% of electricity consumption generated with renewable energy resources by 2030

Energy Efficiency
- 185 trillion Btu reduction in building energy use by 2025
- 23% reduction in building energy use by 2030
- 600 trillion Btu increase in state-wide efficiency by 2030

Energy Storage
- 1,500 MW of energy storage by 2025

Electrification
- Create statewide network of charging stations by 2018
- Zero-emission vehicle memorandum of understanding goals by 2025

These targets mean a transformation of the State's energy sector, from independent energy end-uses reliant on fossil fuels to an increasingly integrated energy system in which clean electricity serves a growing share of building and transportation energy demand. A flexible, more intelligent electric grid will be at the heart of this more integrated energy system. Modernization of the electric grid, as envisioned and articulated in the DSIPs, is thus a critical step toward meeting State policy goals.

The State's quantitative energy policy targets are complemented by other REV goals: affordability, clean energy innovation, choice empowerment, infrastructure improvement, job creation, natural resource protection, energy system resiliency, and cleaner transportation.[15] In addition, the REV proceeding laid out a vision for a distributed electricity marketplace that will enable customers to participate in supplying local energy resources and manage their electricity needs.[16]

Meeting REV goals will require a transformation of New York's electricity system, progressing to a system that is information-rich, facilitates customer engagement and choice, seamlessly integrates distributed resources, and encourages clean energy resources and EE, as enabled by improvements in energy, information, communications, and grid control technologies.

The DSP Vision

Defining DSPs

The Commission defines DSPs as:

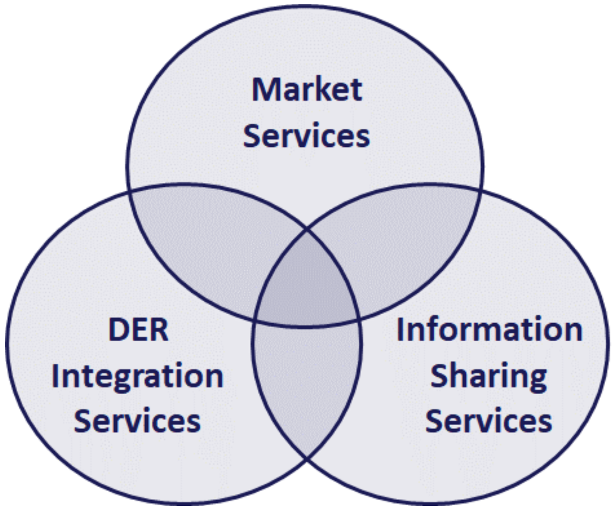
> an intelligent network platform that will provide safe, reliable and efficient electric services by integrating diverse resources to meet customers' and society's evolving needs. The DSP fosters broad market activity that

[15] https://rev.ny.gov/
[16] REV Proceeding, REV Track One Order, p.11.

monetizes system and social values, by enabling active customer and third party engagement that is aligned with the wholesale market and bulk power system.[17]

Taken further, DSPs are the people, processes, and systems that allow utilities to provide three core, interrelated services shown in Figure 5.

Figure 5: Three Core DSP Services



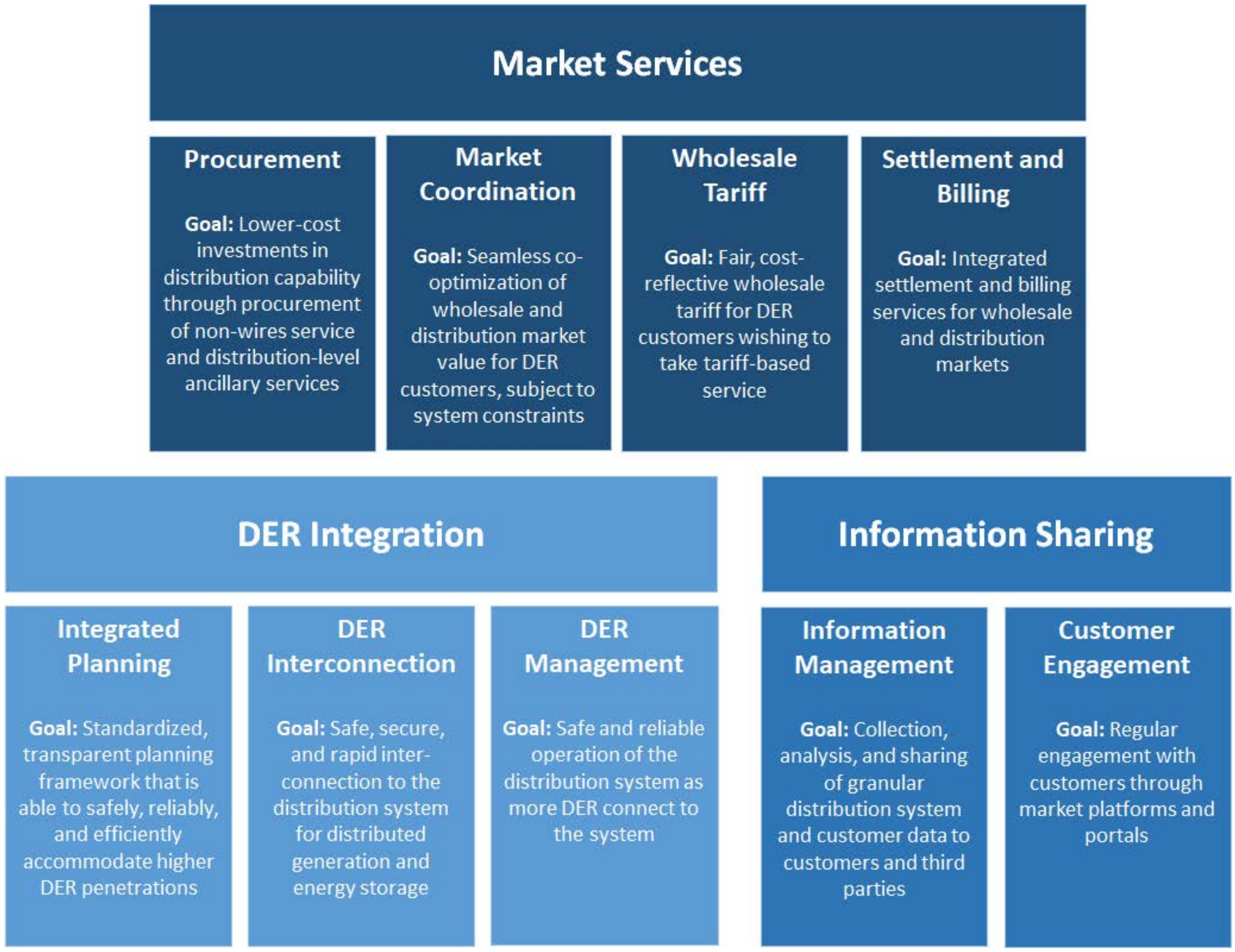
- **DER integration services** are the planning and operational enhancements that promote streamlined interconnection and efficient integration of DER, while maintaining safety and reliability.
- **Information sharing services** are information and communications systems that collect, manage, and share granular customer and system data, enabling customer choice and expanding third-party vendors' and aggregators' participation in markets for DER.
- **Market services** are utility programs, procurement, wholesale market coordination, and tariffs that create value for DER customers through market mechanisms.

DSP Function and Value

As DSP providers, utilities are developing the capabilities, processes, and systems that will enable key DSP functions: integrated planning, DER interconnection, and DER management (*DER integration*); information management and customer engagement (*information sharing*); and procurement, market coordination, wholesale tariff, and settlement and billing (*market services*). Figure 6 describes long-term goals for each DSP function.

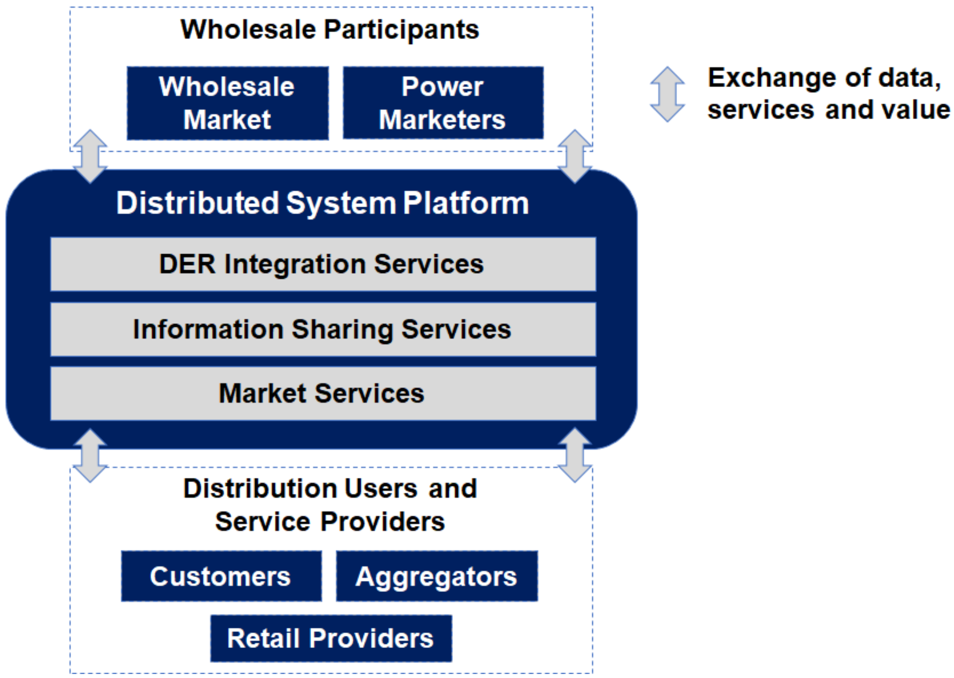
[17] *Id.*, p. 31.

Figure 6: Long-Term Goals for DSP Functions within Each Core DSP Service Area



As they evolve, DSPs will bring together suppliers and buyers of electricity services and become more populated with information and transactions, as shown in Figure 7. DSPs will become a natural marketplace for third-party aggregators and technology vendors to gather data and offer their services.

Figure 7: Illustration of the DSP as an Energy Marketplace



DSPs will open new sources of value for electricity customers and market participants by expanding customer choice, enhancing DER integration, and maximizing the distribution and wholesale value of DER, as shown in Figure 8.

Figure 8: DSP Value to Customers and Market Participants in the Longer Term

Customers

- Ability to identify products and services that lower costs and emissions and improve reliability
- Products and services that can be tailored and bundled to meet customer preferences
- Ability to shop among different service providers
- Granular information on usage, cost, reliability, and emissions

Market Participants

- Streamlined interconnection; detailed information on hosting capacity, interconnection costs, and locational value
- Co-optimization of wholesale and distribution market value
- Procurement for NWS and other distribution services
- Billing and settlement services for wholesale and distribution markets
- Access to granular customer information with customer consent

Con Edison and the Joint Utilities believe that the DSP vision will continue to advance as key drivers and markets evolve.

DSP Evolution

DSP functions and capabilities will progress through different phases, as described in the Joint Utilities' 2016 Supplemental DSIP.[18] A phased approach aligns the pace of investment with the speed of DER adoption, recognizing that some capabilities are not required until DER penetration reaches significantly higher levels. Additionally, a phased approach also provides opportunities to learn from demonstration projects in New York and from experiences in other states and countries.

The Joint Utilities have established a framework for understanding and navigating the different phases of DSP functionality and capability, encapsulated in three DSP "models." DSP 1.0 refers to the first, and current, phase of DSP development. DSP 2.0 refers to a second phase, with enhanced integration, information, and market services. DSP 2.x refers to a longer-term phase of DSP development, characterized by the emergence of transactional distribution markets.

This section focuses on DSP 1.0 and 2.0 and the transition between them, describing three key aspects of DSP evolution: (1) function and capability, (2) customer value, and (3) enabling investments and conditions.

DSP 1.0

In DSP 1.0, utilities create initial stages of the platform, which enables:

- More streamlined interconnection and enhanced distribution system measurement, monitoring, and control capabilities.
- Safe operation of the grid with increasingly higher levels of DER.
- More accessible, granular information on customer use and closer engagement with customers and aggregators through information portals.
- Regular NWS procurement and incorporation of wholesale value through the VDER tariff.[19]

In this phase, DSPs provide retail settlement and billing services to customers based on VDER, and wholesale settlement and billing services to aggregators for NWA procurement, as shown in Figure 9. DER aggregators and their customers can also access wholesale settlement and billing services through the NYISO.

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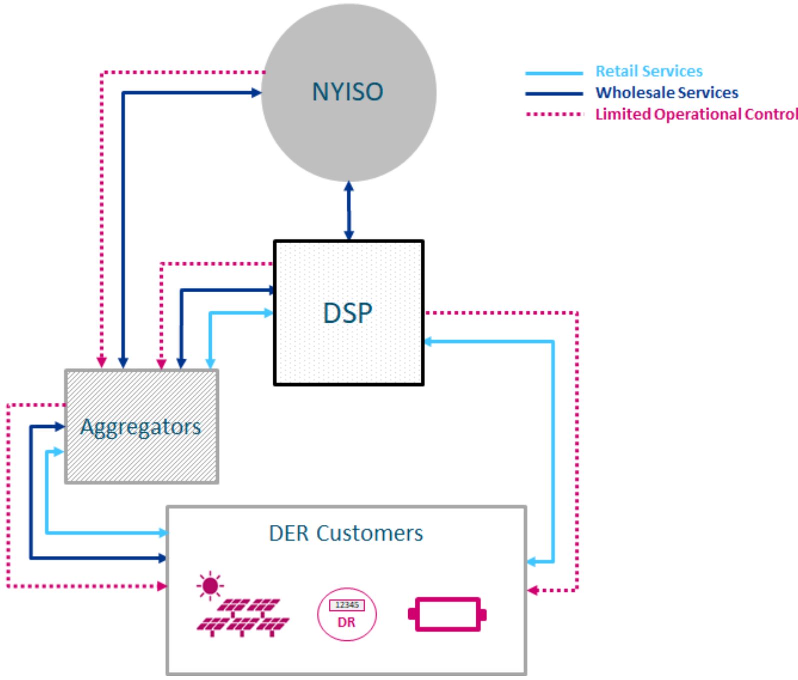
[18] DSIP Proceeding, Joint Utilities Supplemental Distributed System Implementation Plan (filed November 1, 2016) ("Supplemental DSIP"). Available at: http://jointutilitiesofny.org/wp-content/uploads/2016/10/3A80BFC9-CBD4-4DFD-AE62-831271013816.pdf.

[19] Cases 15-E-0751 *et al.*, *Proceeding in the Matter of the Value of Distributed Energy Resources* ("VDER Proceeding"), Order on Net Energy Metering Transition, Phase One of Value Distributed Energy Resources, and Related Matters (issued March 9, 2017) ("VDER Phase One Order").

Figure 9: DSP 1.0 Wholesale and Retail Services



DSP 1.0 promotes increased DER integration up to the limitations of today's distribution grid. Utilities have sufficient visibility and operational control over DER to maintain safe and reliable grid operations. Pre-determined rules for joint participation in NWS procurement and the NYISO markets form the basis for operational coordination with the NYISO.

As described in this filing, Con Edison has made substantial progress in developing the systems, processes, and capabilities that enable DSP 1.0. Investments will facilitate continued progress in DSP 1.0 by focusing on:

- *DER integration capabilities*: integrated planning; operational communications; measurement, monitoring, and control capabilities; distribution automation; and distribution management systems.
- *Information sharing capabilities*: data management and analysis software; customer and aggregators interfaces.
- *Market services capabilities*: NWS planning and procurement, NYISO coordination, and VDER tariff improvements.

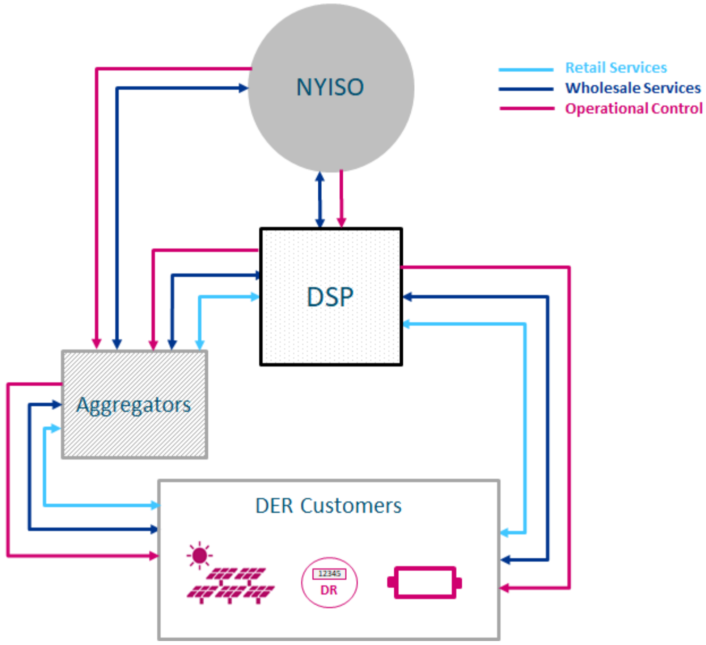
Section 1.5 describes in greater detail these investments and the respective grid functionality they provide.

DSP 2.0

DSP 2.0 builds on the functions and capabilities of DSP 1.0, adding greater visibility and operational control over DER. Greater visibility and operational control allow for the creation of integrated markets for wholesale and distribution services.

In DSP 2.0, DSPs offer wholesale scheduling and dispatch services, allowing customers and aggregators to maximize the value of their resources across NYISO wholesale markets and distribution markets. As shown in Figure 10, aggregators can still access wholesale markets directly through the NYISO. The NYISO also has enhanced capabilities to monitor and control DER.

Figure 10: DSP 2.0 Wholesale and Retail Services and Operational Control



Via DSP market platforms, DSP 2.0 provides an additional "wholesale services" route for DER customers to deliver their services to markets, illustrated by the solid blue line connecting DER Customers and the DSP in Figure 10. These market platforms will be described in greater detail in the DSP Market Design and Integration Report.

Several functions and capabilities in DSP 2.0 do not yet exist and require innovations in software, systems, and process. For instance, DSP 2.0 is characterized by much larger volumes of information flow, which require new approaches and tools for data management and analysis. The protocols, processes, and software enabling near real-time DER control also require innovation and development.

DSP 1.0 and 2.0 are distinguished by key high-level differences in platform function and capability rather than checklists of essential features. Thus, the transition from DSP 1.0 to 2.0 will evolve and develop over time, with variation among the Joint Utilities. Timelines for individual utilities will depend on grid topology, funding, and need.

With further market and technology development, DSP 2.0 could eventually evolve to DSP 2.x, where DER penetration is substantially larger than it is today, loads are highly price sensitive, and decentralized transactions are feasible on a larger scale.

The remaining sections focus on building the functions and capabilities necessary to continue progress in DSP 1.0 and lay the groundwork for DSP 2.0.

1.3. DSP PROGRESS AND IMPLEMENTATION ROADMAP

Con Edison has made significant progress advancing the State's goals and building the capabilities necessary to create a DSP that supports DER market growth and enhances the customer experience. One measurement of success is the growth in solar capacity on the system. Since January 1, 2016, the amount of installed solar capacity added to the system has doubled to over 200 MW_{AC} and is expected to reach 650 MW_{AC} by the end of 2023. This is in addition to significant increases in peak savings from EE and DR programs, which will continue to grow as the Company innovates its portfolio to meet the new EE targets and further leverages NWS. The Company also supports the emergence of energy storage as a system resource and provider of grid benefits.

Con Edison, working with the Joint Utilities, has focused DSP implementation efforts in three core aspects of the platform: (1) facilitating expanded DER integration, (2) sharing information that helps third parties scope business opportunities and helps customers understand energy usage, and (3) expanding market services. Effective integration of DER into planning and operations protects system safety and reliability, while enabling higher levels of DER. Expanded information sharing, including more granular customer and system data, facilitates DER market development and deployment by signaling where DER can provide the greatest value to customers and the grid, aiding in the development of new DER offerings, and building the business case to support investment decisions by third parties and customers. Market services provide the framework for DER value capture, including opportunities to "stack" multiple value streams and participate in multiple markets, which can enable new DER business models and in turn drive increased DER adoption. With progress in these areas, more DER will serve the system, resulting in better resiliency and efficiency, more resource diversity, lower GHG emissions, and more market services.

The Company is executing on its DSP investment strategy to build DSP capabilities that support REV objectives and enable near-term DER market growth. For example, meter and supervisory control and data acquisition ("SCADA") upgrades are increasing system visibility and expanding the ability to leverage energy storage for grid support. Similarly, investments in advanced relays that allow reverse power flow on network systems are increasing the hosting capacity in areas targeted for deployment of NWS, with approximately 2,000 relay installations planned in the current DSP budget.

Driven by changing customer expectations, advances in technology, and State policy goals, Con Edison is developing a Grid Modernization Plan that builds on these ongoing DSP investments, leverages the investment in AMI, and unites them under a holistic and comprehensive view of how the capabilities of the grid will evolve over time. The Plan reflects the uniqueness of Con Edison's service territory, which consists of network and non-network systems operating at 4 kV, 13 kV, 27 kV, and 33 kV, serving both dense urban and suburban customers across the five boroughs of New York City and Westchester County. With the largest underground, low-voltage network system in the world, Con Edison is already a leader in the deployment of modern technologies and tools, such as Distribution SCADA ("D-SCADA"), automated field devices, and advanced network modeling. Con Edison's Grid Modernization Plan expands the use of sensing technology for greater situational awareness of the electric system. Field assets will feed system data back to modern control centers to mitigate system issues in real time, which improves operational awareness and enables higher DER penetration and greater value realization from DER. Enhanced data analytics and advanced management systems will allow Con Edison to more effectively plan and operate the system.

DER Integration

Integrating DER is a central function of the DSP and a key enabler of higher levels of DER. Effective integration of DER into distribution planning and operations protects system safety and reliability in a high-DER environment and provides the operational framework that allows DER to access and achieve value through the DSP and the wholesale market. DER integration has also been an area of significant progress for Con Edison, with several important achievements, particularly in the areas of hosting capacity, interconnection, and demonstration projects to test operational and business models for emerging technologies. Through July 2018, Con Edison, working with the Joint Utilities, has implemented several key DER integration initiatives, which Figure 11 summarizes.

Figure 11: Actions and Results in DER Integration through July 2018

Actions		Results
Created online application portal	→	Streamlined DER interconnection process that increases speed and transparency
Provided access to circuit-level hosting capacity data	→	Developers able to target less costly locations for DER interconnection
Incorporated DER into forecasting in a more robust and granular fashion	→	Better reflects the impact of DER on load and supports efficient investment planning
Procured DER as NWS to defer traditional distribution system investments	→	Increases DER market opportunities and optimizes capital investment
Established common interim M&C standards for PV	→	Maintains system reliability and safety under current DER penetration and enables advanced market functions
Identified potential low-cost M&C solutions while implementing interconnection advancements	→	Reduces barriers to entry for DER and greater cost predictability for developers
Began deploying or planning foundational investments, such as AMI and DERMS	→	Foundational technologies facilitate DER integration and market participation
Installation of advanced relays to allow reverse power flow on network system	→	Increases available hosting capacity and operational flexibility
Initiated REV demonstration projects, such as storage, marketplace, and smart home rates (“SHRs”)	→	Greater understanding of how to deploy these solutions across a service territory to address system needs
Published EV Readiness Framework	→	Supports expansion of the EV market and charging infrastructure
Procured and formed energy storage safety agreements with local authorities and implementing demonstration projects to test new operational and business models	→	Greater opportunities for energy storage deployment
Defined operational requirements for coordination among the DSP, NYISO, DER aggregators	→	Support for DER integration and expansion of DER participation in wholesale markets

The Joint Utilities have continued to strive toward consistency and joint milestones for DER integration. For example, the Joint Utilities provided NWS suitability criteria that followed common guidelines developed in discussions with stakeholders. Utilities and stakeholders agreed that such criteria can help all parties by identifying the best opportunities for NWS, allowing for more efficient use of time and resources. In May 2017, the Joint Utilities filed a description of how future utility planning procedures would apply the proposed NWS suitability criteria and identified projects in each utility's five-year capital plan that meet these criteria.[20]

The Interconnection Technical Working Group ("ITWG")[21] approved updated monitoring and control ("M&C") requirements to maintain system reliability as DER penetration increases. The Joint Utilities also achieved a partially automated interconnection application process through completion of Phase 1 and progress on Phase 2 of the Interconnection Online Application Portal ("IOAP"), which is an online submission portal to streamline and increase the transparency of the interconnection process. This is a milestone in the phased roadmap presented in the Supplemental DSIP to achieve functionality improvements throughout the interconnection process, leading toward "full automation" in the future, as applicable.

To outline and implement standard operating practices across all levels of the transmission and distribution system, the Joint Utilities coordinated with the NYISO to propose operational DSP-NYISO coordination protocols, including approaches for DSP dual participation as a provider of both local distribution services and wholesale energy in NYISO markets, which allows DER to access multiple value streams. Specifically, the *DSP Communications and Coordination Manual*[22] describes how the DSP envisions coordinating with NYISO, DER aggregators, and individual DER assets to preserve system safety and reliability while allowing DER to participate in new markets and deliver value across different services. The *DSP-Aggregator Agreement for NYISO Pilot Program*[23] establishes operational coordination requirements between the DSP and DER aggregators for purposes of the NYISO pilot program.

The Joint Utilities have also collaborated in shared learning on more advanced forecasting approaches, including incorporation of probabilistic methodologies. Enhanced forecasting is supporting more granular marginal cost of service ("MCOS") studies, which underlie more accurate locational costs and will inform the VDER Proceeding.[24] These improved forecasting initiatives are helping to more accurately align DER compensation with grid value through price signals.

The progress of the past two years in integrating DER into planning and operations provides a solid foundation for future actions. The Joint Utilities envision collectively accomplishing the following in the first two years of the five-year plan:

- Refine DER forecasting methodologies to better reflect the impact of DER on the system.
- Complete the more granular Stage 3 hosting capacity analysis by October 2019.
- Evaluate approaches to forecasting hosting capacity.
- Develop specifications for IOAP 3.0 to facilitate increased automation in the DER interconnection process.
- Facilitate ongoing demonstration and deployment of technologies to enable active network management to facilitate system analysis and DER coordination, optimization, and control.

[20] DSIP Proceeding, Joint Utilities' Supplemental Information on the Non-Wires Alternatives Identification and Sourcing Process and Notification Practices (filed May 8, 2017).
[21] http://www3.dps.ny.gov/W/PSCWeb.nsf/All/DEF2BF0A236B946F85257F71006AC98E
[22] Note 5, *supra*.
[23] Note 6, *supra.*
[24] VDER Proceeding, Order on Phase One of Value of Distributed Energy Resources Implementation Proposals, Cost Mitigation Issues, and Related Matters (issued September 14, 2017) ("VDER Phase One Implementation Order").

- Advance M&C standards for a broader set of asset types and sizes via direct control and third-party aggregators.
- Expand smart inverter integration including advanced functions.
- Continue to coordinate with the NYISO to develop a framework for dual participation across wholesale markets and distribution services.

In addition to actions with the Joint Utilities, Con Edison will continue to formalize and institutionalize DER into utility planning, including leveraging experience from NWS projects to inform potential changes to the suitability criteria, as needed, and modifying internal procedures to continuously improve the efficiency and effectiveness of the NWS process. Additionally, the Company will continue to explore low-cost M&C of DER within planned pilots and take the lessons learned from the energy storage demonstration pilots to support energy storage solutions at scale.

Market Services

In DSP 1.0, the market focus is on enabling greater access to market value through advances in the "3 P's" of DER sourcing—procurement, programs, and pricing. Con Edison is continuing to support DER value creation, customer engagement, and DER market development by sending clearer market signals to developers and by providing a greater volume of market opportunities through NWS. Additionally, the Company is piloting new rate designs that leverage AMI capabilities to influence customer behavior through rates that are more reflective of cost causation and has filed tariffs implementing Phase One of the VDER tariff, as part of the succession from net energy metering ("NEM").[25]

Through July 2018, the Joint Utilities have implemented several key market services initiatives, summarized in Figure 12.

[25] The VDER proceeding has two phases. Phase One emphasizes the development of an initial value stack tariff to compensate NEM-eligible technologies for injections onto the grid. Phase One also involves ongoing efforts to address value stack eligibility for non-NEM-eligible resources, such as energy storage and CHP. Phase Two is focused on refining the value stack, creating a mass market NEM successor tariff for energy consumption, and removing barriers to DER participation for all customers. VDER Proceeding, VDER Phase One Implementation Order.

Figure 12: Actions and Results in Market Services through July 2018

Actions		Results
Improved the NWS solicitation process, including providing common datasets	→	Greater transparency, consistency, and efficiency for developers
Ramped up savings through utility programs	→	Additional market opportunities for EE and DR suppliers and vendors
Opened new opportunities for energy storage to support distribution system needs through tariffs, procurements, and programs	→	Promoting energy storage deployment
Applied Phase One VDER Value Stack	→	Clearer market signal to developers of where DER can capture enhanced locational value
Aligned dispatch and communication protocols, and formalized roles and functions among DSP, NYISO, DER aggregator, and DER owner	→	Allow DER to access more value through wholesale markets, while maintaining distribution and bulk power system safety and reliability
Enabled dual participation for DER in both wholesale markets and the provision of distribution services	→	Opportunity for DER to stack value
Developed more granular MCOS studies	→	Increased transparency into and ability to estimate high-cost/value areas of the distribution system
Presented LSRV zones in hosting capacity map	→	Enables market visibility of beneficial locations and geographic granularity

The Joint Utilities have made progress standardizing and streamlining the NWS procurement process, which is expected to facilitate more NWS opportunities and make it faster, easier, and cheaper for developers to respond. For example, multiple stakeholder meetings have generated important feedback on stakeholders' desired timeframes for notification of NWS opportunities, as well as standardization of required data and requirements in response to requests for proposals ("RFPs"). In response to this feedback, information about these opportunities has become available sooner and through central online locations, developer response times are longer, and the type of information included in the RFPs is more standardized.

The Company's EE and peak reduction goals continue to increase, driving additional effort and innovation. In 2017, the Company surpassed its maximum targets for energy savings and peak reduction, achieving 300 GWh of savings and 61 MW of peak reduction. The electricity savings are equivalent to the electricity consumed by over 33,000 U.S. households in a year. The Company employs a host of innovative strategies to increase market solutions. Examples for residential customers include accessing rebates and incentives through market partners, shopping directly through the Online Marketplace, managing energy and demand through programmable thermostats and Wi-Fi-enabled air conditioners, and benefiting from market-based partnerships among Con Edison and mid- and upstream retailers and manufacturers. Con Edison will actively participate in the ongoing stakeholder processes related to the new EE goals and pursue greater innovation.

The role of pricing is to "send value signals that enable the reduction of total system costs in the long run."[26] Similarly, the shift toward more granular pricing is intended to result in a more accurate representation of value streams for DER grid services and encourage the siting of DER where it can provide most system value. The introduction of VDER tariffs to compensate DER and time-of-use ("TOU") rates to manage load are examples of more granular pricing mechanisms designed to influence behavior.

The Joint Utilities have been and continue to be actively engaged in VDER Phase One and Phase Two efforts, including participation in the Value Stack and Rate Design working groups. To further the Phase One effort, each utility developed and filed an implementation plan[27] detailing how it planned to implement the framework of the VDER Phase One Order, spanning from calculation of value stack components to processes for managing billing and tracking credits. Under the Commission's VDER Phase One Order, NEM-eligible resources would be compensated across six value components: (1) energy, (2) capacity, (3) environmental, (4) LSRV, (5) Demand Reduction Value ("DRV"), and (6) the Market Transition Credit for community DG projects.[28] The Commission adopted the Phase One Value Stack in its VDER Phase One Implementation Order based on the calculation methodologies each utility outlined in its implementation plan.

In addition to these Phase One efforts, the Joint Utilities have been actively engaged in Phase Two efforts to improve the price signals for avoided transmission and distribution infrastructure, including the interplay among the value stack tariff, utility programs, and NWS. Each utility provided the Value Stack Working Group with details on its updated methodology for conducting MCOS studies to help the Working Group determine if MCOS studies should continue to form the basis for LSRV and DRV compensation. The Joint Utilities will continue to actively participate in VDER Working Groups to address Phase Two focus areas (and the ongoing Phase One effort to determine value stack compensation for non-NEM-eligible resources). These ongoing efforts will inform DPS Staff's end-of-year report and recommendations to the Commission on Phase Two.

The Joint Utilities have also worked on market services related to specific DER technologies. One area of focus has been supporting adoption of EVs and deployment of EVSE. In the Supplemental DSIP, the Joint Utilities committed to developing a joint EV Readiness Framework aligned with New York State EV adoption initiatives, which was shared with stakeholders in spring 2018 and details various approaches to support greatly increased EV adoption. In addition, Con Edison has several demonstration projects in progress related to EV charging and is testing rate designs to influence charging behavior, including an off-peak charging incentive for EV drivers.[29] The Joint Utilities are exchanging lessons learned from approaches like these to advance innovation that can enhance EV grid value and customer adoption.

Information Sharing

Expanded information sharing, including more granular customer and system data, facilitates DER market development and deployment by signaling where DER can provide the greatest value to customers and the grid, aiding in the development of new DER offerings, and building business cases to support third parties' and customers' investment

[26] REV Proceeding, Order Adopting a Ratemaking and Utility Revenue Model Policy Framework (issued May 19, 2016) ("REV Track Two Order"), p. 14.
[27] VDER Proceeding, Consolidated Edison Company of New York, Inc. Implementation Proposal for Value of Distributed Energy Resources Framework (filed on May 1, 2017).
[28] VDER Proceeding, VDER Phase One Order, pp. 15-16.
[29] https://www.coned.com/en/save-money/rebates-incentives-tax-credits/rebates-incentives-tax-credits-for-residential-customers/electric-vehicle-rewards

decisions. Through July 2018, the Joint Utilities have implemented several key information sharing initiatives, summarized in Figure 13.

Figure 13: Actions and Results in Information Sharing Through July 2018

Actions		Results
Developed individual utility system data portals	→	Easier access to expanded system datasets in one convenient location
Enhanced hosting capacity map to include additional layers, including NWS and LSRV areas	→	More comprehensive view of beneficial locations to support developers in identifying high-value locations favorable for DER development
Increased transparency in interconnection process through more detailed job status updates	→	Interactive project updates support developer planning and customer communications
Provided 8,760 forecast data in system data portal	→	Greater visibility for developers into duration of peak and off-peak periods
Implemented GBC Phase I to share customer data	→	More granular energy data available from AMI accessible to authorized third parties through an automated process in machine readable format
Produced a whole building aggregated data privacy standard for building owners or agents	→	Balances greater data sharing for building benchmarking while protecting customer privacy
Produced statewide-privacy standard for aggregated data provided to third parties	→	Consistent approach to protecting customer privacy
Supported launch of REV Connect to communicate DER opportunities for all utilities	→	Greater transparency for the developer community in NWS and other REV-related opportunities
Worked with New York State Energy Research and Development Authority ("NYSERDA") on the development of the Utility Energy Registry ("UER") for aggregated customer data	→	Public access to aggregated customer data for community energy planning and Community Choice Aggregation ("CCA") development

In the past two years, the Joint Utilities have engaged stakeholders to better understand data use cases and to solicit input on how to improve data sharing. The Joint Utilities made adjustments based on this input, including the creation of centralized portals on both the Joint Utilities' website[30] and REV Connect website[31] to provide system data and access to NWS and other RFP opportunities. These portals enable increased access to and usability of stakeholder-requested information and enhance efficiency for developers seeking to participate in NWS and other opportunities.

The Joint Utilities have also collaborated to address other information sharing priorities stemming from the Supplemental DSIP and related orders. For example, the Joint Utilities System Data Working Group has completed important steps to develop a process of reviewing and standardizing the format of publically available data. As a part of this effort, the Joint Utilities have agreed on the value of annually reviewing the usability and availability of information with stakeholders, to the benefit of DER developers who request the information. In addition, the Joint Utilities have initiated discussions on classifying data based on issues including the sensitivity of information sharing and the level of difficulty to provide the information, which may result in potential fee structures for additional data services.

The Customer Data Working Group has also completed several steps, including approaches for aggregated building data collection and dissemination—some of which were addressed in the 4/50 privacy standard proposal approved by the Commission—as well as a process to track aggregated data requests and responses, allowing for more efficient identification and response to non-standard, high-value data requests from stakeholders. [32]

In addition, the Load and DER Forecasting Working Group has worked on ongoing tasks related to information sharing, including coordination with the NYISO and soliciting input from stakeholders on potential use cases for forecast data. This work included alignment on understanding the use cases for 8,760 substation-level forecasts, which are available through the Company's hosting capacity maps in the system data portal.

Increased access to data sources and standardized, easily understandable formats will characterize information sharing through 2020 and beyond. Going forward, the Company will continue to expand available data and simplify data access while maintaining customer privacy and data security. For example, as of mid-July, 2018, customers with AMI can access their near-real-time data (i.e., 30-45 minutes after the interval ends). Similarly, the implementation of GBC Phase II by the end of 2018 will expand available datasets to third parties, including near-real time data. Additionally, Con Edison, in collaboration with the Joint Utilities, will continue to engage stakeholders on evolving data needs and monitor data-related proceedings.

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[30] Joint Utilities of New York, *Utility-Specific Non-Wires Alternatives (NWA) Opportunities*, Overview of Utility-Specific NWA Opportunities. http://jointutilitiesofny.org/utility-specific-pages/nwa-opportunities/.

[31] REV Connect, *Non-Wires Alternatives*, https://nyrevconnect.com/non-wires-alternatives/.

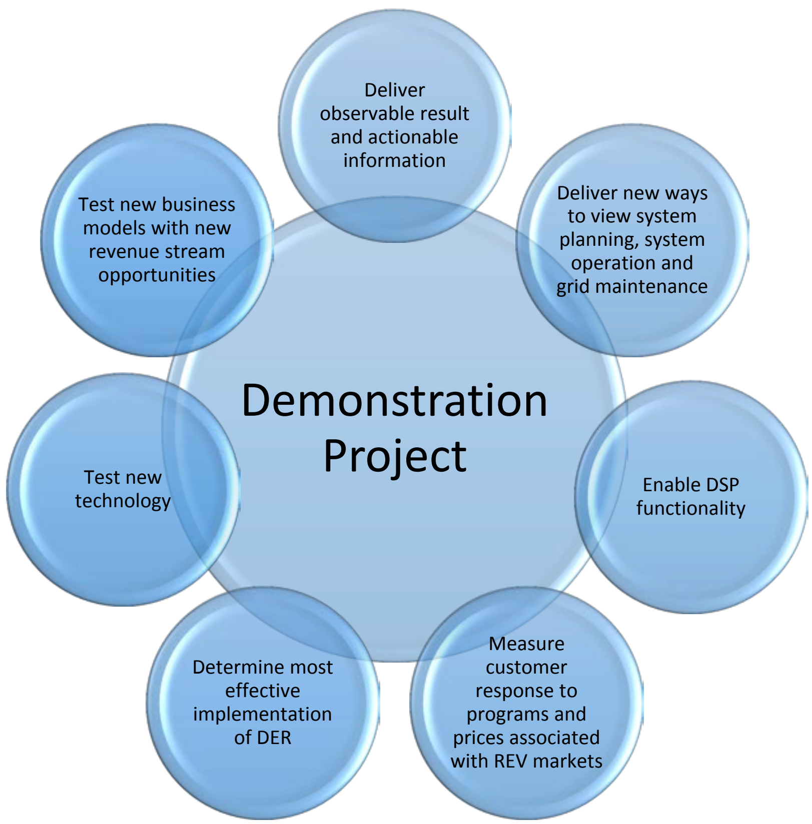
[32] DSIP Proceeding, Order Adopting Whole Building Energy Data Aggregation Standard (issued April 20, 2018).

1.4. INNOVATION AND DEMONSTRATION PROJECTS

Innovation and demonstration projects play an important role in allowing the Company to test new technologies, prove conceptual business models, and inform DSP development.

As part of REV, the Commission required the utilities to file initial REV demonstration projects by July 1, 2015.[33] REV demonstration projects are intended to "advance the development of new utility and third party service or business models and to gain experience with integration of distributed energy resources."[34] Additionally, as stated by Staff, these demonstration projects are "intended to test new technologies and approaches to assess value, explore options and stimulate innovation before committing to full-scale implementation."[35] Figure 14 shows the various principles the REV demonstration projects strive to achieve.

Figure 14: REV Demonstration Project Principles



The Company has initiated several REV demonstration projects, which are in various stages of implementation. The Company is evaluating the timing to solicit more demonstration projects, considering market need and the authorized spending cap for the portfolio of projects. REV Connect is another vehicle for identifying potential new business models

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[33] REV Proceeding, Track One Order, pp. 115-116.

[34] REV Proceeding, Memorandum and Resolution on Demonstration Projects (issued December 12, 2014), Appendix A.

[35] DPS Staff REV Demonstration Projects website. Available at http://www3.dps.ny.gov/W/PSCWeb.nsf/All/B2D9D834B0D307C685257F3F006FF1D9?OpenDocument

and technology solutions. In addition to offering the ability to submit an idea through the website, REV Connect is hosting innovation sprints that seek ideas on a specific theme and utility partnership need within a given timeframe. For example, for the EE innovation sprint, Con Edison is seeking innovative solutions to increase building EE and reduce GHG emissions through improvements to the building envelope.[36] Additionally, Con Edison will be partnering with NYSERDA on the upcoming innovation sprint for energy storage.

Beyond the portfolio of REV demonstration projects, other innovative projects also advance the state of technology, demonstrate new business models, and inform DSP development. For example, Con Edison is part of the project team on three microgrid proposals that have advanced to Stage 2 planning as part of NYSERDA's NY Prize competition. NYSERDA is awarding funding to the three teams to develop a comprehensive engineering, financial, and commercial assessment associated with installing and operating a community microgrid at the proposed site. A Stage 3 Project Build-Out competitive RFP will evaluate the overall costs and benefits, contribution to public need, and other factors.[37]

Another recent innovation is the work with the developers of Hudson Yards—a large, new private real estate development in Midtown West—to create a service design that enables the properties to function as a microgrid and facilitates a seamless transition between island mode and grid connected operation.[38]

A brief description of notable innovation and demonstration projects is included below. While many of these projects serve multiple objectives and functions, they are grouped based on their primary theme. REV demonstration projects are noted below. Staff maintains a website for REV demonstration projects, including links to relevant regulatory filings.[39]

Customer Engagement and Market Development

Building Efficiency Marketplace (REV Demo)

The Building Efficiency Marketplace demonstration project uses a web-based portal, analytics, and a community of vendors to increase commercial customer engagement. The project is designed to examine how Con Edison can leverage interval meter data analytics to enable targeting and multi-channel engagement of commercial customers with high potential for EE savings and demand reduction. Con Edison developed a web-based portal (Energy Insights Portal) that identifies specific measure-level recommendations and allows customers to develop potential projects via the Action Plans page. After developing a project in the portal, customers can submit their project scopes to market partners through the Energy Insights Marketplace to elicit project proposals. The Company is finding that this "high-touch" outreach is the best method to engage commercial customers. The basic delivery model is shown in Figure 15.

[36] https://nyrevconnect.com/innovative-solutions-to-increase-building-envelope-energy-efficiency-con-edison/
[37] https://www.nyserda.ny.gov/All-Programs/Programs/NY-Prize/Competition-Structure
[38] https://www.utilitydive.com/news/coneds-hybrid-service-model-for-large-microgrid-could-become-standard/517413/
[39] http://www3.dps.ny.gov/W/PSCWeb.nsf/All/B2D9D834B0D307C685257F3F006FF1D9?OpenDocument

Figure 15: Building Efficiency Marketplace Program Delivery Model

Connected Homes (REV Demo)

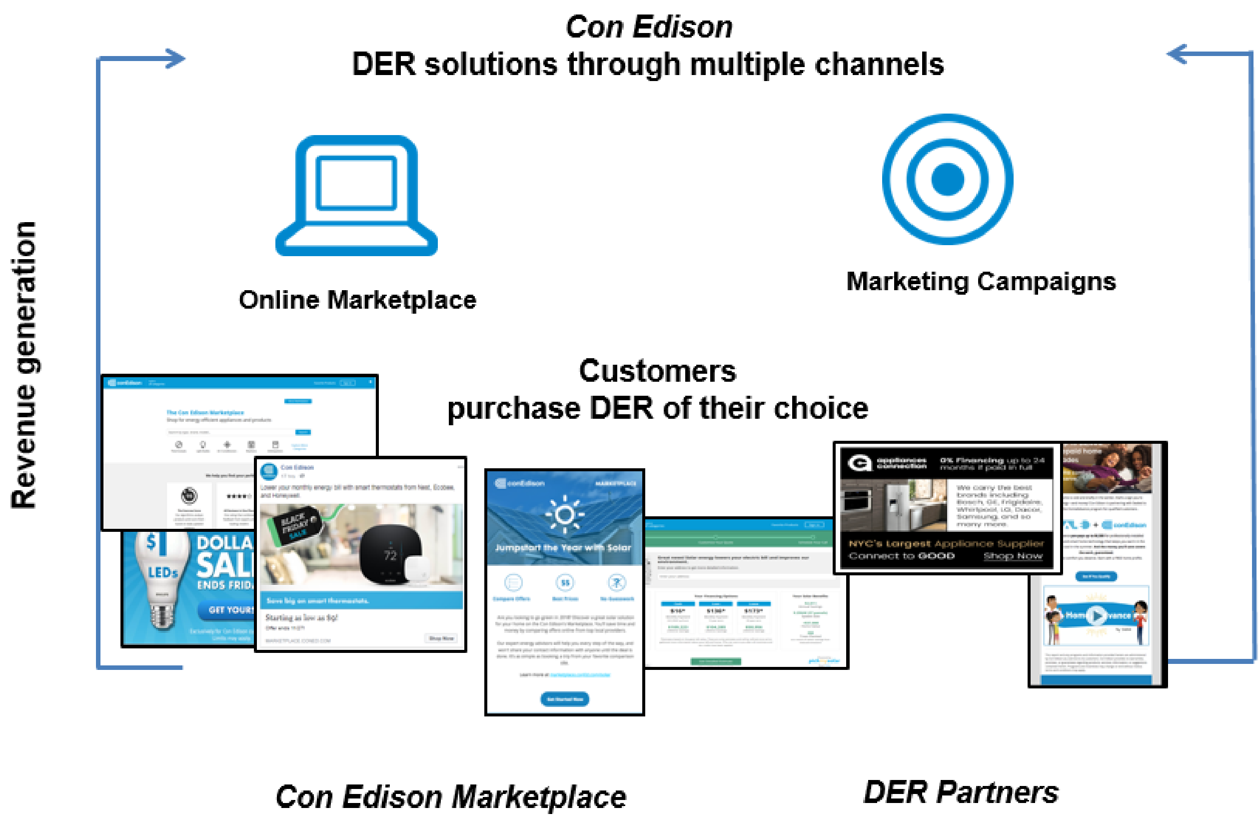
The Connected Homes demonstration project provides a set of tools designed to proactively connect residential customers with cost-effective EE products and services, as well as DG and EV offerings. It is designed to facilitate residential adoption of DER and animate the DER market.

The Connected Homes platform uses data analytics to match customers with specific DER solutions via an online marketplace (Con Edison Marketplace). On the Marketplace, customers can compare energy-saving products by energy score, price, and customer reviews. Customers can also apply for Con Edison appliance rebates, purchase small items such as LED lightbulbs, smart thermostats, and smart power strips, and receive instant rebates where applicable. Additionally, customers can receive bids for solar systems through a partnership with Pick My Solar, which is a solar concierge service that simplifies the experience of evaluating and installing solar. Customers now can also compare different EV makes and models. The demonstration project supports new business models by allowing the Company to generate revenue from third-party partners through lead generation, customer aggregation, and acting as a partner.

With over 1 million views and over 600,000 unique visits to its marketplace, Con Edison has sold more than 121,000 products, including over 113,000 LED light bulbs, and generated an estimated 72 GWh of lifetime energy savings from online sales of smart thermostats and LED equipment.

Figure 16 illustrates the basic program delivery model.

Figure 16: Con Edison Connected Homes Program Delivery Model



Shared Solar Pilot Program

The Shared Solar Pilot Program will serve customers in the Company's electric low-income discount program. The Commission approved the proposed first phase of the Shared Solar Pilot in August 2017, allowing procurement and installation of approximately 3 MW of solar generation on Company rooftops. The program will allocate credits generated from local solar projects to approximately 1,000 low-income residential customers.

The Shared Solar Pilot Program is testing a cost-effective, self-sustaining business model of utility ownership to reduce energy costs for low-income customers and provide lessons for DER market participants interested in serving the low-income customer segment. The program will also engage customers on EE opportunities. Con Edison selected several initial sites on Con Edison-owned property as potential host locations and included these in an RFP for solar developers issued on January 3, 2018. As stated in its Q1-2018 quarterly report, the Company has completed structural assessments of the shared solar sites, developed requirements for customer management tools, and continued to work through the RFP process. [40] The Company expects the solar systems to be operational by the end of 2019.

[40] Case 16-E-0622, *Petition of Consolidated Edison Company of New York, Inc. for Approval of a Pilot Program for Providing Shared Solar to Low-Income Customers* ("Shared Solar Pilot Proceeding"), Quarterly Report of Program Expenditures and Activities through March 31, 2018 (filed May 29, 2018), p. 1.

Program expansion beyond this level requires future approval of the Commission; the Company estimates that it could install up to 11 MW of solar on Company-owned rooftops and grounds in the future.

New Energy Solutions for LMI Customers (in development)

To increase the participation of the LMI customer segment in REV, Con Edison is exploring demonstration projects to test innovative approaches to serve LMI customers. The Company issued a request for information that solicited ideas, products and services, customer engagement strategies, and partnerships that could assist the Company in developing new business models specifically focused on solutions for the LMI segment. Con Edison had three overarching goals for these demonstrations:

(1) Help LMI customers gain access to clean energy and acquire new tools and services.

(2) Aid LMI customers in managing energy use and controlling costs.

(3) Achieve energy savings, reduced greenhouse gas emissions, system improvements, and other local benefits.

The Company's RFI elicited 33 proposals, representing 96 distinct organizations, many of which directly serve LMI communities as part of their core mission. Con Edison selected three projects for demonstration as a result of this process. These demonstrations projects are currently being refined and drafts of the project concepts are undergoing final internal review. Con Edison expects to file the final drafts of the project concepts in Q3-2018.

Energy Storage

Commercial Battery Storage (REV Demo)

The project is designed to demonstrate how distributed, front-of-the-meter energy storage can be utilized to provide transmission and distribution support, help defer capital investments, and generate wholesale market revenues. Con Edison is executing the project in partnership with GI Energy and Smarter Grid Solutions.

Staff approved the project on May 18, 2017.[41] Con Edison is currently implementing the project and files quarterly progress reports under Case 14-M-0101.

Storage on Demand (REV Demo)

The project is designed to demonstrate how mobile storage assets can increase their useful value to the distribution system under multiple use cases, such as transmission and distribution capital investment deferral, low voltage support, and temporary load needs in multiple locations. The project will also demonstrate the ability of storage to participate in and earn revenues from the wholesale markets. Con Edison is implementing the project with its partner NRG Energy. The project consists of two mobile battery trailers and one mobile electrical switchgear trailer, as shown in Figure 17.

[41] REV Proceeding, REV Proceeding, Reforming the Energy Vision Demonstration Project Assessment Report - Con Edison Commercial Battery Storage (issued May 18, 2017).

Figure 17: Con Edison and NRG Deployable Storage Asset

Staff approved the project on May 18, 2017.[42] Con Edison is currently implementing the project and files quarterly progress reports under Case 14-M-0101.

Clean Virtual Power Plant ("VPP") (REV Demo)

The VPP project seeks to demonstrate how aggregated fleets of residential solar plus storage assets can collectively provide resiliency services to customers and value to the distribution system, as well as participate in wholesale electricity markets. The VPP will act as a controllable power generation source that can be optimized to provide value as markets evolve. The pilot will explore the value that residential customers place on resiliency and will test the feasibility of value stacking. The Company intends to take lessons learned from the VPP project to improve integration of storage with utility operations and planning. Con Edison placed the project on hold in early 2017 due to permitting challenges, but is now proceeding with the development of an implementation plan.

BQDM Utility-Owned Battery

The Company recently installed a utility-owned battery system to help meet peak load in the Richmond Hill 4 kV network. This asset will enhance the reliability of the local overhead distribution system that it serves. The battery system will begin commissioning in July and be fully operational in August. Initially, the battery will be controlled onsite, and then transition to remote control through the Company's SCADA system when the control center operators take over in September following personnel training.

BQDM Marcus Garvey Apartments

The Company's BQDM program is facilitating the development of a multi-technology solution in the Crown Heights network at the Marcus Garvey mixed-income apartment complex, including a lithium-ion battery system, fuel cell, and rooftop solar. The system will reduce the property's power consumption and GHG emissions by managing the generation and storage of renewable energy, lower operational costs for the property, and deliver load relief. It will also provide resiliency during outages by providing back-up power to a building that houses a community room with

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[42] REV Proceeding, REV Proceeding, Reforming the Energy Vision Demonstration Project Assessment Report - Con Edison Storage on Demand (issued May 18, 2017).

refrigerators and phone charging. The project is the first renewable-energy-plus-storage system in an affordable housing development.

Transportable Energy Storage System ("TESS") Research and Development Project

Con Edison is working with a technology partner to develop and demonstrate a TESS within Con Edison's service territory. The system will comprise an energy storage system made up of lithium-ion batteries, a power conversion system ("PCS") unit including transformers and manual disconnect switches, and an integrated thermal management system that will serve both the energy storage system and PCS units. In this project, the Company seeks to evaluate the TESS to support pre-planned non-emergency situations, as well as to support emergency and contingency applications on the distribution system. If demonstrated to be a success, the trailer-mounted system would potentially take the place of mobile diesel systems. While not in use, the battery will be dispatched to provide services to the wholesale market through interconnection with the power system at Con Edison's Astoria facility.

The proposed energy storage system will provide 800 kWh of energy and 500 kW of capacity. The energy storage system will be situated within a custom mobile trailer with an estimated dimension of 40-foot trailer length and 12-foot-6-inch height and will be NYC Department of Transportation ("DOT")-compliant. The Company will initially demonstrate the TESS at the Astoria site.

The Company is reviewing permitting requirements with the FDNY, in order to advance the project.

Innovative Pricing and Rate Design

SHR (REV Demo)

The SHR demonstration project seeks to understand how residential customers and customer-sited DER assets respond to pricing signals designed to better manage the grid and deliver benefits to customers. Through this project, Con Edison will conduct a research study, testing two different, dynamic rate designs side-by-side, both enabled by price-responsive home automation technology. The focus of the SHR demonstration project is to combine customers' enthusiasm for proactive energy management and technology with rate designs that result in energy management through programmed response, and to test and learn from the resulting actions and reactions of those customers. Some of the innovative features of these rates include: reflecting the Day-Ahead hourly prices for energy, moving from flat volumetric (kWh) to TOU demand-based (kW) charges to recover delivery costs, and incorporating event-based critical peak charges to recover forward transmission and distribution and generation capacity costs.

Two rates are proposed, each rate with a different structural approach to reflect both generation and transmission and distribution capacity costs: Rate A proposes a daily demand charge with peak event demand charges, while Rate B will combine a monthly demand subscription charge with peak event overage penalties. The demonstration will also assess the impacts of battery storage as an enabling technology specifically for customers with existing solar DG systems. Con Edison has selected partners who will provide the home automation technologies to participating customers and collect and analyze empirical data to test the project results and gauge market opportunities.

Staff approved the SHR demonstration project on July 5, 2018.[43] The Company will work with Staff on the development of the implementation plan, which will include a detailed schedule, budget, projected milestones and detailed test scenarios.

Innovative Pricing Pilot

When the Commission authorized the Company's AMI investments, it directed the Company to include innovative pricing pilots in the Customer Engagement Plan.[44] The Company's pricing pilot project is aimed at identifying how innovative pricing structures can enhance customer benefits from AMI deployment in a cost-effective manner. It will gauge customer acceptance and response to the new prices, as well as estimate system impacts resulting from changes in customer behavior. Additionally, the pilots will collect data to help estimate customer benefits and inform future mass market rate design. The pilot will test both opt-in and opt-out approaches to customer recruitment.[45]

Con Edison's pilot targets mass market (SC-1) and small commercial (SC-2) customers with AMI in Westchester County, Staten Island, and Brooklyn. The pilot timeline is largely driven by the timing of the AMI rollout, with the pilot going live in Staten Island and Westchester County approximately one year before the pilot is active in Brooklyn.

Con Edison filed the pilot design, rates, and customer engagement strategies on July 6, 2018.[46]

EVs

SmartCharge NY[47]

Con Edison's SmartCharge NY program offers incentives to eligible EV drivers for charging in Con Edison's service territory at off-peak times and provides a $150 incentive for installing and activating a free connected car device from FleetCarma that allows users (and the Company) to know where, when, and how much energy an EV consumes during charge events.[48] Participating customers receive $5 per month for keeping the device plugged in and charging in the Con Edison service territory, as well as earn $0.10 per kWh for charging between midnight and 8 a.m. on any day in the Con Edison service territory. During the summer (June 1 – September 30), customers receive an additional $20 when they avoid charging between 2:00 p.m. and 6:00 p.m. on weekdays. The FleetCarma technology will help Con Edison understand charging behavior and EV driver response to incentives.

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[43] REV Proceeding, Reforming the Energy Vision Demonstration Project Assessment Report - Con Edison and O&R's Smart Home Rate Demonstration Project (issued July 5, 2018).

[44] Cases 15-E-0050, *et al.*, *Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consolidated Edison Company of New York, Inc. for Electric Service* ("Con Edison 2015 Electric Rate Case"), Order Approving Advanced Metering Infrastructure Business Plan Subject to Conditions (issued March 17, 2016) ("AMI Order"), p. 38.

[45] SC-2 customers will only be enrolled on an opt-out basis given the limited customer population.

[46] Case 18-E-0397, *Tariff Filing by Consolidated Edison Company of New York, Inc. to Make Revisions to Its Electric Tariff Schedule, P.S.C. No. 10, to Add New Riders Z (Residential) and AA (Small Commercial) Innovative Pricing Pilot, to Implement Rate Structures for Residential and Small Commercial Customers*, Proposal for Innovating Pricing Pilot (filed July 6, 2018).

[47] Con Edison, *Electric Vehicle Charging Rewards*, https://www.coned.com/smartchargenewyork.

[48] EV owners do not need to be Con Edison customers in order to enroll in the SmartCharge New York program. Con Edison 2016 Electric Rate Case**,** Order Approving Electric and Gas Rate Plans (issued January 25, 2017), p. 39.

Electric Power Research Institute's ("EPRI") Open Vehicle Grid Integration Platform ("OVGIP")

Con Edison is participating in an initiative led by EPRI in coordination with EV manufacturers to advance the development of a secure, open platform for utilities, service providers, and EVs to facilitate integration of EVs into DSM programs and allow EVs to provide grid services, such as reliability. By relying on a centralized data cloud with open access, a utility can communicate directly with the EV and access data on vehicle energy use, charging behavior, and customer response to price signals. Con Edison is currently running an OVGIP pilot with the owners of 14 Ford EVs and is already receiving data from the platform. The Company is in discussions with other vehicle manufacturers.

Vehicle-to-Grid ("V2G") School Bus (REV Demo)

Recognizing that electric school buses can transport children in zero emissions vehicles during the school year and serve as dedicated DER in the summer, Con Edison will outfit five electric school buses with V2G capability during summer months. V2G technology allows Con Edison to manage the vehicle as a grid resource, including managing charging times and battery dispatch. This demonstration project will include a partnership among: (1) Con Edison, (2) bus operator (National Express), (3) Lion Electric (bus manufacturer), (4) First Priority Green Fleet (project lead), and (5) NYSERDA. The Lion Electric school bus is pictured below.

Figure 18: Electric School Bus

Staff approved the proposed demonstration project and directed the Company to file a detailed implementation plan.[49]

NYC Curbside Charging (in development)

The Company plans to submit a filing requesting approval to install 100 public and 25 city fleet Level 2 charging units at a number of locations throughout New York City and the surrounding boroughs. Con Edison will partner with a company that has deployed Level 2 curbside chargers across several cities, and with the NYC DOT to secure dedicated street parking for EVs. During the project, the Company will monitor customer charging behavior and evaluate charger utilization, installation processes, hardware durability, and customer acceptance.

[49] REV Proceeding, Letter Regarding the Status of the Staff Review (issued June 20, 2018).

Quick Charging Demonstration Project (in development)

Con Edison is working with charging partners to assess the installation of quick charging stations to catalyze initial investment in infrastructure that enables more EV adoption and test various aspects of quick charging, including utilization, operations, economics, and customer acceptance. The intent is to provide valuable data on key drivers of scaling the quick charge business model and catalyze investment in infrastructure to enable more EV adoption. Con Edison will support development of DC fast chargers available for public use and in high enough concentration to minimize customer wait times. As part of the project, the Company will look at cost savings and utilization drivers in an effort to improve the New York area business model. From a system perspective, the best sites are lightly loaded areas of the system; however, the lowest-cost locations from a system perspective may not align with the locations best suited for maximizing utilization and reaching profitability.

Interconnection

ConnectDER™

Con Edison is installing and testing ConnectDER™ meter collars that provide customers with a lower-cost alternative to interconnecting PV systems in homes with older electric panels that would otherwise require upgrade. In addition, the Company is testing this technology's abilities to provide solar production data and facilitate remote emergency disconnection of customer systems. The meter collar is pictured below.

Figure 19: ConnectDER™ Meter Collar

1.5. GRID MODERNIZATION AND THE DSP TECHNOLOGY PLATFORM

Introduction

Advancements in technology and evolving customer expectations are driving New York's electric sector to be cleaner and more efficient, reliable, and resilient to climate change. At the center of this transformation is a reduction in carbon emissions and increased reliance on renewable energy, including DER. A more flexible and agile electric grid will be required to meet these goals and enable a more integrated electric system and active energy consumer. Guided by the REV vision and the State's policy goals, Con Edison is preparing for a future with high penetration of DER and is building a DSP that promotes new market opportunities and enhanced customer choice, while also supporting the Company's ongoing obligation to provide safe, secure, and reliable service to all customers.

The emergence of new demands requires the Company to invest in new capabilities across several areas. The Company must adapt the way it plans and operates the system as the grid evolves with the growth of DER and increasing bi-directional power flows. To effectively manage the grid in this dynamic environment, the Company needs to: (1) know where DER are located throughout the system, (2) view how DER are performing and interacting with the grid, (3) be able to communicate with DER assets to preserve reliability and enable future market transactions, and (4) forecast trends in the future deployment of customer technologies.

Con Edison has made significant advances in developing its people, processes, and technologies as a DSP. Notable accomplishments include:

- Implemented the IOAP and leveraged the PowerClerk® tool to streamline the interconnection process.
- Developed non-network and network hosting capacity maps.
- Implemented GBC Phase I, which allows customers to share their energy usage data with authorized third parties.
- Published a system data portal that directs third parties to Con Edison's hosting capacity map and available system data, including 8,760 load forecasts.
- Installed advanced relays that allow reverse power flow on network systems and increase hosting capacity.
- Installed VVO controllers and communicating modems at 4 kV unit substations.
- Implemented advanced software applications to enhance the Demand Management Programs ("DMPs") through a DRMS, Demand Management Analytics Platform ("DMAP"), and Demand Management Tracking System ("DMTS").
- Implemented a web-services interface with the Environmental Protection Agency's ("EPA") Portfolio Manager building benchmarking tool to facilitate building owner compliance with New York City Local Laws 84 and 133, as well as measure and track building energy consumption and GHG emissions.

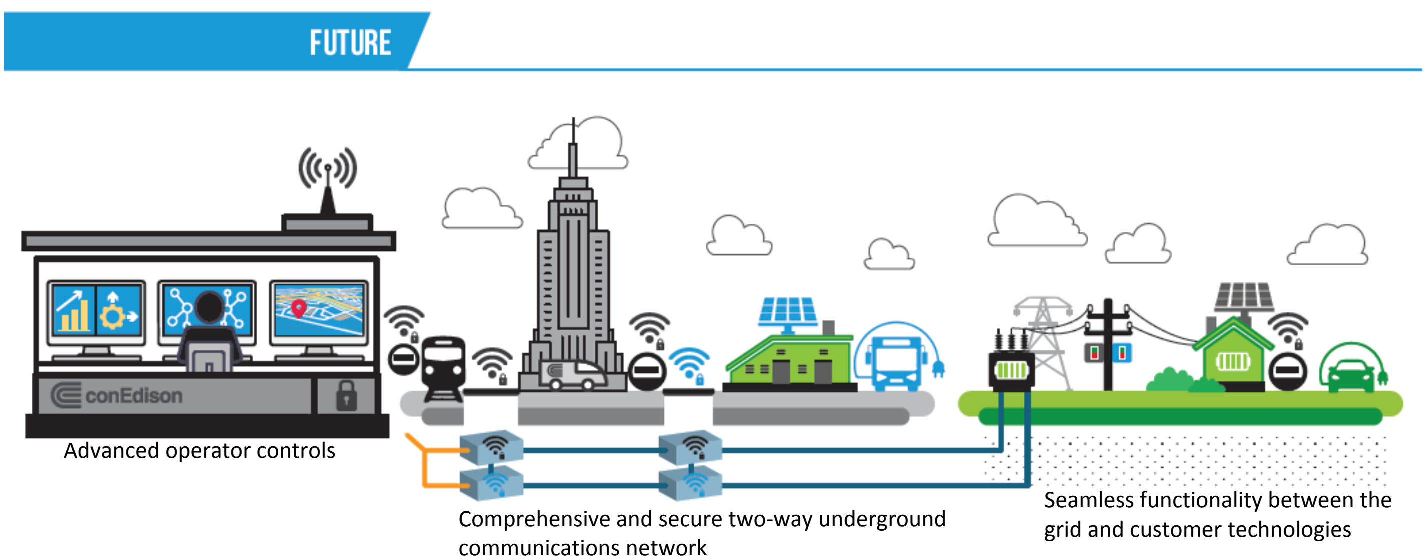
Future investments will provide an integrated and comprehensive view of the Company's entire system, visible from modernized control centers. This will allow the Company to optimize operations, enhance security, and enable greater market functionality over the long term.

For example, Con Edison will seek to invest in modern mapping functionality. The Company presently captures data on its electric system infrastructure within several legacy computerized mapping tools, many of which are decades old. These tools were designed and implemented in an age that did not contemplate today's evolution and deployment of customer technologies on the distribution system. In addition, the Company's predominantly low-voltage mesh underground network distribution system poses complexities to mapping. As a result, the Company's mapping tools act as a repository of data but lack the ability to interface with modern operational and analytical software tools. At the same time, Geographic Information System ("GIS") technology has evolved and reached a state of maturity, making it a productive time to invest in these capabilities. Investment in an enterprise-wide GIS will catalog transmission and distribution assets, as well as BTM devices. The GIS will serve as the system of record for the specific location and operating characteristics of grid-connected assets and be the software platform for enhanced data visualization and other advanced applications. The GIS will also allow for more accurate distribution circuit models for planning and operations and more sophisticated hosting capacity capabilities, among other uses.

Additionally, in the future, DER operational data will be managed by a new DERMS, which, when integrated with an Advanced Distribution Management System ("ADMS") and paired with newly-available grid-edge data available through AMI, will allow the Company to monitor, reconfigure, and control the grid to respond to changing conditions and eventually deploy DER for system needs in near-real time. The DER operational data can also be input into load flow models to support improved forecasting and system planning. Additional future functionality expected from ADMS includes greater automation of Fault Location, Isolation, and Service Restoration ("FLISR") and optimization of distribution grid performance. Smart sensors and two-way communications networks will feed system data back to control centers to mitigate system issues in real time, improving operational awareness, and enabling greater DER penetration. Robust and secure communications systems to exchange data are needed to maximize the value of this new grid intelligence. Investments in cybersecurity will help protect the system and sensitive customer data.

Figure 20 provides a representation of the future grid.

Figure 20: Con Edison's Future Grid



Con Edison's vision for modernizing the grid is built around delivering benefits to customers cost-effectively. These benefits begin in the near term and extend into the future, and include:

- Enhancing safety for the public and utility workers.
- Empowering customers with more choices to meet their energy needs.
- Being more resilient to extreme weather events and climate change.

- Enhancing visibility and intelligence to better plan and operate the grid.
- Integrating more DER for a cleaner energy future.

The Company seeks to evolve the electric system, beginning with strategic investments in foundational technologies that will enable new capabilities.

Grid Modernization and DSP Development

Grid modernization is an expansive term that encompasses a range of actions and investments to introduce new grid capabilities in support of State policy goals and utilities' core responsibilities. Con Edison is already a leader in its deployment of modern technologies and tools, such as D-SCADA, automated field devices, and advanced network modeling. The emergence of REV, along with continued industry evolution, has brought a focus on new capabilities, including DER integration, expansion of clean energy, and market development, and accelerated the timeline for building those capabilities to prepare for higher levels of DER.

The Company's current DSP investment strategy, as outlined in the Initial DSIP[50] and the Company's last rate case,[51] is focused on accelerating the DSP functions that enable near-term DER market growth. For example, investments in a hosting capacity map and an interconnection portal make it easier for developers to site and bring DER online. Similarly, investments in network protector relays capable of accommodating power flows from DER onto Con Edison's networks increase the hosting capacity in areas targeted for deployment of NWS. The development of the GBC data portal provides third parties and customers with more granular usage data to inform business decisions on new products and services, along with several other customer-facing and system-side benefits.

Con Edison is developing a Grid Modernization Plan that builds on these existing DSP investments, leverages the investment in AMI, and unites them under a holistic and comprehensive view of how the capabilities of the grid will evolve over time in support of changing customer expectations, advances in technology, and State policy goals. The Company's Grid Modernization Plan is based on a phased approach to grid modernization that includes a planned and logical sequence of investments and allows for iteration, optionality to include technologies as they evolve, and the incorporation of lessons learned from the many demonstration projects currently underway in New York and across the country. Additionally, a phased approach helps align the pace of investment with the speed of DER adoption, recognizing that some capabilities are not required until DER penetration reaches significantly higher levels. In this DSIP, the Company provides an overview of the progress made executing its DSP-enablement investment program and discusses the broader grid modernization investment plans to be included in future rate requests.

Figure 21 highlights the evolution of capabilities, with the early stages focused on foundational investments that will enable more sophisticated capabilities over time.

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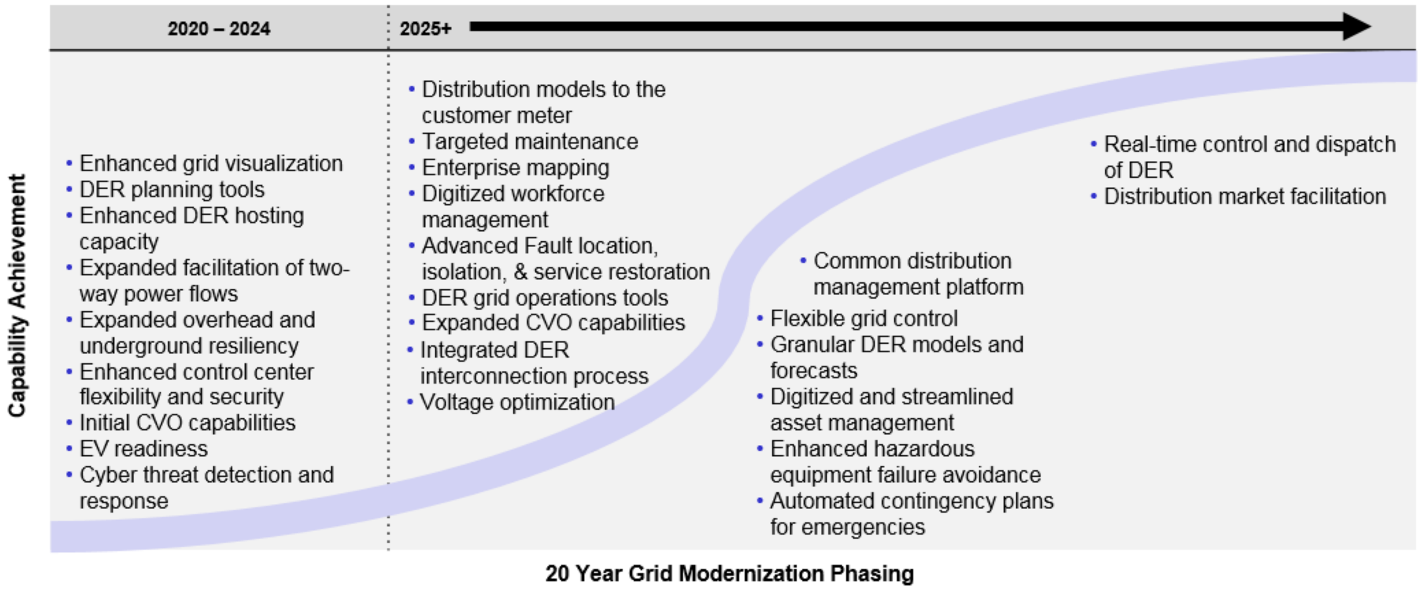
[50] DSIP Proceeding, Con Edison Distributed System Implementation Plan (filed June 30, 2016) ("Initial DSIP").

[51] Case 16-E-0060 *et al.*, *Proceeding on Motion of the Commission as to the Rates, Charges, Rules, and Regulations of Consolidated Edison Company of New York, Inc. for Electric Service* ("Con Edison 2016 Electric Rate Case"), Exhibit EIOP-1 (filed January 29, 2016).

Figure 21: Capability Evolution over Time



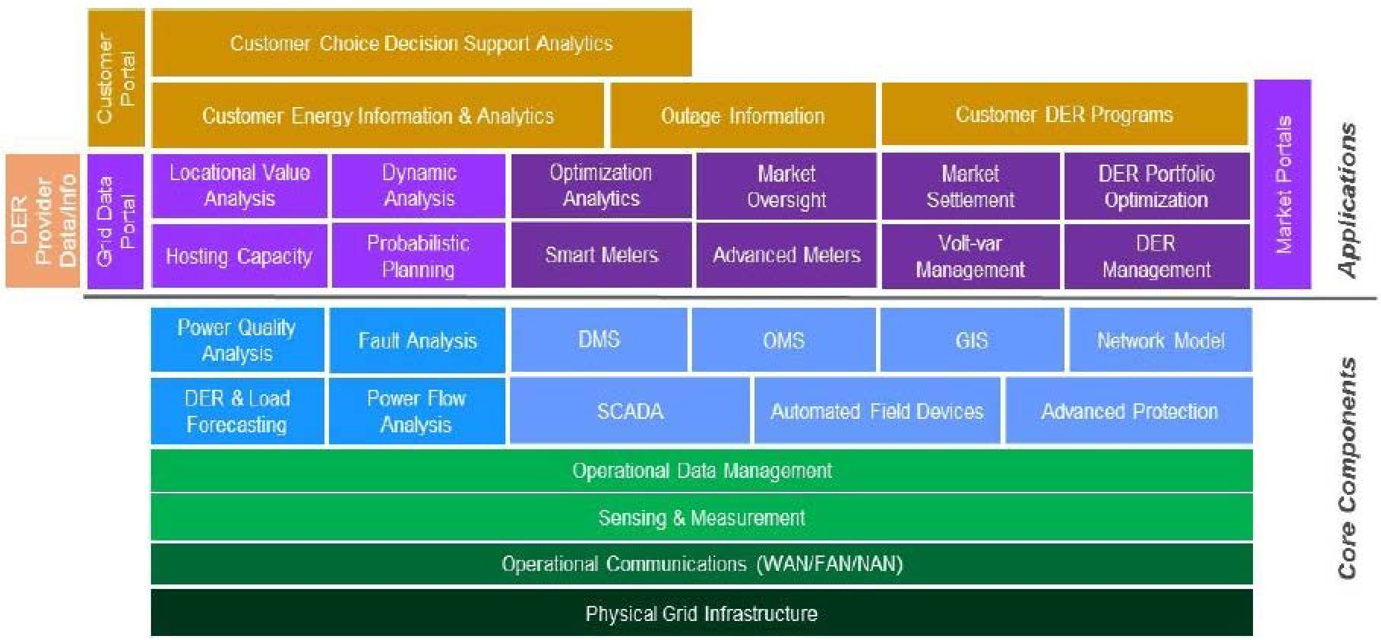
Con Edison's Grid Modernization Plan will consider:

- Technology advances that bring advanced capabilities for sensing, communication, automation, and data analytics.
- Changes in consumer behavior and expectations, driven in part by mobile technology and on-demand services.
- Increased DER penetration in response to increasingly favorable economics, which is transforming the electric grid from one-way electric delivery to two-way power flows.

Industry standard approaches for grid modernization, like those developed through the Modern Grid Distribution Project,[52] will inform Con Edison's grid modernization roadmap, with the caveat that these industry standards are largely based on radial systems, which have different requirements than Con Edison's underground, low-voltage mesh network. Formerly known as "DSPx," and led by the Department of Energy's Office of Electricity Delivery and Energy Reliability ("DOE-OE") in collaboration with the Commission and other state regulatory agencies, the Modern Grid Distribution Project resulted in a set of functional requirements for a modern distribution system platform to enable the full participation of DER in the provision of electricity services. The Company's definitions and characterizations of platform investments and functions are generally consistent with this DOE-OE framework, recognizing that the framework is not exhaustive, and some degree of customization is necessary to reflect Con Edison's current state of technology and unique service territory. A representation of the functions of the DSP under the DOE-OE framework is shown in Figure 22.

[52] United States Department of Energy, Office of Electricity Delivery and Energy Reliability, Pacific Northwest National Laboratory, *Modern Grid Distribution Project*. https://gridarchitecture.pnnl.gov/modern-grid-distribution-project.aspx.

Figure 22: Modern Grid Distribution Platform and Applications[53]



Grid Modernization Investment Roadmap

Con Edison's Grid Modernization Plan will complement and expand upon initial DSP-enabling investments to improve performance and add new capabilities in three broad areas: (1) reliability and resiliency, (2) safety and security, and (3) clean energy and flexibility. Reliability and resiliency refer to meeting and exceeding customer expectations for service in an era of increasingly diverse resources and ongoing weather disruptions. Safety and security refer to protecting people, cyber assets, and infrastructure in an ever-changing environment. Clean energy and flexibility largely speak to enabling customer choice—including access to clean, reliable, and affordable energy—and the ability of grid operators to manage a grid with a cleaner, more distributed resource mix.

Con Edison has identified a set of required capabilities to manage the grid and drive customer benefits. Early stages will focus on foundational investments that enable achievement of more sophisticated capabilities over time. Foundational investments can be considered the backbone or building blocks of a modern grid—they form the base on which further applications and functionality are layered in a modular fashion. As such, these investments are prioritized in the near term as prerequisites for future development and achievements. Con Edison's investment plan will include the following foundational investments: AMI (currently being implemented), GIS, communications infrastructure, ADMS, DERMS, control center modernization, and a cybersecurity test environment.

While it is developing foundational capabilities, the Company believes it is important to initiate, continue, and in some cases accelerate, implementation of other select technologies in the near term to capture more immediate benefits and

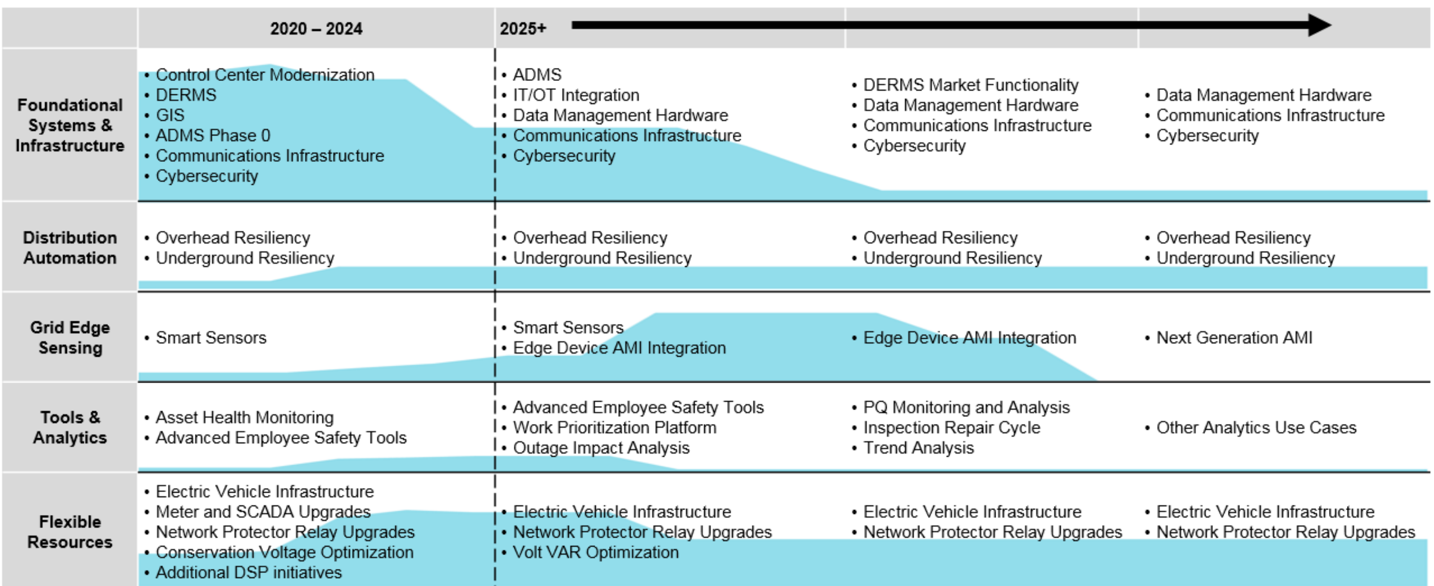
[53] United States Department of Energy, Office of Electricity Delivery & Energy Reliability, *Modern Distribution Grid, Volume III: Decision Guide* (June 28, 2017), p. 26.

provide flexibility for scaling up in the future based on system needs or policy direction. Figure 23 provides an overview of the 20-year grid modernization investment plan and expected spending profile, including the foundational investments and key investments in the areas of:

- Distribution automation
- Grid edge sensing
- Tools and analytics
- Flexible resources, including EV infrastructure and DSP investments

These investments are described in greater detail below.

Figure 23: 20-Year View of Grid Modernization Investments



Foundational Investments

As described above, foundational investments are essential to enabling more sophisticated grid capabilities in a high-DER system. While the full benefits of foundational investments are generally not realized until all capabilities are in place and working together, the foundational investments are expected to increase capabilities and produce tangible benefits in the near term. Specifically, the Company's proposed foundational investments are expected to result in the following near-term capabilities:

- Enhanced grid visualization
- Improved DER planning tools
- Increased hosting capacity
- Expanded facilitation of two-way power flows
- Enhanced control center flexibility and security
- Initial VVO capabilities
- EV and energy storage readiness

- Enhanced cyber threat detection and response

The first 5 years of Con Edison's Grid Modernization Plan will focus on the investments in critical foundational technologies, with continued investment expected over 10 years for full system buildout and integration of those technologies with each other and other systems. Table 2 below provides a description of the foundational investments.

Table 2: Overview of Foundational Investments

Technology	Planned Investment
AMI	Con Edison is deploying a total of 4,715,000 smart meters across its service territory between 2017 and 2022. The meters allow for more granular data collection that will be shared in near real time.
GIS	Con Edison plans to implement an enterprise-wide GIS that enables the capability to understand where all grid-connected assets are located geospatially and serves as the foundation for existing and future operational platforms (e.g., OMS, ADMS, and DERMS).
Communications Infrastructure	Con Edison is exploring holistic solutions for a robust and secure communications system to exchange data. Communications infrastructure supports multiple investments, including but not limited to smart sensing, M&C, DERMS, and VVO.
ADMS	Con Edison is in the initial stages of defining current ADMS functionality and scoping future ADMS capabilities. ADMS is an integrated solution for distribution management that provides real-time monitoring and control, network analysis, network optimization, and outage management capabilities in an integrated software platform. Con Edison plans to work with vendors to customize solutions better suited for its unique low-voltage mesh network system.
DERMS	Con Edison is planning to invest in a DERMS, which will provide a comprehensive view of DER assets, fully integrated with operating and planning systems. The purpose of a DERMS is to manage diverse DER, understand the unique status and capabilities of each, and present these capabilities to supporting applications to facilitate enhanced M&C of the system. The tool will be used to respond to system operational events and eventually market conditions, as well as to track and report on the growth of DER in the service territory. A DERMS will provide visibility and control of a diverse portfolio of resources to address local constraints while flexibly addressing system-wide concerns. The system will visualize, predict, and optimize DR and DG at the circuit, feeder, or segment level, presented in a dashboard suitable for operational use.
Control Center Modernization	Modernizing control centers prepares Con Edison to proactively manage a more complex distribution grid, including establishing a centralized area to deploy advanced distribution management functionalities, enhancing resiliency, improving cyber and physical security, proactively addressing siting logistics, and capturing organizational efficiencies.
Cybersecurity Test Environment	Con Edison will establish an advanced testing environment for information security solutions in preparation for comprehensive, quick, and accurate vulnerability discovery and remediation requirements. This test environment will also be used, in conjunction with the vendor's security controls, to confirm or validate third party vendors and partners with whom the Company shares business, customer, or other sensitive information.

Other Grid Modernization Technology Investments

Grid Edge Sensing: Grid modernization will require increased reliance on sensing technology to have greater situational awareness of the electric system. When paired with data analytics and advanced management systems, like ADMS, this technology allows Con Edison to more effectively plan and operate the system. This acceleration of investment in sensing technologies, currently deployed on a targeted reliability-focused basis, will develop Con Edison's capabilities more quickly and yield synergies with investments in data analytics platforms and advanced grid management software.

Tools and Analytics: The Company will leverage the Enterprise Data Analytics Platform ("EDAP") to fully utilize the existing and emergent stores of utility data. EDAP is a big data platform designed for utilities and first implemented for AMI-related use cases. Con Edison's initial focus for its data analytics has been oriented toward asset health applications. However, as the program and its capabilities mature, the Company will seek to expand the use of its capabilities. For example, outage analytics capabilities could evolve into more predictive capabilities, such as the ability to determine the location and impact of a storm in advance and ultimately to dispatch resources to recover as quickly as possible.

Another use case is work prioritization, which will result in optimized job scheduling based on several factors, including impact to customers (e.g., outages and power quality disruptions), and power quality analysis.

Distribution Automation: Automation technologies improve reliability, resiliency, and operational efficiency by enabling "self-healing" functions in response to disruptions. Specifically, distribution automation technologies use advanced control and communication technologies to automate feeder switching, monitor voltage and equipment health, and manage outage, voltage, and reactive power management. Con Edison has years of experience deploying automation technologies on its distribution system and will seek to continue its investments in this beneficial technology. The Company has progressively deployed FLISR capabilities on its overhead, non-network system.[54] The deployment of AMI has created opportunities for Con Edison to enhance its distribution automation capabilities. Future emphasis will be placed on investments in the underground distribution system, where Con Edison will seek to install automated sensing and reconfiguration functionality on primary feeders and secondary low-voltage mesh systems.

EV Infrastructure: Con Edison seeks to prepare the grid for an increase in EVs, including investments in "make-ready" infrastructure for customers requesting the interconnection of publicly accessible fast chargers. Make-ready infrastructure includes additional service from the point of interconnection to the property line. To date, customers generally bear responsibility for the costs to extend electric service to a new charging station. Such extensions can be costly, requiring extensive trenching and construction. The Company is considering an annual program to cover costs for service line extensions for EVSE. Customers would qualify by showing significant intent to move forward with the projects (i.e., by installing their "inline box") and by meeting the terms of the Business Incentive Rate ("BIR"),[55] which, among other terms, requires the EV-charging facilities be accessible to the public and receive an economic incentive from either federal, state, or local authorities. The program may be run like the Company's EE programs, which allocate budgeted funding each year and processing qualifying applications in the queue on a first-in, first-out basis.

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[54] The non-network system is comprised of 4 kV primary grids and 4/13/27 kV autoloops. On Staten Island, the non-network system includes Fox Hills and Fresh Kills 33 kV load areas.
[55] Con Edison, *Business Incentive Rate*, https://www.coned.com/en/commercial-industrial/economic-development/business-incentive-rate

DSP Investments

The Company continues to execute on its DSP investment plans, which support DER integration and build upon existing customer interfaces to facilitate enhanced customer engagement as markets evolve. These investments are briefly described below.

Substation Meter and SCADA Upgrades: Upgrading the substation metering will be necessary to enable enhanced VVO capabilities. The metering in substations built before 1980 (46 of the 62 total distribution substations) does not provide sufficient granularity to accurately gauge the fine-tuned voltage adjustments for VVO. For example, the older meters offer +/- 10 percent granularity, which would not offer the operator enough visibility to make the 1 to 2 percent adjustments necessary to enable the energy savings from VVO. Meter and SCADA upgrades will increase system visibility and expand the ability to leverage energy storage for grid support. The Company will seek to make investments in substation meters and SCADA systems to enable enhanced capabilities.

Network Protector Relay Upgrades: As discussed in the Initial DSIP, Con Edison is upgrading over 2,000 underground network protective relays to have bi-directional capabilities.[56] This will minimize trips from backfeed due to DG or energy storage discharge and allow for bi-directional communication with SCADA, resulting in greater ability to monitor two-way power flow and host DER. Con Edison has prioritized deployment in areas targeted for NWS and areas where DER penetration is greatest or the grid is most constrained. This proactive approach increases available hosting capacity and enables lower-cost interconnection. The Company will seek to continue deploying this technology, with a plan to scale up installation.

VVO: Advancements in technology and the deployment of AMI have created an opportunity for better management of power flows (i.e., Volts and VARs*)* on the distribution system. Deploying systems to optimize Volt/VAR flows will facilitate energy conservation in the near term and enhance the management of DER in the longer term. Con Edison will seek to expand its deployment of VVO for Conservation Voltage Optimization ("CVO"). CVO is a subset of VVO and describes the adjustment of area substation supply voltage to a lower value while providing adequate voltage levels for all customers. CVO reduces the amount of energy consumed by end use customers to power a given load, resulting in energy savings.

Deployment of CVO functionality across the service territory is incremental to, and dependent on, the AMI rollout, and will geographically coincide with that rollout, starting in Staten Island and Westchester County. The investment includes load tap changer controllers in the 4 kV unit substations and some area substations and information technology ("IT") systems to interface with Meter Data Management System ("MDMS") in order to act upon the greater granularity of data from AMI. In Staten Island, all units on the 4 kV unit substations have been completed, tested, and certified. Based on positive results from the Staten Island tests, the Company is moving forward with CVO enablement in Westchester County, with hardware installations scheduled to begin Q3-2018. Installation in Brooklyn and Queens is expected to begin in 2019. Later phases of VVO may include enhancing the electric system's ability to operate in concert with customer equipment, such as smart inverters.

Interconnection Portal: Con Edison has made significant strides in streamlining and improving the transparency of the interconnection process, including successful completion of IOAP Phase 1 and some Phase 2 requirements and ongoing enhancements to the PowerClerk® platform, which Con Edison licensed from Clean Power Research to be its customer-facing, automated interconnection application management portal. The Company continues to integrate PowerClerk®

[56] DSIP Proceeding, Initial DSIP, p. 125.

with the Company's Customer Project Management System ("CPMS") and increase functionality. The result for developers is greater ease of access and a more transparent and user-friendly internal and external user experience. For example, developers can track an application's progress through over 40 detailed status updates. Providing this information lets developers know exactly where they are in the process, reducing uncertainty about next steps. Additionally, each step of the process is timed in accordance with Standardized Interconnection Requirements ("SIR") timelines and the system generates reminder emails if action is still pending.

The Company is continuing to complete Phase 2 requirements and create base functionality in Con Edison's core systems to facilitate future enhancements. Enhancements to the portal between 2020 and 2022 include continued screen automation and incorporating additional features to improve the experience for developers. Additionally, the Company updated IOAP functionality to specifically include energy storage, increase the efficiency of processing energy storage applications, and make the experience more user-friendly.

DRMS: DRMS supports the management of enrollment, event initiation, and settlement of the Company's DR programs. This system enables Con Edison to efficiently interact with customers enrolled in DR programs and manage peak demand. The DRMS is a key operating tool used to support a portfolio of DR programs, which has experienced substantial growth in recent years. Since 2013, the amount of load under control has increased by 228 MW with significant increases in participating customers. Steady growth in the residential market has been marked by a number of new customer enrollments in the SmartAC and Bring Your Own Thermostat programs. In addition, the current deployment of smart meters is rapidly increasing the number of customers who are eligible to enroll and participate in DR initiatives. The Company will seek to increase DRMS capabilities in the future.

DMTS: DMTS has continued to serve a critical role in the EE and Demand Management ("EEDM") Department's technology and operational infrastructure. The system enables improved, standardized, and more accurate tracking and regulatory reporting; tools to effectively manage third-party implementation contractors and market partners; detailed tracking of customer projects; and more accurate and timely incentive processing. The DMTS provides enhanced controls for managing the portfolio of programs and for improving operational performance. The system provides the department with technology infrastructure necessary to track and manage the performance of its portfolio goals. The data stored within the DMTS will continue to lead to program administration efficiency and provide meaningful insight into customer behavior to drive innovation and expand customer participation.

Con Edison will seek to expand capabilities for DMTS including enhanced Customer Relationship Manager functionality, development and implementation of an EE Measurement & Verification module, development and expansion of financial forecasting tools, and implementation of new EEDM programs developed to reach EE targets.

DMAP: DMAP is a repository for a wide variety of information pertinent to the overall operations, marketing, and evaluation of EEDM programs. This robust customer-centric analytical tool will be used to support management and operational decisions, vendor activity, targeted marketing campaigns, and future EE program design. The DMAP will combine data from internal sources, such as the Customer Information System and MDMS, and external sources like the NYC Department of Building's ("DOB") database. In addition, data from demographic sources, marketing vendors, social media channels, and other external sources will provide a richer capability to manage the customer relationship. DMAP will also provide the critical infrastructure to link and analyze customer behaviors and the impact on distribution network assets and performance. Implementation of this tool began in May 2018 and is expected to last through Q1-2019. In 2020 to 2022, full deployment of AMI will be nearing completion. With this influx of data, DMAP will expand even further to make use of this data.

Conclusion

As the industry evolves, the grid must adapt to new requirements and expectations. Additionally, technological advancements, changing customer expectations, and policy developments are expanding the ways customers interact with the grid and manage their energy use, while opening new market opportunities. The Company is investing in the system capabilities necessary to prepare for this future. Con Edison's Grid Modernization Plan expands upon the DSP investments included in the Initial DSIP and the Company's prior rate case to move the Company further toward the DSP vision and help it keep pace with industry change and enable future market development and customer choice. The Grid Modernization Plan presents a prioritized series of investments to support reliability, resiliency, safety, security, flexibility, and clean energy.

2. TOPICAL SECTIONS

The 2018 DSIP Guidance directed the utilities to provide "planning and implementation details which will help the utilities and stakeholders align their respective needs and capabilities as the electric system evolves."[57] Staff outlined basic requirements common to each topic and specified detailed questions for each topic. In the following sections, the Company provides the common information and responds to the detailed questions, recognizing that there will be some cases where detailed implementation plans are not yet fully developed or where planning efforts are in early stages due to ongoing related proceedings and policy development. In such cases, the Company describes its current status and planned next steps.

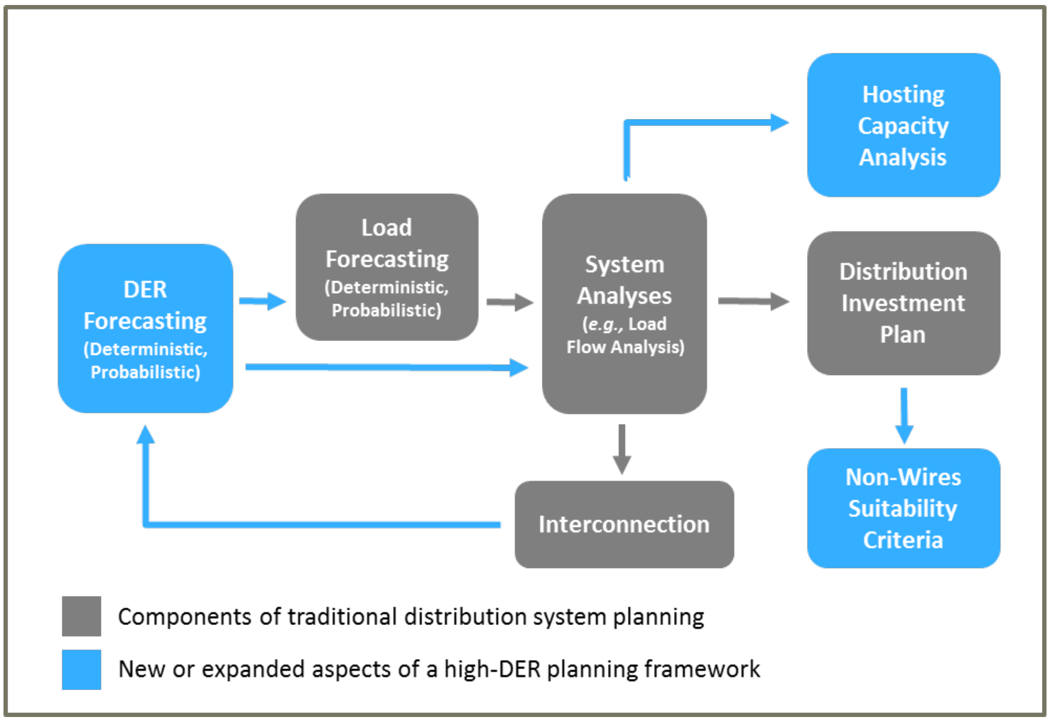
[57] DSIP Proceeding, 2018 DSIP Guidance, p. 5.

2.1. INTEGRATED SYSTEM PLANNING

Context and Background

Achieving the goals and objectives of REV will require enhancements to traditional distribution system planning processes to enable key DSP capabilities. The 2016 Supplemental DSIP presented a framework for evolving the distribution planning process to enhance existing processes while simultaneously complementing them with new processes to support DER integration. The gray-shaded boxes in Figure 24 below reflect the components of traditional distribution system planning and the blue-shaded boxes represent new or expanded aspects of an integrated planning framework that incorporates a broader range of data drivers, additional sources of uncertainty, and a more diverse resource mix.

Figure 24: Evolving Distribution System Planning Processes[58]



As DER penetration increases, and as the sources and magnitudes of uncertainties grow, there may be value in incorporating more probabilistic approaches into the planning process. For example, scenario analysis can assess the implications of a discrete set of outcomes, such as high, medium, or low adoption of DER technologies. Additionally, probabilistic planning methodologies provide systematic approaches for comprehensively addressing the uncertainties introduced by high rates of DER penetration, weather variability, and other factors.

As discussed below and throughout this filing, Con Edison continues to integrate DER into its planning and operations to support DER growth. The result is a quicker and easier process for identifying DER opportunities and bringing new DER online, which is driving improved customer and developer satisfaction and facilitating greater DER deployment.

[58] DSIP Proceeding, Supplemental DSIP, p. 28.

Implementation Plan, Schedule, and Investments

Current Progress

Summary of Achievements

- Refined and enhanced forecasting methods, including adding new load modifiers to better reflect impacts of DER on load.
- Formalized the identification and evaluation of NWS as part of the capital planning process.
- Presented enhanced hosting capacity maps to direct developers to areas where interconnection costs are expected to be lower.
- Streamlined and improved the interconnection process to increase speed and transparency.

Con Edison continues to enhance and expand its distribution system planning processes to facilitate DER integration, including considering DER as solutions to system needs, accounting for the various impacts DER can have on the grid and the value they can provide, adding features to hosting capacity maps, and streamlining the interconnection process. For example, Con Edison is refining its forecasting methodologies to include DER at more granular levels, using a combination of top-down and bottom-up forecasting. Additionally, in 2017 the Company added organic EE and CVO as load modifiers. These enhancements provide a more accurate assessment of DER's contribution to load, resulting in more representative forecasts. Additionally, in response to stakeholder interest and Commission guidance, Con Edison has developed 8,760 hourly load forecasts at the network level, which are available in the Company's hosting capacity platform within the system data portal.

As discussed in Sections 2.13 and 2.14, the Company continues to institutionalize NWS as a formal element of the annual capital planning process. Con Edison filed its NWS suitability criteria in March 2017 and is applying the criteria as part of the annual capital planning process to identify NWS opportunities.[59] This process resulted in the Company issuing three rounds of solicitations for NWS in 2017 and one RFP to date in 2018. The Company is also working with the Joint Utilities to standardize the approach to NWS, including posting the RFPs, providing similar information in the RFPs, and sharing lessons learned to develop best practices.

The Company's hosting capacity map, discussed in Section 2.12, now offers increased visibility into where interconnection costs may be lower (through hosting capacity analysis) and DER value may be higher (through identification of NWS and LSRV areas). The current version of the map, which replaced the static low-voltage network hosting capacity map issued in June 2016, displays Stage 2 hosting capacity analysis for all network and non-network 4 kV and above circuits. Through these actions, customers and third parties have more information with which to assess a project's cost and feasibility, which results in a more complete business case and more predictable project experience.

[59] DSIP Proceeding, Utility-Specific Implementation Matrices for Non-Wires Alternatives Suitability Criteria (filed March 1, 2017) ("Non-Wires Suitability Criteria").

Complementing the more granular and comprehensive hosting capacity maps is a more streamlined and transparent interconnection process that allows developers to bring projects online more quickly and easily. As discussed in Section 2.10, with the new functionality provided by the PowerClerk® interconnection software, application management and preliminary screening are now automated in line with the Phase 1 and portions of Phase 2 functional requirements specified in the EPRI report, *New York Interconnection Online Application Portal Functional Requirements.*[60] Phase 3 will integrate full automation of all processes suitable for automation.

Future Implementation and Planning

Summary of Future Actions

- Refine DER forecasting methodologies to improve forecast accuracy.
- Complete Stage 3 hosting capacity analysis.
- Develop IOAP 3.0 to facilitate increased automation in the DER interconnection process.

The progress made over the past two years in integrating DER into planning and operations provides a solid foundation for the future. In addition to actions pursued with the Joint Utilities, the Company will continue to formalize and institutionalize DER into utility planning, including leveraging experience from NWS projects to inform potential changes to the suitability criteria and modify internal procedures to continuously improve the efficiency and effectiveness of the NWS process.

The Company continues to explore opportunities to incorporate more probabilistic methods into the planning process where they can drive improvement. Probabilistic planning is expected to be most relevant in the forecasting process, as related to probabilities around DER performance and other variables. In contrast, for investment plans, the Company ultimately needs to settle on a single, optimized capital project portfolio to execute against and incorporate into rate requests.

Risks and Mitigation

Building capabilities to support integrated system planning will require investment in enabling technologies and as such, the timing and extent of some aspects of implementation will be determined by the available funding. Additionally, continued learning as part of demonstration projects and early efforts to integrate DER into planning will be fed back into the integrated planning process to inform potential process enhancements.

Stakeholder Interface

As noted above, the Company is evolving the distribution planning process to integrate DER and support DER market growth. The additional value provided to stakeholders is most evident in the externally-facing elements of distribution

[60] EPRI, *New York Interconnection Online Application Portal Functional Requirements* (issued September 2016) ("IOAP Report"). http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/dcf68efca391ad6085257687006f396b/$FILE/EPRI%20Task%201%20Memo%20Report_Final%209-9-16.pdf

planning, namely sharing of system data and hosting capacity analysis, identification of NWS opportunities, and improving DER interconnection. The stakeholder interface and benefits are presented in those sections.

Additionally, as referenced in other sections, the Company, as part of the Joint Utilities, engaged stakeholders to share baseline information on the distribution planning process; provide updates on utility efforts related to distribution planning, such as hosting capacity maps and interconnection; and request input on stakeholder preferences and needs.

Additional Detail

This section responds to the questions specific to integrated system planning.

1) The means and methods used for integrated system planning.

Distribution system planning focuses on forecasting load, identifying system needs, identifying potential solutions to those needs, and selecting and implementing the preferred solution.

Load forecasting is a central component of the distribution system planning process and informs many other planning analyses. Development of the load forecast enables distribution system planners to identify a range of system needs to maintain reliability. Planners use load flow modeling, network reliability modeling, and modeling of system performance to assess the current capability of existing distribution and substation assets to meet the forecasted load, based on the design criteria, type of asset, thermal ratings, and local power factors. These analyses determine which, if any, assets are at risk of becoming overloaded during system peak conditions and under various contingencies. Other areas of system need identified through distribution modeling include:

- Risk reduction programs to perform necessary inspections and replace components with known performance issues in order to enhance network reliability.
- New business projects to interconnect new customers or expand service for existing customers.
- Storm hardening or resiliency projects to strengthen the electric grid.

In addition to the areas of need listed above, the Company budgets for emergency response and replacement, IT solutions to meet strategic business needs, and public works projects to re-route Company equipment due to municipal right-of-way.

Once a list of system needs is compiled, Con Edison planners identify all potential solutions to address the issues. The capital projects are scored and ranked through an optimization process that seeks to reduce operating risks and efficiently meet strategic objectives. The projects are also assessed against the NWS suitability criteria. Specifically, Company planners review the projects in the 10-year load relief program and determine on a project-by-project basis if the project meets the NWS suitability criteria. The suitability criteria identify projects that: (1) are for load relief, (2) have enough lead time to pursue a NWS without foreclosing the opportunity to install a traditional solution if needed, and (3) offer enough capital deferral or displacement to overcome transaction costs and issues of scale. Eligible NWS candidates are then advanced to the procurement process.

The Company considers the NWS portfolio's cost, benefits, and weighted strategic value in building an integrated portfolio. Several iterations may occur until an optimized portfolio is submitted and approved.

More detailed information on the distribution planning process can be found in the Company's Initial DSIP.[61]

2) How the utility's means and methods enable probabilistic planning, which effectively anticipates the inter-related effects of distributed generation, energy storage, electric vehicles, beneficial electrification, and energy efficiency.

Probabilistic planning is a tool to address uncertainty and risk. With DER penetration still relatively low, probabilistic planning is in its early stages. Current probabilistic planning methods are focused on evaluating the need for feeder relief to meet reliability standards, as measured by the Network Reliability Index ("NRI"). The NRI model is the primary tool used to predict the reliability of the networks. It determines the relative strength of each network by calculating the probability of failure of multiple associated feeders within a network over time, as caused by individual component failures.

Starting May 2017, the Company modified its process of evaluating overloads on 13, 27, and 33 kV feeders to incorporate probabilistic planning, as well as DER. The probabilistic approach allows the Company to lengthen the load relief timeline, which increases the likelihood that DER could be deployed to meet the load relief need. When evaluating overloads, if the NRI is less than 0.2, the Company will defer resolving overloads of up to 10 percent of the network load by 3 years. In the past, the Company would relieve the overload for the next summer. Table 3 presents the different NRI ranges.

Table 3: Deferral Limits

Network NRI	Defer for Three Years - % of load threshold	Defer for One Year- % of load threshold
NRI<0.2	≤ 10%	n/a
0.2<NRI<0.8	≤ 5%	n/a
NRI>0.8	n/a	≤ 5%
Non-Network	≤ 5%	n/a

Because of the intermittent nature of the DER, the Company uses scenario analysis to consider additional factors to assess reliability under peak load conditions for normal and contingency conditions. The planning process requires two design requirements to be satisfied:

1) Traditional Baked-in model,[62] which uses the net load of a peak day, factoring in DER output.

2) New DER Backed-out model (or worst case DER scenario),[63] which assumes DER is unavailable on a peak day.

[61] DSIP Proceeding, Initial DSIP, pp. 20-152.

[62] The term "baked-in" is used as this model just looks at the "net" load, and is confirming whether the system, with the loads and DER output at the time of the previous design peak, is adequate for the level of contingency needed.

[63] The model takes the nameplate or maximum value of the DER and adds it as load to the baked-in model.

If both of these requirements are met, meaning the poly-voltage load flow ("PVL") model runs show no overload under these scenarios, there is no further analysis required. Where one or both of these requirements are not met, further analysis is required to determine if DER can adequately meet the peak load requirements.

Additionally, the Company incorporates probabilities when developing the PV and energy storage load modifiers for use in the forecast. For example, to assess the growth rate of solar PV installations, the initial two years of growth is based on an assumed probability of projects in the interconnection queue being completed.

The Company continues to explore opportunities to incorporate more probabilistic methods into the planning process where they can drive improvement.

3) How the utility ensures that the information needed for integrated system planning is timely acquired and properly evaluated.

The Company has established processes for collecting and evaluating data required for system planning. The load forecast is developed internally using a range of inputs, including customer data, economic indices, and new business jobs in queue. DER forecasts are an increasingly important input to the system and network forecasts and are informed by data from the interconnection queue, as well as known program activity, such as approved EE programs. Additionally, the Company has visibility into new business jobs, typically extending over a five-year period. Each individual job within the electric service territory is evaluated to determine the total load (and appropriate phasing-in), the network location, and when it will come online. More detail on load and DER forecasting is included in Appendix A.

Further, the Company's investments in AMI and grid modernization technologies, such as GIS and DERMS, will increase the information available to system planners, particularly at the grid edge.

4) The types of sensitivity analyses performed and how those analyses are applied as part of the integrated planning process.

The Asset Management Life-Cycle Models include sensitivity analyses as part of the modeling. The project began in 2016 with the separation of major assets into 12 asset groups and selection of 3 assets to model in 2016: wood poles, URD cable, and 4 kV unit substation transformers and 2 in 2017: network transformers and network protectors. An Asset Management Life-Cycle model is created for each asset group to provide decision making and scenario planning, including sensitivity analyses. The model uses sensitivity analyses to evaluate a replacement strategy, such as replacing a certain percent of the poorest performing assets each year for the next 10 years. The model predicts asset failure rate trends and how the failure rate is influenced by variation in key parameters, such as inherent asset deterioration with age and use, unit cost, and the likely condition of the assets renewed. Scenario planning will address future asset performance based on an asset maintenance strategy and renewal factoring in historical data and performance.

5) How the utility would timely adjust its integrated system plan if future trends differ significantly with predictions, both in the short-term and in the long-term.

The Company updates its 10-year load forecasts on an annual basis as part of the capital planning process. In developing the forecast, the Company incorporates the best information available at the time, extending over the 10-year period. To the extent that future trends differ from past assumptions, the Company would incorporate the new information into the forecast, which would flow into the system planning process. As such, the system plan evolves in line with trends, as well as unforeseen developments. An example of this in practice is the continued decline in forecasted load growth, driven in large part by recent trends and policy drivers related to EE and PV adoption.

6) **The factors unrelated to DERs - such as aging infrastructure, electric vehicles, and beneficial electrification - which significantly affect the utility's integrated plan and describe how the utility's planning process addresses each of those factors.**

As noted above, Company planners use load flow modeling, network reliability modeling, and modeling of system performance to assess the current capability of existing distribution and substation assets to meet the forecasted load, based on the design criteria, type of asset, thermal ratings, and local power factors. This process identifies a range of system needs, including risk reduction programs to address asset health, of which equipment age is one factor, along with maintenance history, performance, and other factors. A number of assets have replacement/renewal strategies based upon calculated Asset Health Indexes. For example, the unit substation transformer health index calculation uses Dissolved Gas in Oil Analysis, Furan test results, transformer loading, apparent corrosion, oil leaks, load tap changer functionality, environmental impact, proximity to public, and age as factors.

As noted in Section 2.5, the Company expects the distribution system to accommodate the projected increase in home and workplace EV charging. The larger driver of infrastructure needs is the size and location of quick charging stations, which have significant power draw. The Company has a process for handling those requests and determining the service upgrades or system reinforcements required. To date, service requests for quick charge stations have ranged between 800 and 3,000 Amps to support up to 500 kW.

The discussion around beneficial electrification beyond transportation electrification is in initial stages. The Company is exploring opportunities for piloting beneficial electrification solutions through the EE program to test technology adoption, explore delivery channels, and streamline various Company efforts.

7) **How the means and methods for integrated electric system planning evaluate the effects of potential energy efficiency measures.**

The Company has a long-standing practice of incorporating EE and DR as load modifiers that reduce the total forecasted load (or gross load). The Company added organic or naturally-occurring EE (and CVO) as load modifiers in fall 2017 forecast to further refine the forecasting process. See Appendix A for a detailed discussion of how EE and DR forecasts are developed and applied in the Company's forecasts.

8) **How the utility will inform the development of its integrated planning through best practices and lessons learned from other jurisdictions.**

In addition to collaboration with the Joint Utilities, the Company coordinates through EPRI, Institute of Electrical and Electronics Engineers ("IEEE"), and other industry forums to exchange information and stay informed on best practices and lessons learned from other jurisdictions. Through those forums, Company planners have developed relationships with other utility peers, who are a resource for questions and discussion.

2.2. ADVANCED FORECASTING

Context and Background

The development of long-term load forecasts is a central function of distribution system planning and a key input to the Company's strategic and long-range planning. System and network peak demand forecasts guide infrastructure investment decisions, directing capital to the areas of greatest need and setting the stage for identification of NWS and location-specific pricing. Additionally, peak demand forecasts serve as an input to the bulk level system planning process while energy forecasts determine the revenue forecast and set rates.

In a continuation of recent trends, Con Edison forecasts its overall electric system load growth to be nearly flat, with a compound annual growth rate ("CAGR") of 0.1 percent annually over the 5-year period and 0.2 percent annually over the 10-year period, resulting in a 2027 system coincident peak of 13,500 MW. This is a 360 MW reduction compared to the 2016 10-year system peak forecast. The system peak forecast includes 719 MW of incremental coincident demand reduction by 2022, growing to approximately 1,100 MW by 2027. The Company expects the growth in DER, particularly DSM and solar PV, to offset increases in load from EV adoption and localized load growth driven by the resurgence of certain residential neighborhoods in Brooklyn, Queens, and Manhattan. Table 4 summarizes the impacts that offset peak load in the five-year system peak forecast.

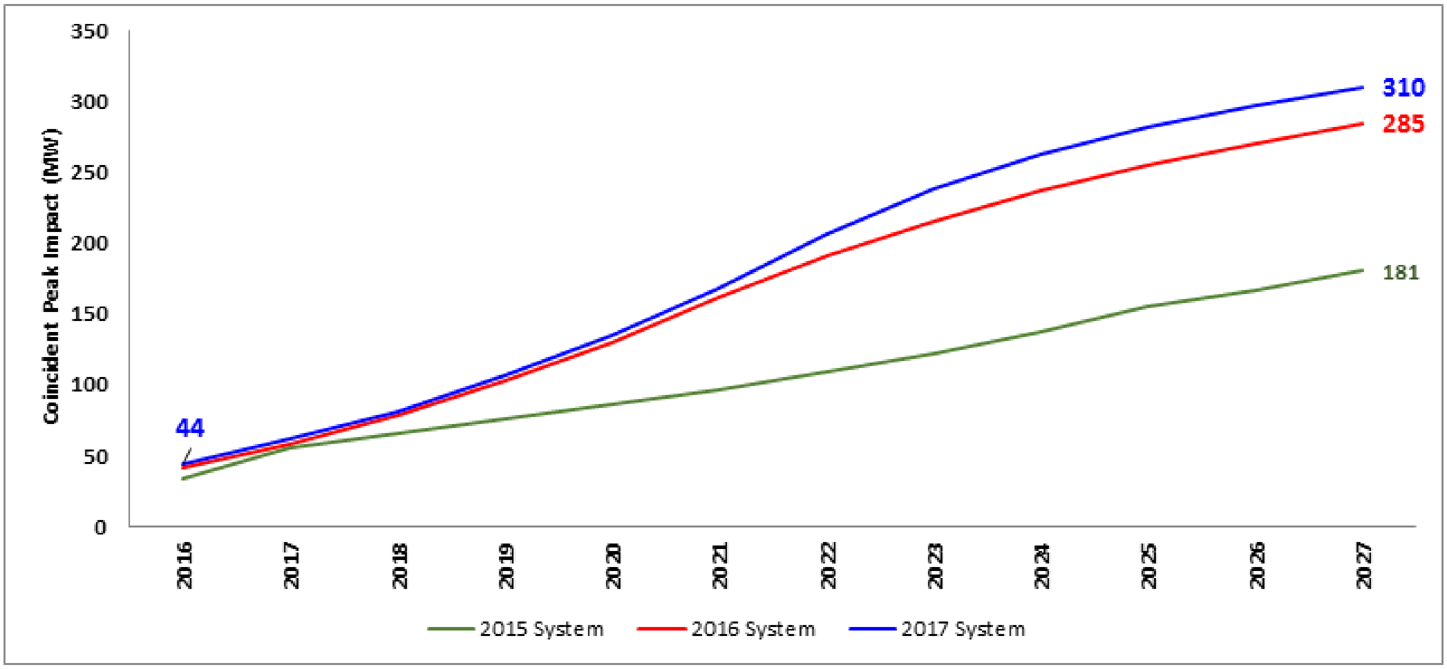
Table 4: Summary of Forecasted Demand Reduction (MW) from Load Modifiers – 2017 Forecast

Negative Load Modifier	2018	2019	2020	2021	2022
Photovoltaics/Solar (PVs)	-19	-44	-73	-106	-144
DG	-4	-27	-41	-47	-53
Energy Storage[64]	-1	-3	-4	-7	-9
CVO	0	-7	-7	-25	-25
Organic EE/ Codes and Standards	-5	-10	-15	-20	-25
Coincident DSM	-161	-276	-375	-419	-463
Total Rolling Incremental MW Reduction	**-190**	**-367**	**-515**	**-624**	**-719**

The Company incorporates the most current information available when producing the forecast and updates trends and assumptions accordingly. For example, as shown in Figure 25 below, the Company's solar PV peak demand forecasts have been updated to reflect market trends. Similarly, the Company's next forecast will update energy storage and EE forecasts to reflect recent State policy actions.

[64] These forecast values are extracted from the forecast produced in fall 2017, which predates the Energy Storage Roadmap released in June 2018. Energy Storage Proceeding, Energy Storage Roadmap. Note 69, *infra.* The forecast produced in fall 2018 will update the energy storage assumptions.

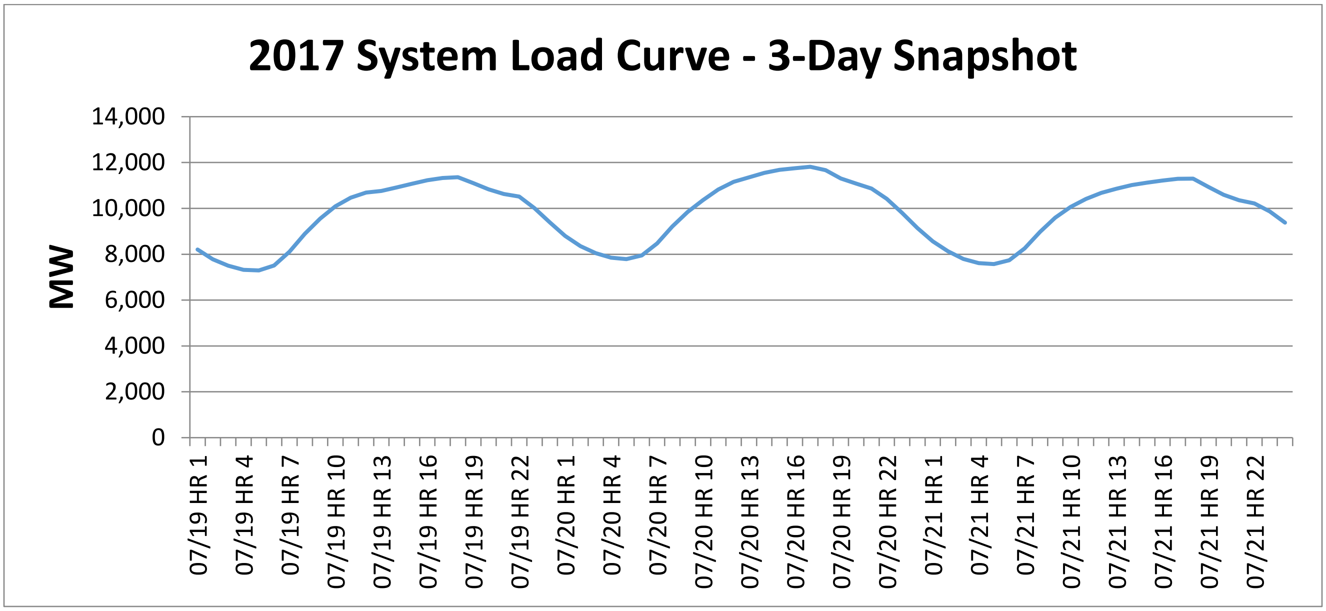
Figure 25: 10-Year Forecast for Solar PV During System Peak



As DER penetration grows, the forecasting of DER at more granular levels becomes increasingly important. The Company has a long-standing practice of incorporating EE and DR as load modifiers that reduce the total forecasted load (or gross load). The Company has evolved its forecasting methodologies and expanded them to specifically include PV, CHP, EVs, and energy storage as load modifiers. Additionally, the Company added organic or naturally-occurring EE and CVO as load modifiers in the fall 2017 forecast to further refine the forecasting process.

As part of the effort to share useful system data, the Company developed 8,760 hourly forecasts covering a three-year period at the network level. This was a result of stakeholder engagement and review by the Load and DER Forecasting Working Group. Stakeholders requested the 8,760 forecasts to provide an indication of the duration of peak and off-peak periods, which is useful for evaluating energy storage opportunities. Figure 26 is an illustrative view of 8,760 data at the system level over a 3-day period in July 2017.

Figure 26: Illustrative 8,760 System Load Curve



More robust and granular DER forecasts should improve forecast accuracy, all else being equal. At the same time, increased adoption of DER introduces new challenges for maintaining forecasting accuracy due to uncertainties associated with the variability of DER output, DER's evolving correlation with net load, and the impact of geographic diversity on aggregate DER output. The Joint Utilities have explored opportunities to develop long-term forecasting capabilities that can more precisely reflect the impacts of DER on system needs. For example, the Joint Utilities have focused on developing granular forecasts using a hybrid of top-down and bottom-up methodologies, which improves forecast accuracy by allowing for cross-referencing between project-specific information and overall macroeconomic trends. Additionally, the Joint Utilities are integrating additional sources of data into forecasts, such as system monitoring information, meteorological data, and customer demographics. Con Edison is committed to continued coordination with the Joint Utilities and NYISO to enhance and potentially align forecasting approaches.

Implementation Plan, Schedule, and Investments

Current Progress

Summary of Achievements

- Refined and enhanced forecasting methodology, including addition of new load modifiers and application of new commercial load density factors to large projects.
- Published 3-year 8,760 hourly load forecasts at the network level.
- Collaborated with the Joint Utilities to share best practices and align forecasting approaches.
- Coordinated with NYISO to share data inputs and assumptions and promote alignment between distribution level and bulk system forecasts.
- Engaged stakeholders, including two sessions in 2017 to discuss forecasting issues and solicit stakeholder feedback.

Following the Supplemental DSIP, the Joint Utilities continued to collaborate on the evolution of long-term load forecasting, including enhancing forecasting tools and refining methodologies for forecasting DER, increasing the granularity of forecast data, and coordinating with NYISO. Additionally, the Joint Utilities hosted two stakeholder engagement sessions in March and July 2017 to present on current practices and solicit stakeholder input. In response to stakeholder interest and Commission guidance, Con Edison developed and published 8,760 hourly load forecasts at the network level, consistent with methodologies discussed with the Joint Utilities. The development of 8,760 forecasts included internal discussions among the Joint Utilities on topics like data resources, treatment of interconnection queue data, and policy issues. The forecasts are available in the Company's hosting capacity platform within the system data portal (as described in Section 2.7).

The Joint Utilities also continued to coordinate with NYISO to share data inputs and assumptions and discuss forecasting approaches, including capturing DER impacts in long-term forecasts in the context of system planning and NYISO's efforts on 8,760 hourly load forecasts. The Joint Utilities' coordination with NYISO has been mutually beneficial and effective at communicating integrated transmission and distribution planning processes, planning assumptions, and data resources.

Additionally, the Joint Utilities hosted discussions with utilities across the country and in the European Union to exchange best practices on long-term load and DER forecasting, including frequency of updates, impacts on investment planning, geospatial and temporal granularity, and inputs and methods. These discussions allowed the Joint Utilities to benchmark their forecasting practices with utilities facing similar issues and confirmed that Con Edison is consistent with its European peers.

Internally, the Company continued to refine its forecasting process, including the addition of organic or naturally-occurring EE and CVO as load modifiers. The addition of these two new load modifiers provides a more complete assessment of the factors affecting the forecasts, thus supporting greater accuracy. Other process refinements include the application of new commercial load density factors to large projects and top-down reconciliation for years 6 through 10 for individual networks.

Future Implementation and Planning

Summary of Future Actions

- Refine existing load modifiers and add new modifiers, as the penetration of DER technologies increases.
- Explore potential refinements to the 8,760 forecasting methodology, as necessary.
- Share information and coordinate with the Joint Utilities and NYISO.

Con Edison will continue to coordinate with the Joint Utilities and NYISO on the forecasting of load and DER, as well as track developments in other states to identify lessons learned and best practices. Future discussions will continue information sharing on forecasting aspects, such as load modifiers, customer-owned generation, and other forecasting issues to support the reflection DER impacts in forecasts at the bulk system level and distribution level.

Additionally, the Company will continue to refine its forecasting methods in support of greater accuracy, recognizing that some degree of statistical error is inherent in the process. For example, the Company will look for opportunities to refine existing load modifiers and potentially add new modifiers as DER technologies proliferate, such as growth in geothermal heat pumps and other electrification efforts.

Further, to support more advanced forecasting methodologies, the Company plans to leverage the more granular and accurate meter data available through AMI to help in the determination of customer contribution to network or substation peaks by customer type. The Company can then extrapolate this information to the queue of customers connecting to the system to determine short- and long-term (one-year) growth. With AMI data, the Company can also calculate a customer's load with DR and DER reductions to determine, by customer type, the reductions at the time of the peak.

Risks and Mitigation

As forecasting becomes more complex and the demand for additional and more granular forecasts increases, such as forecasts at the circuit level, the Company may require additional resources, including staff. The availability of resources may affect implementation timelines.

Stakeholder Interface

The Joint Utilities hosted two stakeholder engagement sessions in March and July 2017. In these sessions, the Joint Utilities provided overviews of the role of forecasting in planning and presented case studies on current forecasting approaches, tools, and data sources. The case studies presented the various load modifiers that the utilities incorporate to develop accurate forecasts. The Joint Utilities also solicited stakeholder feedback and participated in discussions on several forecasting topics of interest to stakeholders, including forecasting use cases and the role of 8,760 forecasts in addressing those use cases; incorporation of additional external inputs to utility forecasts such as public policy; and the evolution of forecasting to incorporate more probabilistic methods and scenario analysis.

To be responsive to stakeholder needs, the Company produced 8,760 hourly load forecasts at the network level. As discussed above and below, the Company has taken steps to produce more granular forecasts that more accurately capture the impacts of DER and will continue to learn and improve based on more experience with DER performance.

Additional Detail

This section responds to the questions specific to advanced forecasting.

1) **Identify where and how DER developers and other stakeholders can readily access, navigate, view, sort, filter, and download up-to-date load and supply forecasts.**

The Company provides extensive system data, including load and energy forecasts, through the Company's hosting capacity platform available through the online data portal.[65] The data portal and hosting capacity map are accessible through the DCX web interface, linked from the Joint Utilities' website,[66] and easily found via internet searches. Within the hosting capacity maps, developers and other stakeholders can view and download network-level 8,760 hourly load forecasts and network-level 24-hour peak load and minimum load duration curves.

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[65] https://www.coned.com/en/our-energy-future/our-energy-projects/distribution-system-platform.
[66] http://jointutilitiesofny.org/system-data/.

Every year, following the summer peak season, the Company produces a series of forecasts to guide the next planning cycle, including a 10-year electric system peak demand forecast and a 5-year system energy forecast, as well as a 10-year network independent peak demand forecast. Appendix A includes the most current forecasts.

2) Identify and characterize each load and supply forecasting requirement identified from stakeholder inputs.

Following the Supplemental DSIP, the Joint Utilities continued to collaborate on the evolution of load forecasting, including enhancing forecasting tools and refining methodologies for forecasting DER, increasing the granularity of forecast data, and coordinating with NYISO. As part of this collaboration, the Joint Utilities hosted two stakeholder engagement sessions in March and July 2017. The Joint Utilities solicited stakeholder feedback and participated in discussions on several forecasting topics of interest to stakeholders, including forecasting use cases and the role of 8,760 forecasts in addressing those use cases; incorporation of additional external inputs to utility forecasts such as public policy and developer forecasts; and the evolution of forecasting to incorporate more probabilistic methods and scenario analysis.

In response to stakeholder interest and Commission guidance, Con Edison developed and published 8,760 hourly load forecasts at the network level, consistent with methodologies discussed with the Joint Utilities. The development of 8,760 forecasts included internal discussions among the Joint Utilities on topics like data resources, treatment of interconnection queue data, and policy issues. As noted above, the 8,760 forecasts are available in the Company's hosting capacity platform within the system data portal.

3) Describe in detail the existing and/or planned forecasts produced for third party use and explain how those forecasts fulfill each identified stakeholder requirement for load and supply forecasts.

See response to 2) above for a discussion of the 8,760 forecast produced for third-party use.

4) Describe the spatial and temporal granularity of the system-level and local-level load and supply forecasts produced.

At the system level, the Company produces a 10-year electric peak demand forecast and a 5-year energy forecast. At the network level, the Company produces a 10-year independent peak demand forecast and 8,760 hourly load forecasts extending 3 years.

5) Describe the forecasts provided separately for key areas including but not limited to photovoltaics, energy storage, electric vehicles, and energy efficiency.

The Company has a long-standing practice of incorporating EE and DR as load modifiers that reduce the total forecasted system load (or gross load). The Company has evolved its forecasting methodologies and expanded them to specifically include PV, CHP, EVs, and energy storage. As discussed above, the Company added organic or naturally-occurring EE and CVO as load modifiers in the fall 2017 forecasts to further refine the forecasting process. The Company will look for opportunities to refine existing load modifiers and potentially add new modifiers as DER technologies proliferate, such as growth in geothermal heat pumps and other electrification efforts.

Appendix A includes a detailed description of the DER forecasts, including methodology and the latest forecasts.

6) Describe the advanced forecasting capabilities which are/will be implemented to enable effective probabilistic planning methods.

The Company has explored opportunities to advance forecasting capabilities to better reflect the impacts of DER on system needs, including developing draft forecast methodologies related to:

- Dispatching DER (five-minute intervals)
- Committing DER (hourly to day ahead or two days ahead)
- Scheduling work on the network (weekly)
- Scheduling DER maintenance (monthly)

For example, to build a forecast for dispatching DER, the Company would use the probabilistic output from multiple weather service models to blend weather temperatures and other variables with their corresponding probability of occurrence. To do this, the Company would need a short-term, local, and refined weather forecast that uses data from high-quality local weather radars, such as a high-frequency S-band dual pol radar, as well as short-term solar radiance and wind forecast models, NASA solar flare models, and multiple satellite images. The Company would incorporate feedback from DER set points to produce and forecast the next five-minute set points.

Additionally, the Joint Utilities are integrating additional sources of data into forecasts, where available, such as system monitoring information, meteorological data, and customer demographics. The Company also plans to use actual customer hourly load data from AMI to help determine customer contribution to peaks. As described above and below, Con Edison is adding and refining load modifiers to better capture exogenous factors influencing peak load.

7) Describe how the utility's existing/planned advanced forecasting capabilities anticipate the inter-related effects of distributed generation, energy storage, electric vehicles, beneficial electrification, and energy efficiency

See response to 5) above.

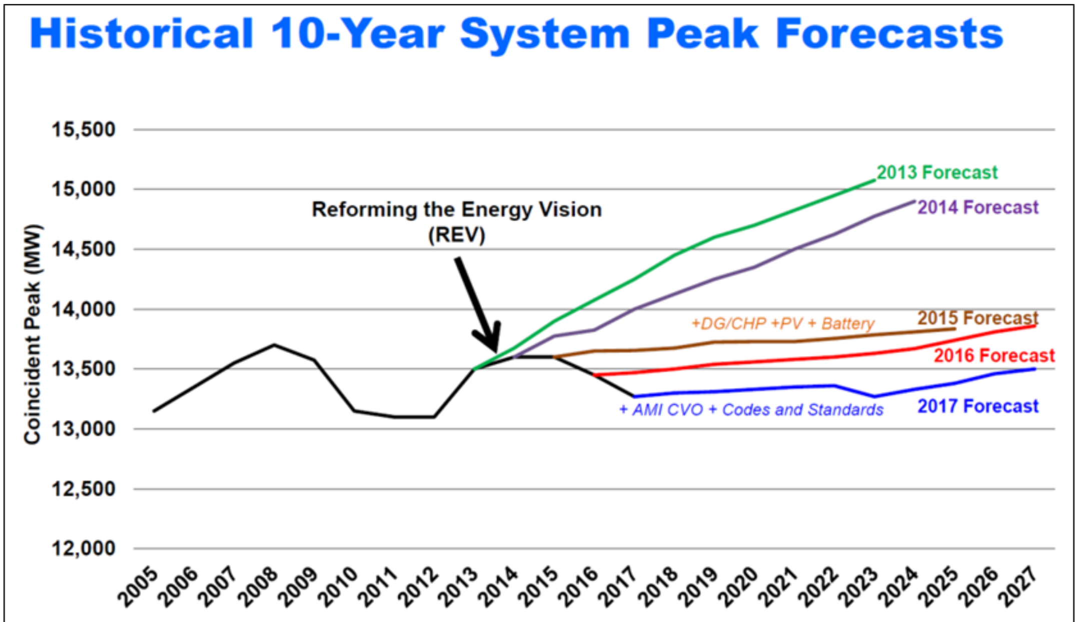
8) Describe in detail the forecasts produced for utility use and explain how those forecasts fulfill the evolving utility requirements for load and supply forecasts.

System and network peak demand forecasts guide infrastructure investment decisions, directing capital to the areas of greatest need and setting the stage for identification of NWS and location-specific pricing. Additionally, bulk level system planners use peak demand forecasts as an input to their planning process. Separately, Con Edison uses energy forecasts to determine the revenue forecast and set rates.

The forecasting of DER becomes increasingly important as DER penetration grows, requiring more granular load forecasts and a better understanding of DER performance. As peak demand forecasts incorporate more robust and granular DER forecasts, Con Edison expects forecast accuracy to improve and the impact of DER growth on system planning will be clearer and more actionable. At the same time, increased adoption of DER introduces new challenges for maintaining forecasting accuracy due to uncertainties associated with the variability of DER output, its evolving correlation with net load, and the impact of geographic diversity on aggregate DER output.

To that end, the Company continues to refine its forecasting process, including the addition of new load modifiers to provide a more complete assessment of the factors reducing the forecasts, thus supporting greater accuracy. Figure 27 shows how the addition of DER load modifiers has significantly reduced the 10-year forecasts in line with the increased adoption of these technologies, as driven by REV policies.

Figure 27: Historical 10-Year System Peak Forecasts



	2012	2013	2014	2015	2016	2017
5-Year CAGR	1.16%	1.37%	0.94%	0.19%	0.19%	0.14%
10-Year CAGR	1.09%	1.11%	0.92%	0.17%	0.26%	0.17%

At this time, the Company treats resources capable of exporting energy to the grid, such as PV, as load modifiers in the forecasts. Separating onsite consumption from exported energy (i.e., supply) would require a level of disaggregation and granularity not currently practical or meaningful to forecast outputs.

9) Describe the utility's specific objectives, means, and methods for acquiring and managing the data needed for its advanced forecasting methodologies.

Con Edison uses a range of data inputs to produce its forecasts, including but not limited to meter data, queued projects, technology-specific growth forecasts, and macro-economic trends. To support more advanced forecasting methodologies, the Company plans to leverage the more granular and accurate meter data available through AMI. Actual customer hourly load data from AMI coincident with system, network or substation peaks will help in the determination of customer contribution to these peaks by customer type. The Company can then extrapolate this information to the queue of customers connecting to the system to determine short- and long-term (one-year) growth. With AMI data, the Company can also calculate a customer's load with DR and DER reductions to determine, by customer type, the reductions at the time of the peak.

The Company is also interested in evaluating the benefit of acquiring more meteorological data, such as high-frequency S-band dual pol radar data, to enable more granular DER forecasting and dispatch.

10) Describe the means and methods used to produce substation-level load and supply forecasts.

The network peak load forecast uses regression analysis to determine the individual network weather-adjusted peaks. The job growth and load modifiers use a combination of bottom-up (jobs in queue) and top-down (econometric and/or industry trends) methods. Con Edison uses a combination of queue data and historical trends to allocate top-down forecasts to each network.

The 3-year 8,760 network forecast utilizes the General Electric – Multi-Area Reliability Simulation ("GE-MARS") program to modify the actual hourly loads from the previous year based on monthly energy distribution from the previous year, forecasted peak demand, and energy send-out. The Company uses the most recent actual hourly loads to capture the DER impacts embedded in the service area to develop the load shapes for the individual networks. The Company adjusts the load shapes to the individual network peak demand and energy send-out forecasts including the projected DER impacts, such that the forecast includes the impact of load modifiers. Figure 28 depicts this process.

Figure 28: 8,760 Forecast Methodology Overview

The 8,760 hour forecasts are for informational purposes. These forecasts have uncertainties such as weather and hourly load curves, as well as the typical inherent forecasting error, including, but not limited to economic drivers, customer decision/behavior, and forecasted DER. Con Edison does not warrant the accuracy of these informational forecasts.

11) Describe the levels of accuracy achieved in the substation-level forecasts produced to date for load and supply.

The system peak forecast has an average 5-year error rate of approximately 1.4 percent and the network independent peak forecast for individual networks and radial systems has an average 5-year error rate of 2.8 percent.

12) Describe the substation-level load forecasts provided to support analyses by DER developers and operators and explain why the forecasts are sufficient for supporting those analyses.

The Company's hosting capacity platform includes 8,760 hourly forecasts at the network level. Stakeholders requested the 8,760 forecasts to provide an indication of the duration of peak and off-peak periods, which is useful for evaluating energy storage opportunities.

13) Provide sensitivity analyses which explain how the accuracy of substation-level forecasts is affected by distributed generation, energy storage, electric vehicles, beneficial electrification, and energy efficiency measures.

The Company will continue to assess the impact of DER on network and system-level forecast accuracy and refine methodologies as appropriate. The Company updates its assumptions each year.

For example, the Company collects detailed outage information from CHP customers seeking a reliability credit and uses the information to develop metrics that analyze outage frequency, duration, causes, and many other factors related to outages. The Company will also issue an annual public report showing aggregate metrics for each network.

While Con Edison does not intend for CHP outage data to provide determinative performance measures, it does probabilistically quantify certain performance aspects by building transition rate tables for each distribution feeder. In addition to collecting simple CHP equipment availability, the Company will collect detailed information about individual outage events that, when analyzed at the network level, will provide data that the Company may use to improve reliability. Con Edison will link specific equipment outages to disturbance reports on the networks, enabling better association of CHP outages with load and distribution outages. Additionally, the Company will now track outages by one CHP owner to outages of other CHP owners to establish any potential relationships among multiple outages.

14) Identify and characterize the tools and methods the utility is using/will use to acquire and apply useful forecast input data from DER developers and other third parties.

The Company relies on actual impacts from installed DER technologies and programs, as well as data from government and industry sources to build the forecast. The Company believes the current practice of using actual performance data and data from trusted academic sources results in a more accurate forecast and prevents potential market manipulation. Additionally, some DER developers may consider information about forecasted installations and market activities to be sensitive competitive information.

15) Describe how the utility will inform its forecasting processes through best practices and lessons learned from other jurisdictions.

Con Edison continues to collaborate with the Joint Utilities to share best practices and align forecasting approaches. The Joint Utilities hosted discussions with utilities across the country and in the European Union to exchange best practices on long-term load and DER forecasting, including frequency of updates, impacts on investment planning, geospatial and temporal granularity, and inputs and methods. These discussions allowed the Joint Utilities to benchmark their forecasting practices with utilities facing similar issues and confirmed that Con Edison is consistent with its European peers.

Con Edison will continue to coordinate with the Joint Utilities and NYISO on the forecasting of load and DER, as well as track developments in other states to identify lessons learned and best practices. Future discussions will continue information sharing on forecasting aspects such as load modifiers, customer-owned generation, and other forecasting issues to accurately reflect DER impacts in forecasts at the bulk system level and distribution level.

16) Describe new methodologies to improve overall accuracy of forecasts for demand and energy reductions that derive from EE programs and increased penetration of DER. In particular, discuss how the increased potential for inaccurate load and energy forecasts associated with out-of-model EE and DER adjustments will be minimized or eliminated.

As discussed above, the Company has taken a number of steps to improve forecast accuracy by better capturing the impacts of DER on load, particularly through the addition and refinement of load modifiers. The Company will continue to refine its forecasting methods in support of greater forecasting accuracy, recognizing that it cannot completely eliminate statistical error and weather uncertainty inherent in the process.

2.3. GRID OPERATIONS

Context and Background

As the penetration of DER grows and power flows in multiple directions across the grid, performing necessary grid functions becomes more complex. Maintaining a safe and reliable grid in a high DER environment requires increased visibility, measurement, monitoring, and control of DER assets, which will also facilitate realization of DER's full value to customers and the system.

While DER adoption is increasing at a significant rate, overall levels of DER penetration relative to the system peak are comparatively low. To prepare for more DER on the grid, the Company is taking a number of steps to enhance operational capabilities, improve operational efficiency, coordinate with NYISO, and test the interaction of DER technologies with the grid, all of which will support higher levels of DER penetration. Central to this plan are enabling investments in systems required to support DSP capabilities. For example, the Company is upgrading over 2,000 network protector relays to have bi-directional capabilities, which minimizes trips due to backfeed from DG and can increase hosting capacity. Additionally, investments in distribution automation will enhance the Company's M&C capabilities, allowing for enhanced visibility at the grid edge. Installation of VVO hardware will improve system efficiency by lowering voltage and set the stage for DER to provide voltage regulation.

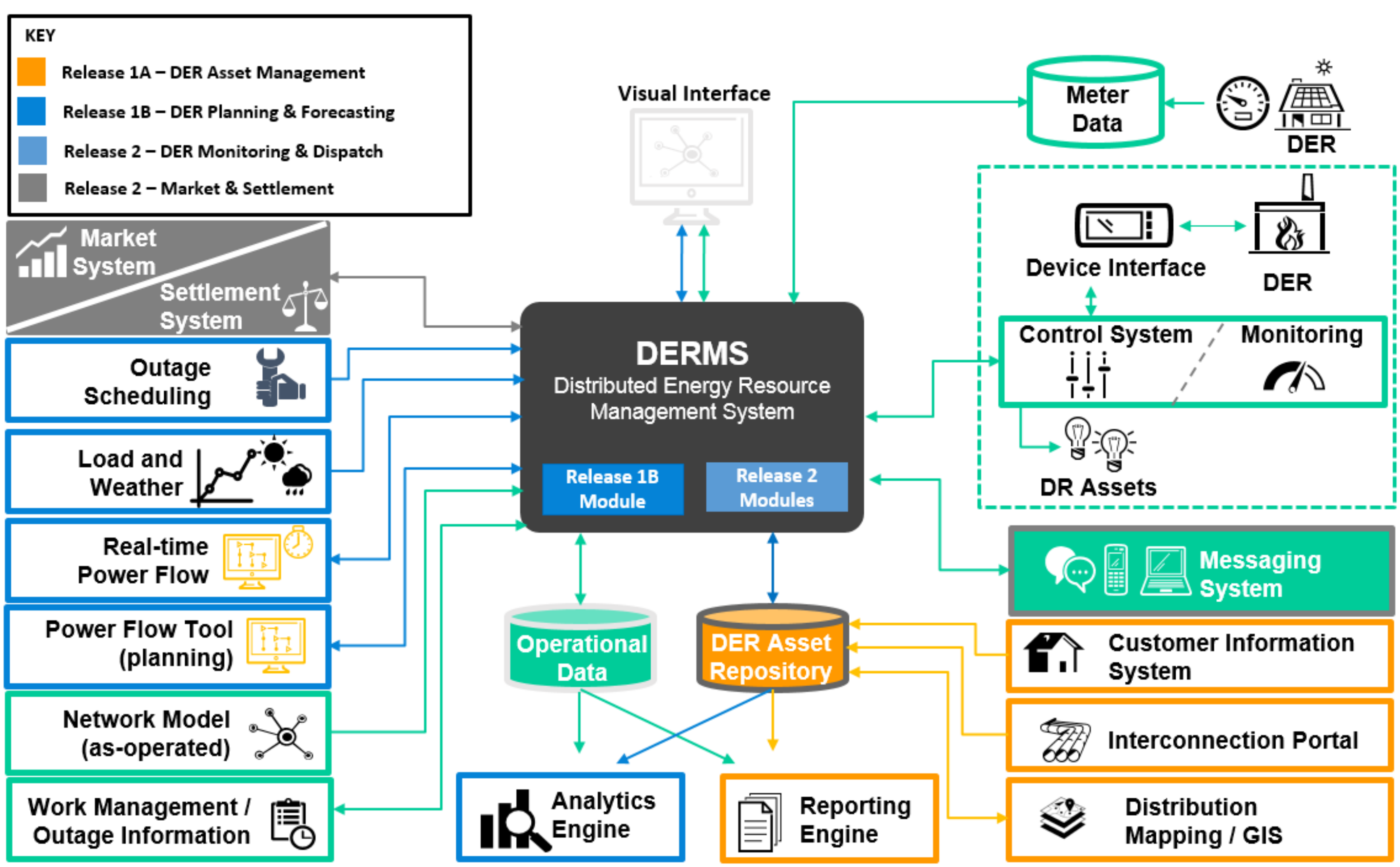
Following extensive benchmarking and business case validation, the Company is proceeding with investments in enterprise-wide GIS and DERMS. The GIS will offer one consolidated mapping and visualization system that stores the physical location and other operating characteristics of facilities and assets, including DER, and maintains the as-built model of the electric and gas distribution systems. Enterprise GIS supports multiple grid modernization investments, such as an ADMS and DERMS, and enables new capabilities, such as:

- Visualizing grid variables, equipment condition, and geo-spatial position of assets.
- Developing accurate distribution grid models all the way to the customer meter.
- Calculating and visualizing of DER installations and hosting capacity.

DERMS will provide a comprehensive view of DER assets, fully integrated with operating and planning systems, that will support better tracking and reporting on DER growth in the service territory. The purpose of a DERMS is to manage diverse DER, understand the unique status and capabilities of each, and present these capabilities to other supporting applications to facilitate enhanced M&C of the distribution system. Con Edison will use the DERMS in response to system operational events, environmental and equipment conditions, and eventually market conditions. A DERMS will provide visibility and control of a diverse portfolio of resources to address local constraints, while also flexibly addressing system-wide concerns. The system will visualize, predict, and optimize DR and DG at the circuit, feeder, or segment level, and present in a dashboard suitable for operational use.

Figure 29 illustrates the DERMS architecture.

Figure 29: Illustrative DERMS Architecture



With the increase in DER on the system, the Joint Utilities have continued to work with DER developers as part of the M&C Working Group to establish reasonable M&C requirements for DER that seek to balance the need to preserve system safety and reliability with project economics. Establishing an appropriate level of visibility and operational situational awareness through M&C of grid assets enables the integration of DER while maintaining continued system safety and reliability. Additionally, effective M&C practices help to maintain power quality, optimize system operations, and enhance grid resiliency, as well as support participation in the day-ahead and real-time wholesale markets. For example, as markets for DER participation continue to develop, the dispatchability of assets enabled by increased M&C can help increase system efficiencies while helping to realize the value of DER to the system. Additionally, M&C allows the utility to detect and respond to issues caused by existing DER on the system. This may encourage future DER integration by facilitating interconnection requirements and processes. Applying the appropriate combination of monitoring and basic and/or advanced control will provide some assurance that a proposed interconnection will not damage customer or utility equipment, cause service interruptions, violate power quality standards, or create safety hazards.

M&C has several touchpoints with parallel work streams within the Joint Utilities Working Groups and NYISO governance process, including the ITWG, ISO-DSP Coordination Working Group, and Market Issues Working Group ("MIWG"). For example, because M&C requirements vary based upon whether the asset targets market or operational use cases, the M&C group is reviewing and harmonizing each of the requirements for consistency to prevent conflicts across multiple stakeholders.

Separate from utility M&C requirements, NYISO has its own requirements for resources participating in the wholesale markets. The Joint Utilities are engaged in ongoing discussions with NYISO to understand coordination needs and define roles, responsibilities, and procedures.

Implementation Plan, Schedule, and Investments

Current Progress

Summary of Achievements

- Invested in new M&C capabilities, including ongoing investments in AMI, GIS, and DERMS, as well as network protector relays that allow bi-directional communication with SCADA.
- Piloted low-cost M&C solutions, such as the ConnectDER™ meter collar.
- Released several technical documents for consideration by the ITWG, including proposed interim requirements for anti-islanding and M&C.

The Joint Utilities have made progress in advancing M&C capabilities, expanding M&C requirements to include additional technologies like energy storage, and identifying lower-cost M&C solutions to reduce the cost burden on developers. These efforts have resulted in a more predictable operating environment for DER developers that attempts to leverage the full value of DER assets while preserving system reliability.

M&C Capabilities

Advanced M&C of DER provides operational situational awareness and allows the utility to dispatch and optimize resources based on current or forecasted system conditions. With DER penetration at relatively low levels, the development of advanced M&C capabilities is in a nascent stage. Currently, the Company uses M&C capabilities to monitor and control the operation of DER to within allowable system parameters. The Company can also use data generated by M&C for long-term purposes, such as distribution planning.

In the Initial DSIPs, each utility included plans for enabling investments in monitoring systems, control systems, and distribution infrastructure upgrades to support DSP capabilities, including the measurement and verification of DER performance. Section 1.5 discusses how the Company's ongoing investments in AMI, GIS, DERMS, and protective relays that have bi-directional communication with SCADA will provide the Company with new M&C capabilities as DER penetration increases. Table 5 provides a snapshot of planned technology investments supporting enhanced M&C capabilities.

Table 5: Utility Technology Investments Supporting Enhanced M&C

Primary Technology	Impacted Business Use Case
AMI	• Leverage existing infrastructure for greater situational awareness for use in planning and distribution operations • Improve restoration metrics through improved outage management
Distribution Automation	• Improve restoration metrics through automation and remote control • Reduce losses through local, automated adjustments to equipment and circuit configurations
ADMS	• Improve automation management to achieve greater operational efficiencies • Improve situational awareness through advanced integration of disparate data sources, resulting in improved safety and reliability in real-time operations • Improve interaction with SCADA-connected DER, enabling the Company to use larger DER assets as operational NWS
DERMS	• Enable operators to manage DER based on economics and reliability, which facilitates participation of DER in wholesale and distribution markets

The technology investments listed above will advance current M&C capabilities and enable capability deployment at scale. AMI deployment provides immediate benefits to Con Edison through billing automation and greater visibility at the edge of the grid, ultimately informing net generation and load growth for planning purposes. The Company can also incorporate AMI data into other grid modernization-enabling technologies, such as DERMS. For example, when Con Edison integrates AMI functionality to provide data to DERMS, the inverter data made available to the utility over the AMI channel will support next-day planning and scheduling, including native load and generation shape analysis. The combination of AMI and DERMS will better inform the utility of the system's constraints and will allow the utility to provide communication dispatch signals to the necessary assets in the field.

Cost Reduction Efforts

The Joint Utilities continue to develop M&C requirements. Since January 2017, Con Edison has been meeting as part of the Joint Utilities M&C Working Group to understand and define the M&C requirements in light of a changing grid and evolving market operations. The Working Group has discussed implementation issues and the continued evolution of standards, such as pursuing lower-cost M&C solutions and integrating new technologies in the M&C framework. The M&C Working Group produced several technical documents for consideration by the ITWG, including proposed interim requirements for anti-islanding and M&C based on benchmarking with other utilities and operational experience.

The M&C Working Group recognizes that M&C requirements can challenge project economics, particularly for smaller projects. The M&C Working Group, in consultation with stakeholders, has focused on developing low-cost M&C solutions that satisfy system safety and reliability requirements while being sensitive to the cost burden. Working Group discussions have identified a few drivers of M&C cost, including:

- Available communication methodologies in a geographic area.
- Engineering, design, and drafting.
- Site installation, back office integration, testing, and commissioning.

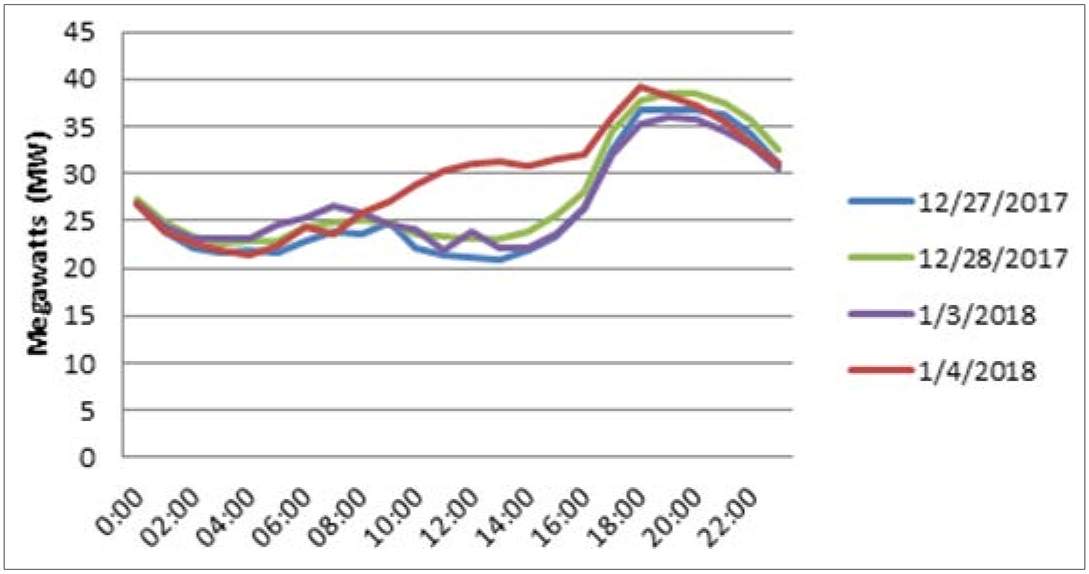
Additionally, the group has found that the most promising opportunities to reduce cost will come through standardization of design and/or functionality for equivalent business and technical use cases. Standardization allows for economies of scale and reduces engineering, design, drafting, installing, testing, and commissioning hours.

The Working Group also recently benchmarked initial low-cost M&C solutions and identified subject matter experts in metering, telemetry, security requirements, and engineering, installation, and commissioning for focused, internal technical discussions regarding cost reduction. The benchmarking effort resulted in the following main observations:

1. M&C bridges two different time-scales: real time, such as for traditional utility operations and SCADA devices, and non-real time, such as for planning purposes. This distinction drives communications backhaul discussions (such as periodicity and data payload size).
2. The utilities have typically used utility assets for M&C for SCADA (real-time) operations. In contrast, M&C for less critical operations can use third-party systems with appropriate interfaces within the utility back office. With the advent of communicating smart inverters, as well as other technologies that offer the potential to bridge traditional utility processes, such as AMI, the Company recognizes the possibility not only for increased visibility, but also for the complexities of integration from both a technological and process perspective.
3. While lower-cost technological solutions for enabling M&C exist, there is significant uncertainty as to their security and ability to integrate into real-time operations and planning processes. To be cybersecure, all digital systems must have the same strength of security throughout the network. While utilities see this as an important consideration to adoption of new technologies and processes, they often overlook it when employing a pure “low-cost M&C hardware” approach.
4. Forthcoming pilot and R&D energy storage projects provide additional opportunities for utilities to standardize low-cost M&C solutions in a controlled environment before approving those solutions for commercial interconnection applications.

The Joint Utilities have several ongoing pilot, research, and demonstration projects at various stages that show promise for low-cost M&C solutions. Con Edison is currently evaluating a monitoring solution for planning use cases (potentially evolving to control capabilities) that utilizes the cloud to collect and communicate recorded data points. For example, the ConnectDER™ meter collar pulls in monitoring data at five-minute intervals, improving the visibility and level of granularity of data available for planning purposes. The current deployment of ConnectDER™ in Staten Island is expected to help the Company disaggregate load and further understand the impact of PV of load. For example, the ConnectDER™ meter collar would allow the Company to disaggregate the load curves shown in Figure 30 below and better monitor variations in solar PV’s contribution to load. Figure 30 highlights the impact of a significant snow fall (on January 4, 2018) on load at the local substation compared to three relatively high solar radiance days. The Company postulates that snowfall covered the panels on January 4, 2018 and removed over 5 MW of solar output from this network, masking the apparent beginning of a characteristic “duck curve” during the solar peak period.

Figure 30: Illustrative Network Load Curves



Con Edison will look to further pilot M&C technologies as DERMS development progresses, recognizing that one of the main challenges to overcome is transmitting data securely.

The Joint Utilities have been evaluating smart inverter capabilities for possible integration into M&C pilots for low-cost solutions. There are functions within the California Public Utilities Commission Rule 21 mandate and Smart Inverter Working Group, such as remote on/off and full real-time measurement, that potentially could lower M&C costs through direct integration. However, utilities have not yet widely implemented these functions and do not anticipate standardizing them in 2018. Further progress must be made in terms of cybersecurity, integration, functionality, and standardization before utilities can integrate them. Upon ratification of the IEEE 1547-1 testing standard, the Joint Utilities will require newly installed smart inverters to be over-the-air firmware upgradeable.

Future Implementation and Planning

Summary of Future Actions

- Focus on low-cost M&C of DER within planned pilots.
- Explore pilots to test DERMS functionality and integration with existing platforms.
- Collaborate with Joint Utilities, NYISO, DPS, NYSERDA, and other stakeholders on evolving M&C requirements.

The M&C Working Group will continue to provide support and input to the ITWG, ISO-DSP Coordination Working Group, and MIWG, while considering present and future distribution system operational needs. Additionally, the group will focus on low-cost M&C of DER within planned pilots, as well as M&C solutions that are harmonized with NYISO requirements and individual utility requirements. Similarly, the group will continue to harmonize M&C requirements and implementation across the Joint Utilities in accordance with NYISO and non-market facing requirements. The effort to develop utility options for low-cost M&C, as well as standardizing and harmonizing with the NYISO requirements, further supports the operational and market benefits of DER. In collaboration with the Joint Utilities, Con Edison will continue to support realizing those benefits to the DER community by developing M&C requirements that support high DER penetration and are also sensitive to project economics.

The Joint Utilities will further address grid operations topics through the development of a separate Market Design and Integration Report that "identifies, describes, and explains their jointly planned market organization and functions along with the policies, processes, and resources needed to support them."[67] Further, and in line with the June 2018 DPS Staff and NYSERDA Energy Storage Roadmap,[68] the Joint Utilities will work with NYISO, DPS, and NYSERDA to discuss issues raised in the Roadmap, including grid operations. Con Edison, as part of the Joint Utilities, will remain actively engaged to inform the development of the Market Design and Integration Report.

Risks and Mitigation

Building capabilities to support advanced grid operations, including advanced M&C, will require sustained investment in grid modernization technologies. The amount of available funding will influence the timing and extent of implementation.

Additionally, cybersecurity remains of paramount importance as the grid adds digital technologies. Emerging cybersecurity concerns or requirements have the potential to impact the implementation timeline in an effort to manage risk. The Company closely follows cybersecurity developments as provided in the Joint Utilities Cyber and Privacy Framework filed in the Supplemental DSIP and is actively engaged in industry discussions.[69]

Stakeholder Interface

As noted above, the Joint Utilities worked with stakeholders to align on M&C requirements and potential lower-cost M&C solutions. The Joint Utilities will continue to work with the DER community to find mutually-satisfactory solutions and maintain the transparency of M&C requirements.

The Joint Utilities also hosted a stakeholder engagement session in October 2017 to communicate the progress made working with NYISO on coordination issues and gather additional input. Defining new operational coordination requirements between the DSP, NYISO, DER aggregators, and individual DER makes greater DER integration and market participation possible, including expanding the ability of DER to access and be compensated for multiple value streams. Each utility will not only need to expand its historical level of coordination with NYISO, but also build upon, and in some cases establish, new forms of coordination with DER aggregators and individual DER. In the *Order on Distributed System Implementation Plan Filings* ("DSIP Order"), the Commission highlights that "many complex and nearly continuous interactions will need to occur among NYISO, the DSPs, and DER operators."[70] The Joint Utilities agree, and have worked with NYISO, DPS Staff, and stakeholders to define required information exchanges and operational coordination among the various entities.

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[67] DSIP Proceeding, 2018 DSIP Guidance, p.4.
[68] Case 18-E-0130, *Proceeding in the Matter of Energy Storage Deployment Program* ("Energy Storage Proceeding"), New York State Energy Storage Roadmap and Department of Public Service/New York State Energy Research and Development Authority Staff Recommendations (issued June 21, 2018) ("Energy Storage Roadmap"), p. 72.
[69] DSIP Proceeding, Supplemental DSIP, pp. 148-160.
[70] DSIP Proceeding, Order on Distributed System Implementation Plan Filings (issued March 9, 2017) ("DSIP Order"), p. 7.

Additional Detail

This section responds to the questions specific to grid operations.

1) Describe in detail the roles and responsibilities of the utility and other parties involved in planning and executing grid operations which accommodate and productively employ DERs.

The utility's primary responsibility is to preserve distribution system safety and reliability. Con Edison has coordinated with DER aggregators and the NYISO to define operational coordination requirements, including specific roles and responsibilities for each party, to preserve safety and reliability for a system characterized by increasing amounts of DER. As part of distribution system programs (e.g., DR) and procurements (e.g., NWS), the utility requires participants (e.g., DER aggregators) to sign a contractual agreement that defines the roles and responsibilities for both the utility and DER aggregator. For example, contracts typically specify the amount of advanced notification the utility will provide the DER aggregator prior to an event, and separately they define all reporting and settlement requirements for the DER aggregator.

In addition to operational coordination for DER participating as part of utility programs and procurements, the Joint Utilities have developed a *Draft DSP Communications and Coordination Manual*[71] to define the roles and responsibilities among the utility, NYISO, DER aggregators, and individual DER to enable DER wholesale market participation while preserving system safety and reliability. For example, as part of NYISO's bidding and scheduling process, the DSP will analyze the dispatch feasibility of individual DER and DER aggregations (as provided by the DER aggregator) to avoid jeopardizing system safety or reliability as a result of wholesale market participation. Figure 31 outlines the bidding and scheduling framework in more detail. The Joint Utilities have also developed a *Draft DSP-Aggregator Agreement for the NYISO Pilot Program*[72] to further define the roles and responsibilities between the DSP and DER aggregators.

Figure 31: DER Wholesale Market Scheduling Framework

	Two Days Prior to Operating Day*	One Day Prior to Operating Day				Operating Day (Real Time)
Time	**1500**	**0500**	**1100**	**1300**	**1500**	**T-5 mins and T-6 secs****
From	DSP	DER Aggregator	NYISO	DER Aggregator	DSP	NYISO
To	Individual DER	NYISO	DER Aggregator, DSP	DSP	DER Aggregator, NYISO	DER Aggregator
Information	Network conditions impacting individual DER	Day-ahead "hourly capability" deadline	DER aggregation day-ahead schedule	Individual DER day-ahead schedule	Network conditions impacting DER	DER aggregation real-time dispatch
Communication Method	Report – email, phone, mail, etc.	Spreadsheet – email	Spreadsheet – email	Spreadsheet – email	Report – email, phone, mail, etc.	Telemetry

[71] Note 5, *supra*.
[72] Note 6, *supra*.

2) Describe other role and responsibility models considered and explain the reasons for choosing the planned model.

Con Edison's programs and procurements define the types of roles and responsibilities the Company, in coordination with third parties, has defined as being necessary for effectively addressing utility needs while providing actionable information to DER aggregators and individual DER operators to help preserve distribution system safety and reliability. With respect to DER wholesale market participation, the Joint Utilities coordinate with the NYISO on an ongoing basis to define the roles and responsibilities for relevant parties to facilitate DER wholesale market participation in a safe and reliable manner. Similarly, input received through the NYISO stakeholder process has informed the development of these currently defined roles and responsibilities. The Joint Utilities further describe these models within Section 1.2 and will provide additional detail as part of the supplemental Market Design and Integration Report.

3) Describe how roles and responsibilities have been/will be developed, documented, and managed for each party involved in the planning and execution of grid operations.

For distribution-related programs and procurements, Con Edison will continue to capture all roles and responsibilities within contractual agreements with relevant parties. The Joint Utilities continue to coordinate on opportunities to align the procurement process, which may help inform a more standardized set of roles and responsibilities across the utilities. While the high-level roles and responsibilities will generally be consistent across the different utilities' programs and procurements, the unique nature of each system need may result in differences (e.g., pre-defined time periods in which the DER portfolio is required to be available for performance).

With respect to operational coordination for DER wholesale market participation, the Joint Utilities have developed a *Draft DSP Communications and Coordination Manual*[73] to define the coordination requirements between the DSP, NYISO, DER aggregator, and individual DER. As DER increase participation in the wholesale market, there may need to be enhanced coordination across four major functions: (1) registration, (2) planning, (3) operations, and (4) settlement. The Joint Utilities have also developed a *Draft DSP-Aggregator Agreement*[74] for the NYISO pilot program to: (1) close the operating and communication gap between the utility interconnection agreements or tariffs and NYISO tariffs, and (2) provide DER aggregators with transparency into how to coordinate with the DSP to maximize the ability of DER aggregations to deliver value across different services. While the utility may use this as part of the NYISO pilot program, the agreement is meant to inform the development of a full DSP-DER aggregator operational agreement for use once the NYISO fully implements its DER participation model.

4) Describe in detail how the utilities and other parties will provide processes, resources, and standards to support planning and execution of advanced grid operations which accommodate and extensively employ DER services. The information provided should address:

a. organizations;

As discussed above, Con Edison coordinates with DER aggregators and the NYISO to define operational coordination requirements, including specific roles and responsibilities for each party, to preserve safety and reliability for a system characterized by increasing amounts of DER.

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[73] Note 5, *supra*.
[74] Note 6, *supra.*

Internally, the Company maintains an extensive collection of standard operating procedures and specifications for electric system planning and operations that incorporate DER as appropriate. Con Edison is also modernizing its control centers to proactively manage a more complex distribution grid. Modernizing the control centers will bring significant enabling benefits for integrating the latest technology, resiliency, and standardization of processes, including establishing a centralized area to deploy advanced distribution management functionalities.

b. operating policies and processes;

The Company develops and maintains operating guides for Company personnel that describe the policies and procedures for performing a range of operational functions. As the Company implements new processes and functionalities, such as the IOAP and hosting capacity map, the Company integrates lessons learned from early stages of deployment into the relevant policies and procedures, as appropriate. Con Edison has established cross-functional steering committees and project teams, representative of the organizations involved in DSP activities and inclusive of the executive levels, to facilitate the governance structures necessary to institutionalize, monitor, and enforce operating policies and processes.

c. information systems for system modeling, data acquisition and management, situational awareness, resource optimization, dispatch and control, etc.;

Con Edison recognizes the need for further investment in grid management tools and is committed to building the systems and functionality that maximize the integration of DER assets into utility operations. For example, an increase in grid endpoints will require further investment in SCADA technologies and communication infrastructure to maximize the value of the investment. The Company maintains an overall strategy to meet communications requirements across multiple criteria. This communications strategy delivers sufficient capacity and diversity of communications channels in advance of planned device deployment, while also addressing cybersecurity and other operational requirements.

To accommodate future systems, applications, and devices, the Company will expand or enhance existing communications infrastructure to meet the needs of each asset. This infrastructure expansion will span a 20-year horizon in alignment with Con Edison's Grid Modernization Plan. The Company's efforts to gather system, application, and device requirements informed the determination of optimal communications solutions.

The need to incorporate DER assets into traditional operations will necessitate the integration of new DERMS and ADMS systems in more modern control center environments. Additionally, GIS is foundational to DERMS and ADMS and will help provide a holistic view of how DER fits into the overall system. Modernized control centers will require a suite of situational awareness tools to allow operators to analyze and react to inputs from both utility-owned assets and third-party equipment.

d. data communications infrastructure;

The Company understands that streamlined data management and optimization will underpin the future of utility operations and as such, the Company has procedures and roadmaps in place to layer these needs into a corporate repository that can serve as a single source of data and reporting. For example, as part of the ongoing AMI deployment, Con Edison has established data governance teams and structures to facilitate an enterprise-wide approach to data management and the creation of an EDAP. The Company has also developed a hierarchical approach to data management and communications to facilitate decisions regarding the safe and reliable transfer of data assets for a wide range of use cases.

e. grid sensors and control devices;

As technological advances bring new sensing and communication capabilities, Con Edison will leverage these advancements to support integration of higher penetrations of customer-owned and operated assets. The Company plans to deploy smart sensors throughout the system to provide better real-time data that is expected to lead to improved employee and public safety. These data points will allow Con Edison to remotely perform many activities that currently require onsite labor, a capability that will provide greater workforce flexibility and lower costs over time. As DER penetration levels continue to increase, grid sensing equipment will offer a more complete look at the impact customers will have on the grid, allowing the Company to continue to incentivize electric generation and demand in a way that brings the highest value with the greatest reliability. Additionally, investment in SCADA communications and technology will offer operators a wider range of control that will lead to faster system response times and a wider range of operational flexibility.

f. grid infrastructure components such as switches, power flow controllers, and solid-state transformers;

As noted in the responses to 4c and 6c in this section, the Company is investing in equipment that supports system reliability in a high DER environment. These investments build on ongoing efforts to reduce the impact of storms, including installing additional automatic devices, such as reclosers or gang switches, fuses, fuse bypass switches, and automatic sectionalizing switches on the overhead system.

Investments in network protectors with communicating relays that are capable of two-way wireless communication will allow for SCADA, which will provide control centers the ability to remotely monitor and operate the network protectors, allowing more dynamic ability to load and de-load specific feeders. In addition to timelier fault identification, the modernized network protector relays also enable soft transfer trips in which, upon a feeder fault, a customer breaker or network protector is opened. Soft transfer trips, executed automatically and in near real-time, de-energize the backfeed on feeders to protect both customer and utility equipment and the safety of Con Edison field workers. As DER penetration increases, the risk to worker safety and equipment damage due to backfeed increases, and more granular distribution control becomes a priority.

By modernizing the network protective relays in prioritized areas (e.g., where DER penetration is greatest or the system is most constrained) and in a pre-emptive manner, the Company is maintaining the system reliability and resiliency while integrating more DER into the electric system.

Power flow controllers and solid-state transformers are emerging technologies currently in the research and development phase. As such, these technologies are not part of the current investment plan. The Company continues to explore new technologies in a demonstration project or research and development capacity, as appropriate.

g. cyber security measures for protecting grid operations from cybersecurity threats; and,

The Supplemental DSIP outlined a common and comprehensive approach to managing cybersecurity risks in the evolving REV environment. The Joint Utilities Cyber and Privacy Framework focuses on people, processes, and technology to maintain data security. [75] The Framework requires the implementation of an industry-approved risk management methodology and an alignment of control implementations with the control families in the National Institute of Standards and Technology ("NIST") Special Publication ("SP") 800-53 revision 4. The Joint Utilities periodically assess the need for updates to the Framework. The current version, as filed in the Supplemental DSIP, remains relevant with no

[75] DSIP Proceeding, Supplemental DSIP, pp. 148-160. Note 70, *supra*.

updates required. As technology evolves, the Joint Utilities will align the protocols in the Framework with security controls.

h. cyber recovery measures for restoring grid cyber operations following cyber disruptions.

Con Edison has developed incident response and recovery plans, which the Company practices on a regular basis for key processes, systems, and departments. Additional detail on cybersecurity practices is included in Section 2.9.

5) Describe the utility resources and capabilities which enable automated Volt-VAR Optimization (VVO). The information provided should:

a. identify where automated VVO is currently deployed in the utility's system;

Voltage management has long been a crucial part of maintaining the stability of our electric grid. Initially, the Company managed voltage using hardware at the station. More recently, voltage is controlled at each station using SCADA. Both methods control voltage by adjusting the area substation transformer tap changer. The methods do not automatically switch capacitor banks or make other decisions. Some of the Company's grid modernization investments will enhance the control systems and necessary components to automate this process, as well as increase the accuracy for appropriate measurement and verification and control.

Currently, the Company regulates voltage with limited knowledge of the customer voltage. As the Company deploys AMI, it will provide new voltage measurement capability at meters (i.e., what voltage the customer is receiving), thus increasing the amount of information available to grid operators and planners and enabling Con Edison to better control voltage across the system.

b. in both technical and economic terms, provide the energy loss and demand reductions achieved with the utility's existing automated VVO capabilities;

VVO is a broad term related to reactive compensation and voltage optimization and includes CVO. CVO is the adjustment of area substation supply voltages to a lower value while providing adequate voltage levels for all customers. CVO reduces the amount of energy consumed by end use customers to power a given load, resulting in energy savings.[76] With the right enabling technologies, CVO can also optimize voltage and improve the power factor.

The target for AMI-enabled CVO is 3.0 percent voltage reduction, which equates to approximately 1.5 percent energy savings, subject to measurement and verification studies. This results in an environmental impact of 1.9 percent fewer total CO_2 emissions due to the reduction of power fossil fuel plants generate annually across the Company's service territory and a 1.0 percent total reduction in New York State. This equates to 229,125 metric tons and 368,821 metric tons of CO_2 across the Company's service territory and New York State, respectively. Further, as the AMI Business Plan states, the Company estimates a $346 million NPV cost savings for the 20-year BCA analysis, of which $292 million results from fuel savings and $54 million is due to CO_2 reductions.[77] The Company did not perform a business case at the circuit level.

c. describe in detail the utility's approach to evaluating the business case for implementing automated VVO on a distribution circuit;

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[76] Energy savings vary depending on the type of customer load profile.
[77] Con Edison 2015 Electric Rate Case, Advanced Metering Infrastructure Business Plan (issued November 16, 2015).

See response to 5b.

d. provide a preliminary benefit/cost analysis (using preliminary cost and benefit estimates) for adding/enhancing automated VVO capabilities throughout the utility's distribution system;

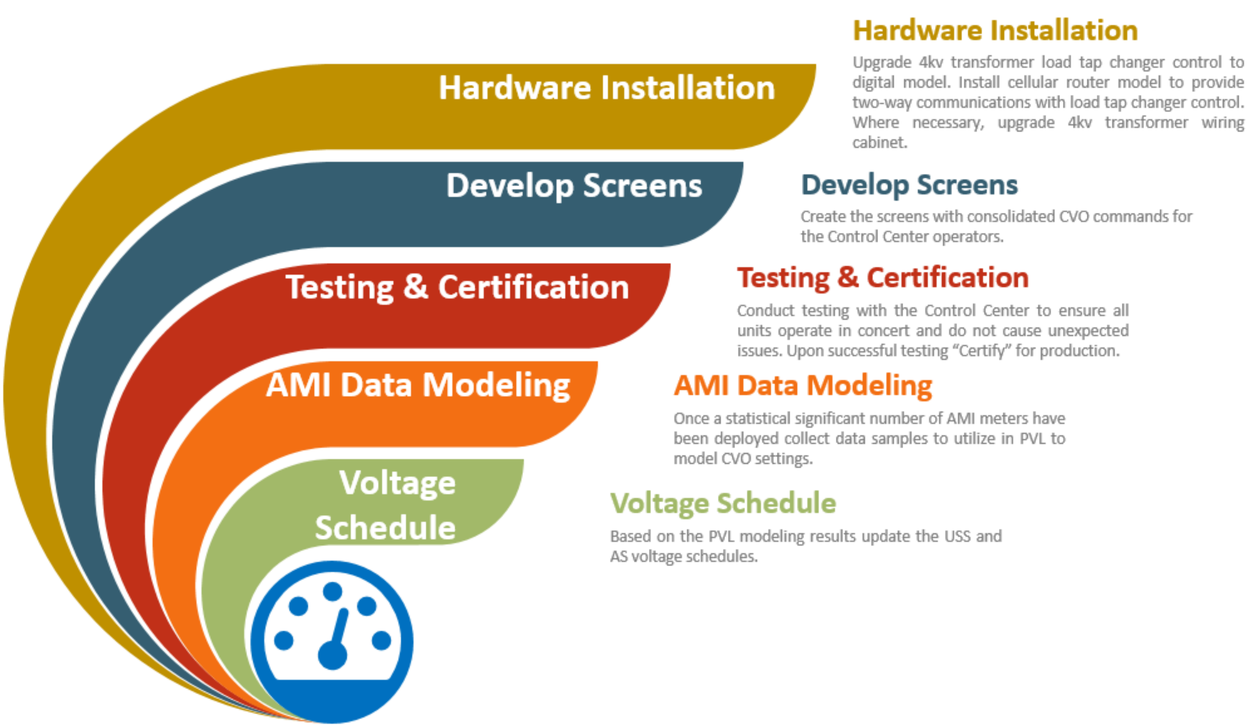
See response to 5b.

e. provide the utility's plan and schedule for expanding its automated VVO capabilities;

Con Edison is in the early stages of its VVO program, with initial efforts focused on implementing CVO, as described in the AMI Business Plan.[78] The Company's VVO efforts will evolve to incorporate more complexity and enhance voltage optimization.

The implementation of AMI-assisted CVO follows a staged process that includes: AMI meter deployment saturation, 4 kV controller installation, identification of data sources, verification of area substation controller and tap changer functionality, and adequate analysis time for the AMI data to refine the voltage schedules. The basic process and dependencies are shown in Figure 32.

Figure 32: CVO Implementation Process and Dependencies



The Company has a three-stage plan for implementing CVO. The first stage follows AMI deployment in an area and involves fixing any low-voltage areas and iteratively adjusting the area station or unit station voltage schedule. In order to have sufficient voltage data to perform the necessary analysis to implement new CVO voltage schedules, the

[78] *Id.*

Company requires 90 percent AMI meter deployment in a region, which serves a key dependency and trigger for the CVO deployment schedule. The second stage involves more dynamic voltage management, where the customer's voltage reading dynamically adjusts the area station or unit station bus voltage. The third stage seeks to leverage DER to help regulate the voltage in local pockets.

VVO provides communication with smart inverters to give or take VARs to maintain an optimized power factor. This functionality supports the penetration of smart inverter technology and in achieving the right balance of active and reactive power, improves grid efficiency by reducing line losses. DERMS implementation will facilitate the interaction with smart inverters and enhance VVO capabilities.

The Company has purchased and installed the necessary modems and controllers at 4 kV unit substations in Staten Island and expects to implement CVO in Staten Island by the end of 2018. The Company is required to start reporting on its CVO progress in a report due October 31, 2018. Table 6 summarizes the metrics to be reported on in the 2018 and future reports.

Table 6: CVO Implementation Metrics

Metric	Description	Target	Report Start Time	Frequency
Number of networks deployed with CVO	Number of networks with AMI deployed and have implemented CVO	Substation voltage schedules updated within one year following installation of all smart meters associated with station.	10/31/2018	Semi-annual
kWh savings attributed to CVO	Quantify kWh savings attributed to CVO	Goal is 1.5% energy savings based on verified calculations.	10/31/2019	Annual
Environmental benefits due to CVO	Provide total fuel consumption savings and corresponding emissions reductions.	By end of 2022, reduction in fossil fuel consumption results in annual of CO2 emission reduction of: • 229,000 metric tons in Con Edison's territory • 369,000 metric tons in all of NYS	10/31/2019	Annual

f. describe the utility's planned approach for securely utilizing DERs for VVO functions; and,

As described above, the Company is in the early stages of advanced voltage management. The Company expects to use DER for voltage management functions as part of the third stage of CVO deployment, which DERMS will enable.

g. **in both technical and economic terms, provide the predicted energy loss and demand reductions resulting from the expanded automated VVO capabilities.**

See response to 5b.

6) Describe the utility's approach and ability to implement advanced capabilities:

a. **Identify the existing level of system monitoring and distribution automation.**

Con Edison currently has a significant level of monitoring for utility-owned assets on the distribution system. Con Edison monitors ~27,000 distribution transformers on the network system via the Net Remote Monitoring System ("RMS"), along with SCADA communications for area substation circuit breaker and transformer equipment. The Company uses these data streams for both real-time monitoring as well as an historical input to circuit models for load flow and planning cases.

In addition to the RMS on the distribution network transformers, Con Edison monitors the network protectors on the secondary side of these units. The Company is able to remotely control a portion of these locations through the SCADA system and plans to increase this capacity over time through capital investment that will be strategically located in areas where the Company implements NWS projects or DG penetration levels exceed network thresholds.

Additionally, the installation of AMI infrastructure throughout the service territory will increase grid visibility from the network transformer level to the service delivery point offering.

The Con Edison overhead system incorporates loop designs with alternate circuit feeds that will operate to segment feeders and restore load through relaying; Con Edison can operate some through remote operation. Currently, Con Edison has over 2,000 monitored reclosers on the overhead system.

b. **Identify areas to be enhanced through additional monitoring and/or distribution automation.**

As the Company expands AMI deployment and has increased availability of granular network data, it will be able to improve existing planning models. This will allow grid operations use cases to be more inclusive of DG penetration and help guide M&C investments to coincide with the most needed areas in the distribution grid.

The phased development of a DERMS and ADMS will be a significant driver for monitoring, control, and distribution automation. Con Edison will use these systems as the optimization engines to fully integrate DG operation into traditional grid management. These systems will require significant M&C data points from the utility grid and third-party DER assets that will be available to provide grid support. Con Edison has actively participated in the Joint Utilities efforts on lower-cost M&C initiatives and will continue to invest in solutions that provide the necessary operational information without impeding DG projects.

As the Company looks to the future and continues to expand grid visibility and utility distribution automation, there will be a need to consolidate older systems into more modern, flexible technologies that are capable of marrying tremendous amounts of disparate information into a complete model of the real-time system. To meet future needs, the Company will need these systems to consolidate broad skill sets in both planning and operational. Con Edison will look to both modernize and consolidate control center locations and functionality so it can deploy the full benefits of future systems (e.g., DERMS, ADMS) across the service territory.

Additionally, as VVO efforts increase, there will be further ability to control voltage profiles by having more monitored and controlled end points.

c. Describe the means and methods used for deploying additional monitoring and/or distribution automation in the utility's system.

Communications channels and functionality will continue to grow as a result of the Company's grid modernization efforts, as it is a key component of future operations. For example, Con Edison currently is engaged in a multi-year project focusing on equipping existing network protectors with newer model relays and SCADA functionality. The relays allow for more backfeed in the secondary network, while SCADA enhancements give operators the ability to remotely operate the protectors. The goal of this project has been to target areas with existing or projected DG penetration growth to facilitate a network topology that is more accepting of network backfeed under low load conditions.

In the near term, the Company is increasing the number of switches on the overhead system and enhancing FLISR capabilities. The Company also plans to continue to increase automation on the overhead distribution system, especially as it builds ADMS functionality and is able to support operational actions that will offer a greater level of flexibility during system events. Con Edison will make these types of investments as part of the Company's overall grid modernization strategy, which will target areas that would receive the greatest benefit from automated operations.

The Company also recognizes the need to monitor and, in some cases, control third-party-owned DG. The Company's investment in DERMS capabilities will expand this functionality. Con Edison will explore cost-effective ways of backhauling data for optimization and operational decisions.

d. Identify the benefits to be obtained from deploying additional monitoring and/or distribution automation in the utility's system.

Expanded monitoring across the system will enable planners and operators to optimize the value of utility and non-utility owned assets. This co-optimization will lead to more informed operational decisions and capital investments that will drive customer benefit. In addition, the ability to trend data over time will refine the ways the Company is able to offer value streams to the DG community (i.e., NWS, LSRV, and market facilitation).

Similarly, an increase in distribution automation, through ADMS investment, will increase operational flexibility and continue to advance Con Edison's ability to provide safe and reliable electric service while incorporating greater levels of system value and support from DER.

e. Identify the capabilities currently provided by Advanced Distribution Management Systems (ADMS).

Con Edison does not currently operate an ADMS system. However, the Company operates a suite of systems that can perform some of the core functionalities characteristic of an ADMS system (e.g., fault location, outage management system ("OMS") modeling, and SCADA interfaces) and many of the Company's planned grid modernization investments, such as GIS, will support ADMS functionality. The market for ADMS solutions is currently nascent for Con Edison's unique service territory, which requires specific tools for planning and operating a low-voltage mesh network system.

f. Describe how ADMS capabilities will increase and improve over time;

Con Edison plans on utilizing a phased approach to grid modernization where it can incorporate new functionality as DERMS and ADMS software become more mature. The Company plans to leverage software solutions that it has and will procure for specific needs in the near term, to pilot the future development of modern tools that the Company can successfully integrate into its operational environment.

Additionally, the Company will work with O&R to learn from its ADMS experience and bring relevant knowledge to the Company.

g. Identify other approaches or functionalities used to better manage grid performance and describe how they are/will be integrated into daily operations.

Con Edison will continue to use lessons learned from demonstration and pilot projects to prove out the conceptual elements that the Company will need to advance grid operations in the future. The Company sees this as a necessary environment to partner with leaders in technology development to refine the Company's software and technology roadmap as the Company moves closer to full DSP functionality. These lessons learned will facilitate "no risk" investments that the Company can phase into grid operations.

2.4. ENERGY STORAGE INTEGRATION

Context and Background

New York State is a leader in ushering in a cleaner energy system and energy storage, with its capability to help manage the abundance of intermittent renewable generation, will be an important part of this future. Con Edison shares this clean energy vision and is committed to integrating a portfolio of energy storage solutions at all levels of the power grid, from the bulk power system to the distribution system, and on the customer's side of the meter. The Company believes cost-effective energy storage will provide valuable distribution services, and is bringing energy storage into its planning and operations functions and testing different use cases and business models through several demonstration projects to understand the full potential of energy storage to provide system benefits.

The Company's efforts link closely with REV objectives and State policy initiatives, notably the Clean Energy Standard[79] and the Governor's recently announced goal to deploy 1,500 MW of energy storage statewide by 2025.[80] To support this goal, NYSERDA, in partnership with DPS Staff, developed a strategic roadmap that presents "near-term policies, regulations, and initiatives needed to realize the Governor's ambitious 2025 energy storage target in anticipation of a 2030 target to be established later this year."[81] NYSERDA released its Energy Storage Roadmap on June 21, 2018, which draws on a study of net potential savings from energy storage, electric system needs storage can address, and how energy storage compares to alternative options. The study analyzed ranges of energy storage that could result in net positive benefit to ratepayers in meeting electric system needs, including ICAP, distribution and sub-transmission needs, that arise under various scenarios, sensitivities, and time horizons (2020, 2025, 2030).[82] The Commission is expected to issue the final 2030 energy storage goal and action plan by the end of the year.

Con Edison is participating in the ongoing discussion on the Energy Storage Roadmap, which is currently in the comment stage, including allocation of storage targets, determination of incentives, utility ownership, and funding availability. How those issues are resolved will likely impact the Company's energy storage plans, including the energy storage forecast. The forecast included in this DSIP was developed in 2017 prior to the announcement of the energy storage target and release of the Energy Storage Roadmap. As such, the forecast does not reflect the level of growth anticipated by the roadmap. The Company is participating in the Energy Storage Roadmap proceeding as it evolves and will integrate outcomes of the proceeding on an ongoing basis, as applicable, including updating its 2018 forecast. Similarly, the Company will incorporate experiences from its demonstration projects to inform these discussions.

Con Edison is well-positioned to add significant energy storage resources where and how they can best benefit the system and customers. In addition to enabling intermittent generation, energy storage, if dispatchable by the utility and strategically sited, can help the utility better manage system peaks and increase the hosting capacity of its distribution circuits. Additionally, energy storage can help the NYISO fulfill future needs for capacity and providing other bulk-power services. Con Edison anticipates that the NYISO will develop market rules that provide energy storage resources (and all DER) with the opportunity to participate across wholesale capacity, energy, and ancillary service markets while also providing distribution value.

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[79] Cases 15-E-0302 *et al*., *Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard,* Order Adopting a Clean Energy Standard (issued August 1, 2016).
[80] https://www.nyserda.ny.gov/All%20Programs/Programs/Energy%20Storage.
[81] Energy Storage Proceeding, Energy Storage Roadmap, p. 4.
[82] *Id.*

Current Progress

Summary of Achievements

- Increased the amount of storage on the system, including 33 BTM batteries representing 2.3 MW/6.5 MWh of capability, as of July 1, 2018.
- Commissioned utility-owned battery in the BQDM area, which will be fully operational in August.
- Initiated demonstration projects to better understand energy storage capabilities and test new business and operational models.
- Opened new opportunities for energy storage to support distribution system needs through tariffs, procurements, and programs.
- Reduced technical barriers to interconnecting energy storage, including working with the NYC DOB and the Fire Department of the City of New York ("FDNY") to establish a standardized testing and permitting process for lithium-ion energy storage in outdoor installations in New York City.

Since submitting the Initial DSIP, Con Edison has worked to increase energy storage on its system and facilitate market growth. For example, the Company has four demonstration projects underway to better understand the value energy storage can provide in different applications and under different business models. Modifications to the Company's tariffs and programs are introducing new opportunities for energy storage and storage is becoming well-represented in NWS portfolios. In addition, while challenges remain, developers can now more efficiently install and interconnect lithium-ion devices in New York City through the creation of a more standardized and transparent interconnection process for outdoor devices.

Demonstration Projects

Con Edison has several energy storage demonstration projects underway. The following REV demonstration projects have energy storage elements: (1) Commercial Battery Storage; (2) Storage On Demand; (3) VPP; and (4) SHR. Additionally, the V2G electric school bus pilot will leverage the EV battery for grid services. An R&D project is also underway that focuses on developing energy storage as a transportable system resource. Table 7 summarizes the Company's current energy storage REV demonstration projects.

Table 7: Current Con Edison Energy Storage REV Demonstration Projects

Project/Program Name	How the Project Includes Energy Storage	Battery Rating (MW/MWh)	Project Status
REV Demo: Commercial Battery Storage	Con Edison will contract with third-party-owned customer-sited, front-of-the-meter batteries to meet distribution system needs and participate in wholesale markets.	4 MW/4 MWh	Scheduled commercial operation date ("COD") in Q1-2019.
REV Demo: Storage On Demand	Con Edison will deploy mobile batteries to provide support for peak shaving, low-voltage scenarios and temporary load needs in addition to testing wholesale market participation.	1.5 MW/4 MWh	Scheduled COD in Q2-2019.
REV Demo: SHR – Track 2	Track 2 of the SHR demonstration project pairs solar plus storage with dynamic, time-varying rates to influence behavior. Con Edison will offer solar customers opting into a smart-home rate a free battery system to better manage their production and use of electricity.	7 kW/14 kWh (per participating household)	In planning phase.
REV Demo: VPP	Con Edison will install aggregated fleets of solar plus storage assets to test the capability of a VPP to provide back-up power for customers, grid support, and to be aggregated and dispatched to earn revenues in wholesale markets.	7 kW/19.4 kWh (per participating household)	Previously on-hold due to permitting issues. Planning has resumed.

New Opportunities for Third-Party Energy Storage

Con Edison has introduced new opportunities for energy storage to participate in the Company's tariffs, procurements, and programs. For example, Con Edison revised its tariffs to expand the circumstances under which energy storage systems can export power onto the distribution system.[83] New tariffs provide eligible energy storage technologies with

[83] Case 17-E-0104, *Tariff Filing by Consolidated Edison Company of New York, Inc. to Revise P.S.C. No. 10 - Electricity, General Rule 8.3 - Generating Facilities Used on an Emergency Basis for Export, to Permit the Export of Electricity Discharged by Battery Storage Systems during Demand-response Events under the Brooklyn/Queens Demand Management Program,* Order Approving Subject to Modifications Tariff Amendment For Battery Discharge In Brooklyn/Queens Demand Management Program and Making Other Findings (issued May 18, 2017). Case 17-E-0458, *Tariff Filing by Consolidated Edison Company of New York, Inc. to Modify Its Electric Tariff Schedule, P.S.C. No. 10, Regarding Energy Storage Systems*, Order Approving Tariff Changes with Modification (issued February 22, 2018).

a simplified approach for interconnecting to the distribution system and receiving compensation for energy exports. Previously, energy storage technologies had been eligible for exporting onto the Company's primary distribution system, but not the secondary distribution system. Recent evolution in technologies such as smart inverters can help manage the output of energy storage devices, and the Company intends to make full use of such technologies by allowing them to export to the secondary distribution system. This will increase opportunities for customers to deploy and utilize energy storage devices, while providing benefit to the distribution system.

NWS solicitations also encourage storage resources. Section 2.14 notes that recent solicitations have invited innovative solutions, including advanced technologies such as energy storage, advanced controls, and DG. The Company has received additional vendor proposals for potential storage solutions as part of its NWS solicitations and is evaluating these accordingly.

Energy storage has ample opportunity to participate in the DMP, which offers incentives for technologies that help improve operational performance of buildings and reduce electric demand during system peaks. The DMP seeks service territory-wide system peak reduction with an emphasis on advanced technology. With significant incentives, the DMP has received applications for nearly 20 MW of peak demand reduction for 2017-2019, including several energy storage applications featuring a range of battery technologies. The Company has extended incentive offer letters to over 12.2 MW of energy storage projects. Four battery projects totaling 327 kW of demand reduction are operational under the 2017 DMP. Two battery projects, totaling 915 kW, have received Letters of No Objection from authorities as part of the 2018 DMP and the Company expects them to be operational by the end of the year.

The DMP has been successful in providing support to the nascent market for energy storage, but it has also experienced some obstacles. For example, some projects have applied but are unable to proceed, primarily due to challenges with timelines and the permitting process. The Company will seek to build on the experiences of this program to encourage and support the development of energy storage resources where and when these resources provide the most value.

The Company has continued to engage market participants through partnerships. At the time of the Company's Initial DSIP filing, the Company was actively evaluating responses to its RFI to test innovative business models for energy storage. This RFI sought partners to work with the Company on new methods for integrating energy storage with the existing power systems to optimize the assets' unique benefits across the electric system, customers, and wholesale markets. Through the RFI process, Con Edison identified applications and business models for the deployment of energy storage, leading to the Company engaging market partners in the development and implementation of two REV demonstration projects (Commercial Battery Storage and Storage On Demand).

BQDM BATTERY STORAGE

The BQDM project includes a 2 MW/12 MWh utility-owned battery in the Richmond Hill 4 kV network on land owned by Con Edison.

The battery system will begin commissioning in July and be fully operational in August. Initially, the battery will be controlled onsite, and then transition to remote control through the Company's SCADA system when the control center operators take over in September following personnel training.

Reducing Technical Barriers to Energy Storage

While energy storage devices are proliferating around the country, they lack an extensive operational track record for large-scale commercial deployment in conjunction with electric distribution systems. Con Edison is actively working with stakeholders to address technical and experiential barriers to increased energy storage deployment. For example, Con Edison has continued to work with stakeholders to advance the technical feasibility of deploying energy storage. The

Company's actions include working with municipalities to mitigate permitting concerns regarding energy storage devices in and around buildings and actively participating in stakeholder forums, particularly the New York Battery and Energy Storage Technology Consortium ("NY-BEST"). Con Edison has worked closely with New York City and other municipalities in its service territory to define rules for battery installations that balance safety with the expectations of future battery growth. For example, the Company is working with the NYC DOB and the FDNY to establish a standardized testing and permitting process for lithium-ion energy storage in outdoor installations.

Future Implementation and Planning

Summary of Future Actions

- Continue to support State energy goals and provide input to the DPS and NYSERDA Energy Storage Roadmap, including providing comments on the draft.
- Continue collaboration with stakeholders to increase the efficiency and transparency of required processes to build and interconnect energy storage resources.
- Advance demonstration projects and gather lessons learned to reduce operational and market barriers and develop additional opportunities for energy storage.
- Participate in a working group comprised of Joint Utilities, NYISO, DPS, and NYSERDA representatives to address tasks as part of the Market Design and Integration Report.

Con Edison will continue to support and meet the State's energy goals through a portfolio of solutions and approaches that will leverage energy storage across multiple potential use cases. This will include evaluating the potential to deploy energy storage at scale on utility property to directly serve the distribution grid, such as at substations with capacity constraints, and more readily provide services to the bulk power system. This will also include coordinating with NYISO to leverage storage as a bulk system asset. To help create a streamlined and transparent process for developing energy storage resources, the Company will continue its participation as part of the Joint Utilities, the ITWG, and other industry forums and collaborations across the State. In addition, Con Edison will continue its demonstration projects to test different operational and business models that can promote expanded opportunities for energy storage. The Company feeds the lessons learned from its demonstration projects, as well as from BQDM and DMP, back to industry stakeholders to open up market opportunities for storage.

Risks and Mitigation

Risks that could affect timely implementation of higher levels of energy storage include permitting, difficulties for energy storage to capture multiple value streams, and a protracted process to adjust incentive mechanisms. Additionally, as is common with new technologies and when testing new business arrangements, processes around permitting, contracting, and negotiation can be complex and time-consuming. Con Edison will continue to undertake actions to mitigate these risks. The Company will continue its work with municipal authorities and other stakeholders to help streamline and make more transparent the processes for permitting, building, and interconnecting energy storage. The Company's demonstration projects, including the Storage On Demand and the VPP, will identify mechanisms for energy storage to provide "stacked value" and will result in lessons learned that can streamline future contracting arrangements.

Additionally, the Federal Energy Regulatory Commission ("FERC") issued Order 841, which requires each Regional Transmission Operator and Independent System Operator to remove barriers to participation of energy storage across all capacity, energy, and ancillary service markets.[84] The updated tariff NYISO submits to FERC within 270 days of Order 841's issuance will significantly impact the ability for energy storage to capture multiple wholesale value streams. Separately, the Joint Utilities continue to coordinate with NYISO to develop a framework for dual participation between wholesale markets and provision of distribution services. The timing and details of this framework will similarly impact the ability for energy storage to capture multiple value streams.

Stakeholder Interface

Con Edison consistently engages stakeholders, including developers, through the Joint Utilities stakeholder engagement groups, the ITWG, and other industry forums and collaborations across the State. The Company intends to continue engaging stakeholders through these means as it progresses DSIP implementation.

In addition to incorporating stakeholder feedback into many aspects of this DSIP filing, the Company will continue to leverage this input into ongoing engagement efforts with relevant parties to advance opportunities for energy storage. For example, to enhance customer and developer understanding of the interconnection process for energy storage, Con Edison supported the City University of New York, in collaboration with the NYC DOB and the FDNY, in the development of their process guide for permitting and interconnecting lithium-ion outdoor systems in New York City. [85] This guide provides clarity on the requirements, processes, and responsibilities for obtaining approval to install lithium-ion energy storage devices. Separately, to increase developer understanding of opportunities for energy storage on Con Edison's system, the Company has provided actionable information to NY-BEST, which often invites Con Edison to present on storage topics and has Con Edison representation on its Board of Directors. Additionally, Con Edison has participated with the Joint Utilities in ITWG efforts to propose and draft new SIR technical requirements for energy storage to help create a consistent and effective process for the interconnection of energy storage devices.

Additional Detail

This section responds to the questions specific to energy storage.

1) **Provide the locations, types, capacities (power and energy), configurations (i.e., standalone or co-located with load and/or generation), and functions of existing energy storage resources in the distribution system.**

As of July 1, 2018, the Company's distribution system has interconnected 33 BTM energy storage resources. Table 8 provides information on storage resources currently interconnected.[86] The Company believes demand reduction is the primary function of most of these resources.

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[84] FERC Docket Nos. RM16-23-000 and AD16-20-000, Order 841, *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators* (issued February 15, 2018), p. 1.

[85] New York City Department of Buildings and Fire Department of New York, *Energy Storage System Permitting and Interconnection Process Guide for New York City Lithium-Ion Outdoor Systems, April 2018.* https://www.nyserda.ny.gov/-/media/Files/Programs/Energy-Storage/lithium-ion-energy-storage-systems-permitting-process-guide.pdf

[86] The table above does not include installations that are not yet operational.

Table 8: BTM Energy Storage Resources as of July 1, 2018

Year Installed	Network Level Location	Total kW	Total kWh	Battery Chemistry	Co-location
2012	Park Place	200	400	Lead Acid	Standalone
2012	West Bronx	70	144	Lead Acid	PV + Battery
2012	Long Island City	50	150	Lithium-ion	PV + Battery
2013	Bay Ridge	100	200	Lead Acid	PV + Battery
2014	Harlem	100	200	Zinc-Manganese	Standalone
2014	Flushing	50	150	Lithium-ion	Standalone
2014	Granite Hill	27	64	Lithium-ion	Standalone
2015	Hudson	300	288	Lithium-ion	Standalone
2015	Kips Bay	100	400	Lead Acid	Standalone
2015	Grasslands	4	12	Lead Acid	PV + Battery
2016	Fulton	100	400	Lead Acid	Standalone
2016	Yorkville	100	400	Lead Acid	Standalone
2016	Yorkville	100	400	Lead Acid	Standalone
2016	Pennsylvania	100	400	Lead Acid	Standalone
2016	Southeast Bronx	4	12	Lead Acid	PV + Battery
2017	Crown Heights	300	1,200	Lithium-ion	PV + Battery
2017	Lincoln Square	125	300	Lead Acid	Standalone
2017	Lenox Hill	125	300	Lead Acid	Standalone
2017	Midtown West	125	300	Lead Acid	Standalone
2017	Ossining West	20	54	Lithium-ion	Standalone
2017	Granite Hill	15	30	Lithium-ion	PV + Battery
2017	Washington Street	15	30	Lithium-ion	Standalone
2017	Buchanan	10	27	Lithium-ion	PV + Battery
2017	Millwood West	10	27	Lithium-ion	PV + Battery

2017	Flushing	9	20	Lead Acid	PV + Battery
2017	Granite Hill	3	6	Lithium-ion	PV + Battery
2017	Ossining West	3	6	Lithium-ion	PV + Battery
2018	Sutton	100	400	Lead Acid	Standalone
2018	Harrison	36	72	Lithium-ion	Standalone
2018	White Plains	10	27	Lithium-ion	Standalone
2018	Buchanan	6	13.5	Lithium-ion	PV + Battery
2018	Granite Hill	5	13.5	Lithium-ion	Standalone
2018	Washington Street	10	27	Lithium-ion	Standalone

2) Describe the utility's current efforts to plan, implement, and operate beneficial energy storage applications. Information provided should include:

a. a detailed description of each project, existing and planned, with an explanation of how the project fits into the utility's long range energy storage plans;

Con Edison has several projects underway to plan, implement, and operate energy storage applications, including demonstration projects. The Company has designed its portfolio of demonstration projects to test different use cases and business models and assess how it can best leverage storage to meet distribution and bulk system and customer needs. These projects will help inform the Company's long-term energy storage plan by providing real-world experience with energy storage technologies and data on the costs and benefits.

Commercial Battery Storage Demonstration Project

Con Edison and its project partner will install batteries totaling 4 MW/4 MWh (4 individual 1 MW/1 MWh installations) in front of the meter at 4 customer sites. The project partner will own the assets and be responsible for customer acquisition, engineering, construction, operations and system maintenance. Con Edison has the right of first dispatch for the systems and is seeking locations within constrained areas of the distribution system to provide grid benefit, including peak shaving and voltage support. When Con Edison does not require the systems for grid needs, the project partner will bid in the resources into NYISO markets and share market revenues with Con Edison. The project will compensate site host customers in the form of a lease payment for use of their property. DPS Staff approved the project and site selection and permitting is underway. The FDNY and NYC DOB issues Letters of No Objection for the first two sites.

Storage On Demand Demonstration Project

Storage On Demand consists of 3 Con Edison-owned mobile 500 kW/1.34 MWh lithium-ion battery trailers for a total project size of 1.5 MW/4 MWh. Con Edison has designed each trailer for both standalone operation as well as operation as a cohesive system. Con Edison will site the trailers to support summer peak needs, low-voltage pockets, or temporary construction demands. These resources will be able to bid into NYISO markets from their docked home at the Astoria Gas Turbine site whenever the assets are not utilized by Con Edison. DPS Staff approved the project, and design and permitting activities began in Q3-2017.

VPP Demonstration Project

The VPP demonstration project seeks to demonstrate how aggregated fleets of residential solar plus storage assets can collectively provide resiliency services to customers and value to the distribution system, as well as participate in wholesale electricity markets. The VPP will act as a controllable power generation source that can be optimized to provide value as markets evolve. The pilot will explore the value that residential customers place on resiliency and will test the feasibility of value stacking. Con Edison placed the project on hold in early 2017 due to permitting challenges, but is now proceeding.

SHR Demonstration Project

As described above, within the SHR demonstration project, Con Edison will test the impacts of a granular time-varying rate for customers with installed solar PV and a battery. These customers will receive a price-responsive battery for optimization with the more advanced rate.

TESS Research and Development Project

Con Edison is working with a technology partner to develop and demonstrate a TESS within Con Edison's service territory. The system will comprise a TESS made up of lithium-ion batteries, a PCS unit including transformers and manual disconnect switches, and an integrated thermal management system that will serve both the TESS and PCS units. In this project, the Company seeks to evaluate the TESS to support pre-planned non-emergency situations, as well as to support emergency and contingency applications on the distribution system. If demonstrated to be a success, the trailer mounted system would potentially take the place of mobile diesel systems. While not in use, the battery will be dispatched to provide services to the wholesale market through interconnection with the power system at Con Edison's Astoria facility.

The proposed TESS will provide 800 kWh of energy and 500 kW of capacity. The TESS will be situated within a custom mobile trailer with an estimated dimension of 40-foot trailer length and 12-foot-6-inch trailer height and will be NYC DOT-compliant. The Company will initially demonstrate the TESS at the Astoria site. Con Edison met with FDNY in July to discuss the planned delivery and installation later this year.

b. the original project schedule;

Table 9 summarizes the original project schedule and current project status of the storage projects described above, including expected COD.

Table 9: Original Schedules and Current Status of Storage Projects

Project	Original Project Schedule	Current Project Status	Next Steps
Commercial Battery Storage	Planned installation in April 2018.	Sites identified, contracting underway, and permits submitted. Two of four permits received in Q2-2018, with expected COD of Q1-2019.	Refer to Con Edison's REV Demonstration Project: Commercial Battery Storage Q2-2018 Quarterly Progress Report, dated July 26, 2018.
Storage On Demand	Scheduled COD in early 2019.	Contracting underway and permits submitted. Expected COD of Q2-2019.	Refer to Con Edison's REV Demonstration Project: Storage On Demand Q2-2018 Quarterly Progress Report, dated July 26, 2018.
VPP	Commissioning was originally scheduled to be complete in 2016, however permitting challenges arose. The Company subsequently placed the project on hold in 2017.	Planning has recently resumed, and the contracting process is underway.	Currently developing an implementation plan that will include the project schedule and requirements. In parallel, contracting is underway with two project partners.
SHR Demonstration Project	Project expected to go live in April 2019.	Contracting underway. Project schedule remains intact.	Customer recruitment will begin in Q3-2018.
TESS Research & Development Project	The FDNY issued a Letter of No Objection for this project in 2015. Planned installation in October 2018.	TESS is currently under construction. Recent correspondences with FDNY indicates that the FDNY may impose additional requirements.	Due to the recently issued Energy Storage System Permitting and Interconnection Process Guidance For New York City Lithium-Ion Outdoor Systems, the team is reviewing with the FDNY current requirements to move the project forward.

c. the current project status;

See response to 2b above.

d. lessons learned to-date;

The Company's energy storage demonstration projects are in planning phases or under construction, making it premature to cite definitive lessons learned. One early observation is that obtaining the necessary permits from municipal authorities requires significant time and effort, which should not be underestimated. The permitting process will require additional stakeholder focus to support a robust market for energy storage. The Company will continue its efforts to collaborate with stakeholders to streamline the permitting process and increase transparency into the process for its customers.

e. project adjustments and improvement opportunities identified to-date; and,

The Company expects ongoing streamlining in permitting processes and definitive market participation rules to facilitate future improvement opportunities.

f. next steps with clear timelines and deliverables.

See response to 2b above.

3) Provide a five-year forecast of energy storage locations, types, capacities, configurations, and functions.

Appendix A presents Con Edison's system-level forecast, which includes a five-year outlook for energy storage. As the market for energy storage evolves and yields increasingly robust data, the Company will seek to make further refinements to its forecasts.

4) Identify, describe, and prioritize the current and future opportunities for beneficial use of energy storage located in the distribution system. Uses considered should encompass functions which benefit utility customers, the distribution system, and/or the bulk power system. Each opportunity identified should be characterized by:

a. its location;
b. the energy storage capacity (power and energy) provided;
c. the function(s) performed;
d. the period(s) of time when the function(s) would be performed; and,
e. the nature and economic value of each benefit derived from the energy storage resource.

The Company supports and will pursue the State's energy storage goals through a portfolio of solutions and approaches. Current and future opportunities will represent a diversity of locations, sizes, functions, and business models. For example, utility-sited storage and customer-sited front-of-the-meter storage with utility control can help with load relief, reliability, and resiliency. Similarly, storage at the bulk power level can support the integration of intermittent generation and help NYISO fulfill future needs for capacity and other bulk power services. Separately, customer-sited BTM storage can help customers manage their load to reduce costs (i.e., peak shaving), be more resilient to power outages and interruptions, and support grid needs when sent the appropriate signals, such as when an NWS activates an event. Table 10 outlines potential energy storage use cases that provide value across the customer, transmission and distribution, and bulk power grid domains.

Table 10: Potential Energy Storage Use Cases

Customer Value	Locational Value	Ancillary Services
Demand charge reduction Increase PV self-consumption TOU bill management Resilience / outage management	Reliability Resilience Voltage support Peak shaving Transmission and distribution deferral Renewables integration	Energy arbitrage Resource adequacy Frequency regulation

The Company is exploring adding energy storage resources where and how they can best benefit the system and customers, including coordinating with NYISO to leverage storage as a bulk system asset. Several demonstration projects are underway to test different operational and business models. Additionally, the Company is evaluating the potential to deploy energy storage at scale on utility property to serve the distribution grid, such as at substations with capacity constraints, and more readily provide services to the bulk power system.

As it continues efforts to implement the DPS and NYSERDA Energy Storage Roadmap and gains more experience with storage through demonstration projects and early customer adoption, the Company will be able to better identify and prioritize future opportunities and pathways for meeting the State's goal.

5) **Identify and describe all significant resources and functions that the utility and stakeholders use for planning, implementing, monitoring, and managing energy storage at multiple levels in the distribution system.**
   a. **Explain how each of those resources and functions supports the utility's needs.**
   b. **Explain how each of those resources and functions supports the stakeholders' needs.**

Given the infancy of the storage market in Con Edison's service territory and the limited installations to date, as well as permitting issues, the Company is still identifying what resources and functions it may need in the future for planning, monitoring, and managing energy storage. For example, a GIS system will serve as the system of record for the specific location and operating characteristics of grid-connected assets and be the software platform for enhanced data visualization and other advanced applications. A GIS will also allow for more accurate distribution circuit models for planning and operations and more sophisticated hosting capacity capabilities, among other uses. Additionally, Con Edison expects the DERMS to provide M&C capabilities for utility-sited and controlled devices to provide benefit to the distribution and bulk power systems. Con Edison plans on using its demonstration projects to test options for monitoring and communicating with storage assets and provide a test case for integrating storage within the DERMS environment. Additionally, NYISO pilots in the Company's service territory, which Con Edison is actively engaged in, will also help test monitoring, coordination, and communication of aggregated storage resources.

Separately, the Company expects ADMS to provide enhanced capabilities to monitor and manage the distribution system, including energy storage devices, while AMI will provide customers with information needed to monitor and manage energy use and help determine the value of adopting energy storage devices.

The Company plans to provide more detail on the necessary resources and functions and how they support utility and stakeholder needs in the next DSIP.

6) Describe the means and methods for determining the real-time status, behavior, and effect of energy storage resources in the distribution system. Information produced by those means and methods should include:

a. the amount of energy currently stored (state of charge);
b. the time, size, duration, energy source (grid and/or local generation), and purpose for each charging event;
c. the time, size, duration, consumer (grid and/or local load), and purpose of each energy storage discharge;
d. the net effect (amount and duration of supply or demand) on the distribution system of each charge/discharge event (considering any co-located load and/or generation); and,
e. the capacity of the distribution system to deliver or receive power at a given location and time.

See response to 5) above.

7) Describe the means and methods for forecasting the status, behavior, and effect of energy storage resources in the distribution system at future times. Forecasts produced by the utility should include:

a. the amount of energy stored (state of charge);
b. the time, size, duration, energy source (grid and/or local generation), and purpose of charging events;
c. the time, size, duration, consumer (grid and/or local load), and purpose of energy storage discharges; and,
d. the net effect on the distribution system of each charge/discharge event (considering any co-located load and/or generation); and,
e. the capacity of the distribution system to deliver or receive power at a given location and time.

As Appendix A highlights, energy storage is a separate line item in the DG forecast. Energy storage penetration and growth information is derived from the Company's interconnection queue, which provides a near-term view of proposed and under-construction projects. For the 2017 forecast, the Company reviewed existing and queued energy storage projects. Given the early development of energy storage technology in the service territory, the Company used conservative assumptions on energy storage growth. The 2018 forecast, prepared following the summer 2018 peak season, will update growth assumptions based on the outcomes of the Energy Storage Roadmap initiative. The Company is evolving toward a probabilistic approach that incorporates historical growth rates of DER technologies with similar characteristics, such as space requirements. In the future, as more actual energy storage installation data and clearer guidance on the policies surrounding energy storage becomes available, the Company plans to revise and refine its forecasting model for energy storage projects.

Energy storage systems are a flexible resource in terms of the value they can provide. For example, a 10 MW, 4-hour (or 40 MWh) battery can discharge in several ways–10 MW discharged for 4 hours, 5 MW discharged for 8 hours, or different levels of discharge for varying durations. Battery systems could also target a use case that provides more consistent output of intermittent renewable sources or flattening the peaks of load curves of customers with highly variable loads. These systems are most predictable when they discharge in a manner set by program rules (e.g., the Company's DMP specifies the battery must discharge from 2:00 p.m. to 6:00 p.m.). For planning purposes, the Company will view the demand reduction from the battery as the amount of discharge it can provide over four hours, in line with the network peak load. Thus, a 500 kW reduction from peak would be a 2 MWh battery discharged over 4 hours. The

Company understands that a battery system could discharge in a variety of ways and if an incentive mechanism (e.g., DR or program rules) caused the battery discharge pattern to vary from this standard, then the Company could adjust the amount of reduction the forecast includes.

The Company recognizes that several factors require further study, including storage use and charging methods. In general, an energy storage resource serves as a load to the utility when it charges from the grid and serves as a resource to the utility when it discharges.

Storage use, and its impact on peak load, varies by intended purpose (e.g., customer-peak shaving, DR, direct utility-control) and size of resource. Customer-peak shaving depends on the time of the customer's peak and may not be coincident with the utility or NYISO peak. Additionally, resources targeting customer-specific energy needs may have obligations that cause them to be unavailable at certain times.

Detailing storage operational requirements within contracts allows the Company to measure and influence or control a range of storage use cases. For example, the DMP and REV demonstration projects (e.g., VPP and recently issued RFP for energy storage) support a higher level of utility visibility and impact to peak demand. BQDM also provides an opportunity for the Company to control an energy storage unit as part of a larger suite of demand management ("DM") projects. Similar RFPs would guarantee coincidence with the Company's greatest need. Depending on storage capacity, technology, and project economics, utility-owned energy storage projects may also be capable of bidding into NYISO DR and/or ancillary services markets (and other market products as NYISO evolves its market rules). The Company expects data from these programs to contribute to peak load and energy use impact studies in the coming years.

8) Identify the types of customer and system data that are necessary for planning, implementing, and managing energy storage and describe how the utility provides those data to developers and other stakeholders.

The business model for the storage resource will influence which types of customer and system data the storage operator needs for planning, implementing, and managing targeted use cases. For example, Con Edison uses information from the distribution planning process to identify locations experiencing or expecting to experience constraints that storage (or other technologies) may be able to mitigate and shares this information with third parties through NWS postings and solicitations and identification of LSRV areas.

For developers marketing BTM storage to customers, the customer's energy demand and consumption data is typically necessary. This data is available through Con Edison via GBC and Electronic Data Interchange ("EDI"). Developers can also work with customers to obtain data directly – i.e., customers can use the Green Button Download My Data tool available in My Account and share the resulting file (available in both xml and csv formats) with the developer.

9) By citing specific objectives, means, and methods describe in detail how the utility's accomplishments and plans are aligned with the objectives established in New York State's recently signed Energy Storage Deployment legislation and Governor Cuomo's new initiative to deploy 1,500 megawatts of energy storage in New York State by 2025.

The Company has aligned its efforts with the State's energy storage goals and enabled the growth of energy storage in several ways. For example, by integrating NWS into the planning process, the Company is routinely looking for opportunities to defer traditional investment through DER. Recent NWS solicitations have encouraged advanced technologies, including storage. The BQDM project includes batteries, including a 0.3 MW/1.2 MWh battery at the Marcus Garvey Apartments and a 2 MW/12 MWh utility-owned battery. The Company expects energy storage to be a core component of NWS portfolios going forward.

Additionally, as described above, Con Edison has actively sought and introduced new opportunities for energy storage to participate in the Company's tariffs and programs. For example, Con Edison filed revised tariffs to expand the circumstances under which energy storage systems can export power onto the distribution system. Energy storage also has ample opportunity to participate in the DMP, which offers incentives for energy efficient technologies to help improve operational performance of buildings and reduce electric demand during system peaks.

Con Edison has continued to work with stakeholders to advance the technical feasibility of deploying energy storage. The Company has worked with municipalities to mitigate permitting concerns regarding energy storage devices in and around buildings, and continues to actively participate in stakeholder forums, particularly those with NY-BEST. The Company is also complying with new requirements in the SIR designed to facilitate the interconnection of storage assets.

Finally, the Company is actively participating in implementing the DPS and NYSERDA energy storage roadmap and will provide comments on the roadmap.

10) Explain how the Joint Utilities are coordinating the individual utility energy storage projects to ensure diversity of both the energy storage applications implemented and the technologies/methods employed in those applications.

The Joint Utilities established an internal working group to coordinate and share insights on each utility's energy storage deployment efforts, including implementation barriers encountered. These coordination efforts have focused on permitting considerations, the technologies being deployed, and the applications that energy storage will serve in each case. The Joint Utilities have benchmarked the types of use cases and ownership models of each energy storage project to promote a diversity of approaches across the State. The Joint Utilities will continue this coordination effort to facilitate further progress in energy storage deployments.

2.5. EV INTEGRATION

Context and Background

The EV market in New York, while still in its infancy, is poised for rapid expansion. With almost 8,000 EVs now registered in the Con Edison service territory, the uptake in sales signals continued momentum in transportation electrification. The State's EV policies, which generally derive from the 2015 State Energy Plan, support this growth. [87] The plan commits the State to reduce GHG emissions 40 percent by 2030 and 80 percent by 2050. Transportation accounts for nearly 35 percent of New York's GHG emissions, and the State Energy Plan highlights EVs as a key element of the overarching strategy to reduce GHG emissions.

One of the central elements of the State Energy Plan is the Charge NY initiative, which the Governor launched in 2013 with the mission of creating a statewide network of up to 3,000 public and workplace charging stations and putting up to 40,000 plug-in vehicles on the road over 5 years.[88] The initiative also developed best practices for municipal EVSE regulations, provided for vehicle incentives such as reduced bridge tolls, and removed regulatory obstacles for installing EVSE at public parking lots. Charge NY is led by a collaboration of NYSERDA, the New York Power Authority ("NYPA"), and the Department of Environmental Conservation ("DEC"). These agencies are also tasked with implementing the Multi-State ZEV Action Plan, of which New York is one of eight signatories.[89] The Multi-State ZEV Action Plan established a collective goal of 3.3 million ZEVs by 2025; for New York, this is equivalent to about 800,000 to 900,000 ZEVs on the road by 2025. Additionally, the Northeast States for Coordinated Air Use Management, a nonprofit association of air quality agencies in eight northeast states, issued an update to the Multi-State ZEV Action Plan in June 2018, which addresses priorities for action through 2021.[90] Further, because New York is a ZEV signatory, automakers are required and incentivized to sell EVs in the State. The State also offers an instant rebate of up to $2,000 per vehicle. Cumulatively, these actions have fostered a significant increase in new EV adoption. New York EV sales increased 30 percent over the April 2017 to April 2018 time period and nearly 50 percent since January 1, 2015.[91]

Con Edison and the Joint Utilities continue to support the State's EV goals and prepare for more EVs on the road. The Joint Utilities are working together to promote EV market growth, with a focus on EV readiness. The objectives of EV readiness planning are to identify, prioritize, and execute actions in the near- to mid-term in order to unlock the potential benefits of transportation electrification and overcome hurdles to widespread deployment of EV infrastructure (and vehicles, where appropriate). The Joint Utilities, with input from stakeholders, developed an EV Readiness Framework that reflects a more proactive stance by utilities in the EV market.[92] As the Framework discusses, the Joint Utilities are advancing EV demonstration and pilot projects and programs and are continuing to work with regional groups, associations, and governments to advance EV initiatives and infrastructure awareness. Prior to posting the Framework on the Joint Utilities website in March 2018, the Joint Utilities circulated a draft with stakeholders in January 2018 and hosted a stakeholder session in February 2018 to focus on aspects of the draft Framework and provide an opportunity for stakeholders to ask questions and offer additional input on the document.

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[87] https://energyplan.ny.gov/

[88] https://www.governor.ny.gov/news/governor-cuomo-announces-installation-hundreds-electric-vehicle-charging-stations

[89] ZEVs include pure battery-EVs ("BEVs"), plug-in hybrid EVs ("PHEVs"), and hydrogen fuel cell EVs ("FCEVs"). If longer range battery EVs become more popular, then the estimated number of ZEVs required to meet the target could be reduced substantially.

[90] *Multi-state ZEV Action Plan: Accelerating the Adoption of Zero Emission Vehicles, 2018-2021*. http://www.nescaum.org/documents/2018-zev-action-plan.pdf

[91] https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/

[92] http://jointutilitiesofny.org/resources/

The Framework addresses near-term priorities resulting from stakeholder engagement sessions, with a focus on:

- Planning EV charging infrastructure and forecasting EV growth to assess and mitigate potential system impacts.
- Streamlining charging infrastructure deployment in New York, including service connection requirements, local ordinances, building codes and design guidelines, and interoperability and standardization.
- Advancing rate design considerations that will improve the customer experience while minimizing impacts to utility system operation.
- Conducting education and outreach efforts that improve customer awareness about the benefits of EVs.

The Framework also discusses hurdles to EV adoption including, but not limited to, the higher price of EVs compared to conventional vehicles, lack of public EV charging infrastructure, lack of consumer awareness of EV benefits, and lack of coordination among diverse stakeholders.

The utilities will continue to use the Framework to identify useful indicators for assessing market performance and update internal assessments related to determining the thresholds at which EVs may create more significant distribution system impacts or benefits. Concurrently, the Joint Utilities will need to address system conditions unique to the geography of their respective service territories. For example, Con Edison's underground urban and networked distribution system may precipitate higher system reinforcement and interconnection costs and the siting of EV chargers close to distribution loads at buildings to minimize the cost of trenching and extending power to new charging locations. While the Joint Utilities have developed a common framework, the market indicators, program implementation plans, and timelines individual utilities develop will vary due to utility-specific factors.

To foster continued EV readiness, in April 2018, the Commission instituted a statewide EV proceeding to "consider the role of utilities in providing infrastructure and rate design to accommodate the needs and electricity demand" of EVs and EVSE.[93] This proceeding will explore regulatory strategies for removing obstacles to adoption, including:

- Cost-effective ways to build infrastructure and equipment.
- Whether tariff changes are needed to accommodate and promote EV deployment.
- Characteristics of EV charging systems.
- How these charging stations may facilitate EV participation as a DER in manners not captured by REV.
- Immediate and long-term actions to support EV market growth, including system planning for EV readiness.[94]

The Commission ordered that the proceeding include a technical conference to be followed by the issuance of a Staff whitepaper with the opportunity for stakeholder comment.[95] The Company participated in the technical conference and will be engaged in the proceeding as it progresses. Because the proceeding is ongoing and may result in regulatory changes that affect the Company's plans, Con Edison may update or augment the information in this DSIP in subsequent regulatory filings or as part of the next DSIP.

[93] EVSE Proceeding, Instituting Order (issued April 24, 2018), p. 3.
[94] *Id.*
[95] *Id.,* pp. 4-5.

Implementation Plan, Schedule, and Investments

Current Progress

Summary of Achievements

- Developed an EV Readiness Framework with the Joint Utilities addressing near-term priorities resulting from stakeholder engagement sessions.
- Implemented a multi-faceted approach to promoting and preparing for increased EV adoption, including off-peak charging incentives and rate design, facilitating charging infrastructure deployment, and fleet initiatives.

Con Edison is proactively promoting and preparing for increased EV adoption and has demonstration projects and programs in various stages of implementation to test market enablement strategies and promote EV readiness. The initiatives generally fall into three areas: (1) off-peak charging incentives and rate design, (2) facilitation of charging infrastructure deployment, and (3) fleet initiatives. Additionally, Con Edison is a channel partner for vehicle and EVSE manufacturers, including providing customers access to promotional rebates and offering Level 2 home charger units through the Company's Marketplace demonstration project.

By testing a range of EV enablement activities, the Company can assess where it can make the largest impact on market growth and create the most benefits. The Company categorizes charging into the following market segments:

- Home charging
- Workplace charging
- Public charging (including public quick charging)
- Multi-unit dwelling charging
- Transit bus charging
- School bus charging
- Medium-duty fleet charging

Off-Peak Charging Incentives and Rate Design

Con Edison offers programs and rates to incentivize off-peak charging.

<u>SmartCharge NY</u>

Con Edison's SmartCharge NY program offers incentives to eligible EV drivers for charging in Con Edison's service territory at off-peak times, including a $150 upfront incentive for installing and activating a free connected car device from FleetCarma that plugs into the vehicle's diagnostic connector and allows users (and the Company) to know where, when, and how much energy an EV consumes during charge events.[96] Single-owner fleet customers have the option of using data from smart chargers to verify charging behavior. The SmartCharge NY program will help Con Edison understand charging behavior and EV driver response to incentives. Con Edison piloted the first iteration of the smart device within its workplace charging program, which is described below. As of July 1, 2018, over 1,300 EVs were enrolled in the program, evenly split between privately-owned EVs and NYC fleet vehicles.

Participating customers have the opportunity to earn an additional $500 annually, consisting of $5 per month for keeping the connected car device plugged in and charging in the Con Edison service territory and $0.10 per kWh for charging between midnight and 8:00 a.m. on any day in the Con Edison service territory. During the summer (i.e., June 1 to September 30), customers receive an additional $20 when they avoid charging between 2:00 p.m. and 6:00 p.m. on weekdays.

On March 1, 2018, the Company sought Commission approval to expand the eligibility criteria for the SmartCharge NY program to include medium- and heavy-duty vehicles, including buses.[97] The Commission recently has received comments on the filing.

In a related effort, Con Edison is participating in an initiative led by EPRI in coordination with EV manufacturers and utilities called the OVGIP.[98] The initiative, launched in 2012, seeks to advance the development of a secure, open platform for utilities, service providers, and EVs that will facilitate integration of EVs into DR and DSM programs and allow EVs to provide grid services, such as reliability. By relying on a centralized data cloud with open access, utilities can communicate directly with the EV and access data on vehicle energy use, charging behavior, and customer response to price signals. Con Edison recently completed a supplemental OVGIP pilot by receiving data via the platform from 14 Ford EVs currently enrolled in SmartCharge NY. The Company is in discussions with two other vehicle manufacturers to conduct additional OVGIP pilots.

TOU Rates

Public Service Law 66-o required all utilities to make a filing by April 1, 2018 establishing a residential tariff for charging EVs. The Company already had several rate options that comply with this requirement and promote off-peak charging through differentiated rates for on-peak, off-peak, super peak, and by season. For example, Special Provision E allows residential customers who own an EV to enroll in the whole house TOU rate with a one-year price guarantee that eliminates risk.[99] After 12 months, the Company will compare what was paid under TOU rates with what would have been billed under the standard residential rate. If a customer paid more on the TOU rate, the Company credits the customer's account for the difference. As of July 1, 2018, the Company has 53 EV customers enrolled in the whole house TOU rate, with additional applications pending TOU meter installation.

Special Provision F allows customers to measure EV load on a separate meter from other electric consumption for billing purposes, thus allowing for EV-specific TOU rates.[100]

[96] https://www.coned.com/smartchargenewyork. EV owners do not be Con Edison customers in order to enroll in the SmartCharge New York program.
[97] Con Edison 2016 Electric Rate Case, Proposed Expansion of the SmartCharge New York Program (filed March 1, 2018).
[98] https://www.epri.com/#/pages/product/000000003002008705/
[99] https://www.coned.com/_external/cerates/documents/elecPSC10/SCs.pdf, Tariff Leaf 395.
[100] *Id*.

Facilitating Charging Infrastructure Deployment

Con Edison continues to facilitate charging infrastructure deployment. The Company's demonstration projects and programs span many market segments, including workplace charging, public quick charging, transit bus charging, and school bus charging.

<u>Workplace Charging</u>

In addition to home charging, EV drivers want to be able to charge their vehicles at work. Workplace parking is typically limited in parts of Con Edison's service territory, but there are areas in the outer boroughs and Westchester County where workplace charging could be more readily expanded. The primary challenge in the outer boroughs is the typically large distance between the facility's utility service point of entry and the location of the facility's parking areas. The cost of trenching and extending power to the lot can be significant, which can result in business owners or property management firms deciding against the investment. The Company is working with NYSERDA on a workplace charging program that is being rolled out across the State.

Con Edison offers workplace charging to Con Edison employees on a pilot basis. As of July 1, 2018, Con Edison had installed 28 dedicated 120V outlets at 16 Con Edison facilities. The program currently serves 15 employees with EVs. All Con Edison employees who participate in the Workplace Charging program are required to enroll in SmartCharge NY. Con Edison uses the FleetCarma connected car devices to monitor charging at Company facilities.

The Company is also offering businesses the ability to monitor workplace charging as part of the SmartCharge NY program. Con Edison will offer employers who require enrollment in SmartCharge NY participation in their workplace charging program access to the FleetCarma fleet portal for the purpose of monitoring charging at their facility. Con Edison is also offering this program to multifamily buildings and companies with electric fleets.

<u>Public Charging</u>

Con Edison views public EV charging as a necessary segment for dense urban environments. Approximately 40 percent of New York City drivers do not have dedicated parking or access to workplace charging. Quick charging is particularly attractive given the limited availability to site charging stations in the Company's territory and the number of customers without access to private off-street parking. Quick charger hubs fill the role that a gas station does for fossil-fueled vehicles.

BIR

The Commission approved Con Edison's request for a new program under the Company's existing BIR program to incent publicly accessible quick charging EV stations in its service territory and address the short-term challenges with the current quick charge business model.[101] The program responded to feedback from stakeholders, including the EV industry, on the challenges facing EV quick charging station development. Specifically, with current charging station

[101] Case 17-E-0814, *Tariff Filing by Consolidated Edison Company of New York, Inc. to Modify its Electric Tariff Schedule, P.S.C. No. 10, to Expand the Scope of its Economic Development Business Incentive Rate to Include an Electric Vehicle Quick Charging Station Program*, Order Approving Tariff Amendments (issued April 24, 2018).

utilization rates, demand charges can make the economics of building EV charging stations difficult. The proposed program provides a 34 or 39 percent lower delivery service rate for these stations for a 7-year period. The new rates became available May 1, 2018.

To qualify for the EV program, the facility must: (1) be open to the public, such as supermarkets, malls and retail outlets, or train stations, (2) as a newly constructed station, have a minimum 100 kW of aggregate charging capacity with a maximum aggregate demand of 2,000 kW, and (3) receive an economic incentive from either federal, state, or local authorities. Though station economics can be challenging, as EVs use these stations for charging, their load factor improves and over time, the stations are expected to become more economic.

EV Project Partners RFI

On April 20, 2017, Con Edison released an RFI seeking pilot concepts that meet one or both of the following two requirements: (1) creates infrastructure for submarkets that have or will soon have a positive total cost of ownership ("TCO") for electric transportation, and/or (2) builds expertise in reducing EV infrastructure costs.[102] Through these concepts, the Company seeks to:

- *Increase EV penetration* - Replace internal combustion engine miles driven in Con Edison's service territory with EV passenger miles.
- *Create customer benefits* - Create cost-of-service benefits for all Con Edison customers by optimizing the utilization of the electric infrastructure.
- *Maximize third-party investments* - Maximize the impact of Con Edison's efforts by inducing the deployment of private sector capital and/or other resources (such as a commitment to utilize EVs).[103]

The Company received several proposals and is moving forward with three projects, two of which aim to add public charging infrastructure.

NYC Curbside Charging Demonstration Project

The Company plans to install 100 public and 25 city fleet Level 2 charging units at a number of locations throughout New York City's 5 boroughs, offering the first curbside chargers in New York City. Con Edison will partner with a company that has previously deployed Level 2 curbside chargers across several cities, and with the NYC DOT to secure dedicated street parking for EVs. The project will test charger utilization, installation process, hardware durability, and customer acceptance.

Quick Charging Demonstration Project

Con Edison is working with charging partners to assess the installation of quick charging stations to catalyze initial investment in infrastructure that enables more EV adoption and test various aspects of quick charging, including utilization, operations, economics, and customer acceptance. The intent is to provide valuable data on key drivers of scaling the quick charge business model and catalyze investment in infrastructure to enable more EV adoption. Con Edison will support development of DC fast chargers available for public use and in high enough concentration to minimize customer wait times. As part of the project, the Company will look at cost savings and utilization drivers in an

[102] https://www.coned.com/evrfi. p.5.
[103] *Id.*, p. 4.

effort to improve the New York area business model. From a system perspective, the best sites are lightly loaded areas of the system; however, the lowest-cost locations from a system perspective may not align with the locations best suited for maximizing utilization and reaching profitability.

Fleet Initiatives

Con Edison Transportation

Con Edison is expanding the use of alternative fuels in the fleet and phasing into its fleet plug-in electric cars, trucks, and other work vehicles. As of May 1, 2018, the Company added 23 plug-in work trucks and 45 plug-in passenger vehicles to the fleet, with additional vehicles planned for future years. For example, in 2018 the Company expects to add 30 plug-in passenger vehicles. The vehicles are reducing GHG emissions and noise disruptions as the crew is working. Con Edison has installed EV chargers at 11 facilities to serve this expanding electric fleet. Each location includes one DC fast charger and four Level 2 chargers, with capability to add four more Level 2 chargers. There are also six Level 2 chargers at the Company's corporate headquarters in Manhattan.

Additionally, the Charge-N-Go program allows employees to drive plug-in electric cars for work purposes. Any employee, with supervisor permission, can schedule the use of a plug-in car through an online reservation system.

School Bus V2G Demonstration Project

Electric school buses transport children during the school year and can serve as dedicated DER in the summer. This has particular value in Con Edison's service territory, which has high summertime electricity demand and low school bus demand during the summer. Since a school bus typically sits idle during the summer, when loads are highest, the battery can become an asset that charges in the off-peak periods and discharges to the grid at times of high load. The fleet operator can do this on simple fixed cycles or can intelligently manage it to align with times of maximum benefit. The new revenue stream captured by the fleet operator can lower the TCO; utility investment in full or partial ownership of the batteries can help further reduce upfront capital costs.

The hypothesis is that the shared use of electric school buses makes this new technology more affordable for the bus operator and the utility. This demonstration project will include a partnership among: (1) Con Edison, (2) National Express (bus operator), (3) Lion Electric (bus manufacturer), (4) First Priority Green Fleet (project lead), and (5) NYSERDA. First Priority Green Fleet, the North American dealer for Lion Electric, will be the project lead on the V2G technology, and be responsible for providing reliable, grid quality power that does not interfere with National Express' operational needs. Lion Electric is manufacturing the five buses, which will serve White Plains public schools. They will park and perform V2G services for Con Edison from National Express's Northern White Plains depot from June 15 to August 31 (buses' summer period) over 8 hours at an aggregate 75 kW (15 kW per bus).

Staff approved the proposed demonstration project and directed the Company to file an implementation plan.[104]

Electric Transit Bus Charging

Electric transit buses have significant environmental and customer benefits, including lower CO_2 emissions, reductions in PM and NO_x pollutants, and less noise for passengers and the public. Developing charging models for transit is necessary for widespread adoption of electric buses. Transit bus charging is in the developmental stages with the

[104] Note 50, *supra*.

Society of Automotive Engineers still finalizing standards for various use cases. There are two types of charging other entities have deployed: (1) in-depot overnight charging, and (2) on-route opportunity charging. Additionally, the two basic bus designs available today align with these two charging approaches. Large battery packs with high upfront capital costs typically utilize overnight charging (at 50 kW), while small battery packs with lower upfront costs rely on on-route charging. While the best solution is a function of the route lengths and energy consumption, the wide diversity of route types and distances seems to indicate that no single solution will emerge, but rather aligning technology to use cases will become the preferred solution.

The Company is implementing a pilot that seeks to optimize the approach and costs for transit bus charging in Manhattan, Brooklyn, and Queens and estimate the benefits to transit riders. The Company is working closely with the MTA on installing chargers and determining what charging model is most compatible with the MTA's EV expansion goals. Further, Con Edison is working with the MTA and the NYC DOT to estimate charging power requirements and to put charging stations on routes.

Future Implementation and Planning

Summary of Future Actions

- Shift from demonstration projects to full-scale deployment, where appropriate.
- Collaborate with the Joint Utilities on EV readiness activities, outreach and education, including sharing lessons learned.
- Actively participate in ongoing EV regulatory proceeding.

Con Edison is committed to applying the data, experiences, and lessons learned from its portfolio of EV demonstration projects and pilot programs to develop solution sets for the various segments of anticipated users of transportation electrification and provide enhanced education and outreach that increases the rate of adoption.

Additionally, the Joint Utilities agree on the importance of working together to communicate the benefits of EV adoption to customers. The Joint Utilities EV Working Group will continue advancing the commitments described in the Supplemental DSIP, including:

- Design and conduct individual utility engagement activities with local governments and municipalities.
- Continue to work with regional groups, associations, and governments to advance EV initiatives and infrastructure awareness.
- Continue to support the identification and implementation of EV demonstration and pilot projects.

Risks and Mitigation

The EV market is nascent, with EV and charging technology in the early stages of deployment. While there are positive growth indicators, there is the risk that vehicle cost and performance may not improve at the expected pace and magnitude, which could slow adoption. Various market forecasts indicate a market inflection point in the latter half of the 2020s, at which point the upfront costs of EVs will be comparable to conventional vehicles. To the extent that this inflection point is delayed, the Company's programs can provide continued cost mitigation, incentives, and support for EV adoption and EVSE infrastructure.

Similarly, rapid growth often brings significant market disruption, which could result in some of the Company's project vendors or business partners going out of business or being acquired by other firms. Con Edison mitigates the risk of partnerships by using competitive solicitations and robust procurement practices, and by conducting extensive due diligence prior to entering a relationship, and practicing robust project management and risk mitigation practices.

There is also the risk of diminishing policy support at the federal level, which could slow adoption. For example, the federal tax credit available for plug-in EVs is nearing expiration for several automakers, and is unclear whether it will be extended and/or expanded.

Stakeholder Interface

The Joint Utilities engaged stakeholders in the development of the EV Readiness Framework, including hosting stakeholder sessions in September 2017 and February 2018 to focus on aspects of the draft Framework and provide an opportunity to ask questions and offer additional input on the document, which was revised to incorporate stakeholder input. The Company will continue to engage stakeholders through the Joint Utilities' EVSE stakeholder engagement group and as part of the EV proceeding, including recent and upcoming technical conferences.

Additional Detail

This section responds to the questions specific to EV integration.

1) **Using a common framework (organization, format, semantics, definitions, etc.) developed jointly with the other utilities, identify and characterize the existing and anticipated EV charging scenarios in the utility's service territory. Each scenario identified should be characterized by:**

   a. **the type of location (home, apartment complex, store, workplace, public parking site, rest stop, etc.);**

The common framework implied in this question is a detailed EV charging infrastructure siting analysis that would be a precursor to investment or engagement at a scale larger than what has currently been contemplated publicly by any single utility in New York. Based on the Joint Utilities' review of transportation electrification filings in other states, this type of jointly conceived framework regarding existing and anticipated EV charging scenarios is atypical. As utilities have made substantial investments in other states, they have targeted various aspects of the EV market—with a focus on workplace and public charging stations, and some residential charging. These efforts, however, have been aligned with some internally defined business and investments decisions, rather than the subject of a jointly conceived siting framework.

The most detailed analysis of charging scenarios comes from the National Renewable Energy Laboratory's *National Plug-in Electric Vehicle Infrastructure Analysis*, which includes an estimated number of public Level 2 and DC fast charging or quick charging ports in several geographies.[105] However, that analysis does not address the majority of the characteristics requested (and outlined below). Some of the characteristics of each scenario requested can be populated by information and lessons learned from completed, ongoing, or planned pilot projects. However, many of these characteristics require myriad assumptions regarding aspects of the vehicle market that are not well understood—

[105] National Renewable Energy Laboratory, *National Plug-in Electric Vehicle Infrastructure Analysis.* https://www.nrel.gov/docs/fy17osti/69031.pdf

including travel patterns, the anticipated vehicle architecture of the market moving forward (e.g., plug-in hybrid vs. battery electric), and the expected or preferred technology for charging vehicles in different locations.

Table 11 highlights Con Edison's categorization of charging infrastructure (or EVSE) into types of market segments, locations, and examples.

Table 11: Categorization of EVSE

	Residential	Commercial
Private Property-Sited Vehicle Charging	• Single-family home • Multi-unit dwelling	• Workplace • Maintenance yards and depots (light-duty fleet) • Transit bus depot • School bus depot • Private parking lots (e.g., event parking, other required visitor validation)
Publicly Accessible Vehicle Charging	• N/A	*Co-located with commercial host* • Stores • Shopping centers/malls • Parking garages • Rest areas *Dedicated charging location* • Municipal curbside and parking lot • Quick charge hubs

b. the number and spatial distribution of existing instances of the scenario;

The U.S Department of Energy Alternative Fuels Data Center has an interactive online station locator at https://www.afdc.energy.gov/stations/#/find/nearest. The locator includes a searchable database and capability to download data about existing and announced or planned charging stations. It is searchable by state and zip code and returns the number of chargers available and/or planned in a given geography. Data fields include location, charger type, charging network, and other useful information. The Plugshare website at https://www.plugshare.com/ also identifies public Level 2 and DC quick chargers.

c. the forecast number and spatial distribution of anticipated instances of the scenario over the next five years;

While it does not forecast the number of chargers or the spatial distribution of chargers to meet future EV load, Con Edison forecasts annual EV-related system and network coincident peak demand and integrates those results into the peak demand forecast. At a high level, the methodology considers the number of electric light-duty vehicles in the Company's service area to meet the State's ZEV policy goal, allocates the number of electric light-duty vehicles by zip code based on current vehicle registrations, aligns those zip code allocations to networks, and estimates the expected peak charge rate and hour.

The Company believes that most EV charging will take place in the private residential segment. National studies suggest that 80 to 90 percent of EV charging will take place at home, as drivers with off-street parking will take advantage of available utility interconnection and low residential rates.[106] However, given that many Con Edison customers lack a garage or other off-street parking in which to charge their vehicles, home charging may be limited to 60 to 70 percent of EV charging in much of Con Edison's service area. Further, the dense urban nature of much of Con Edison's service territory will encourage a prevalence of quick charging for all vehicle types. Table 12 summarizes the basic assumptions for these chargers:

Table 12: EV Charger Assumptions

Charging Type	Assumptions
Level 1	120-V AC, 12-16 amp, 1.4-1.9 kW
Level 2	208/240V AC, 30-80 amp, 7.2 - 19.2kW
Quick Charging	DC power inverter, 208-600V AC, 25-150 kW

EVSE developers and hosts will determine the nature of public charging in the Company's service area. EVSE developers will likely look at driver travel patterns, vehicle charging profiles, vehicle registration distribution, owner income distribution, and other key data that it requires to understand the nature of charging infrastructure needs.[107]

d. the type(s) of vehicles charged at a typical location (commuter car, bus, delivery truck, taxi, ride-share, etc.);

The Company expects light-duty vehicles to be the predominant class of EVs in the service area. This will include a mix of privately-owned, commercial and municipal fleets, for-hire transportation network vehicles, and taxi cabs. The Company assumes that these light-duty vehicles will charge at private and public charging locations.

The Company also expects a growing mix of medium- and heavy-duty EVs. These vehicles typically would be part of commercial fleets, such as delivery trucks, transit buses, school buses, coach buses, etc. These fleet vehicles will likely use private charging.

e. the number of vehicles charged at a typical location, by vehicle type;

While the Company can forecast the total number of vehicles needed to comply with ZEV, it is difficult to answer how many chargers will be installed at specific individual locations to support those vehicles. As a source of general information, the National Renewable Energy Laboratory's *National Plug-in Electric Vehicle Infrastructure Analysis*[108] counts the current number of chargers and vehicles to estimate how many chargers are typical of public charging locations and how many vehicles those chargers support, and forecasts the infrastructure needed to support further EV adoption.

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[106] *Id*.

[107] There are a few public studies on current and forecast public EVSE needs. *See, e.g.*, National Renewable Energy Laboratory, *National Plug-in Electric Vehicle Infrastructure Analysis.* https://www.nrel.gov/docs/fy17osti/69031.pdf.

[108] National Renewable Energy Laboratory, *National Plug-in Electric Vehicle Infrastructure Analysis.* https://www.nrel.gov/docs/fy17osti/69031.pdf.

f. the charging pattern by vehicle type (frequency, times of day, days of week, energy per charge, duration per charge, demand per charge);

Generally, Con Edison does not collect or forecast charging patterns by vehicle type. The Company's EV-related system and network coincident peak demand forecast assumes an average charging usage per vehicle based on previous studies and a vehicle charging rate equal to the weighted average of current registered EVs.

Con Edison will be collecting charging pattern data through the SmartCharge NY program, which offers incentives to eligible EV drivers for installing and activating a free connected, plug-in car device from FleetCarma and charging in Con Edison's service territory at off-peak times. For each charging session, the device records:

- Start date and time
- Duration of charging session
- Charging power level (kW)
- Total charging energy (total electricity consumed in kWh)
- 15-minute interval charging energy (kWh)
- Charging loss (electricity lost due to charging efficiency in kWh)
- Starting and ending state of charge
- GPS coordinates of where the charging session occurred

The Company also expects to observe baseline load profile data of public DC quick charging stations and public curbside Level 2 charging through its demonstration projects.

g. the number(s) of charging ports at a typical location, by type;

The Company does not forecast the number of chargers at a typical location in its planning scenarios. For reference, the National Renewable Energy Laboratory's *National Plug-in Electric Vehicle Infrastructure Analysis* identifies assumptions on the number of charging ports at a typical location.[109]

h. the energy storage capacity (if any) supporting EV charging at a typical location;

The instances of energy storage applications installed in Con Edison's service territory specifically to support EV charging are very limited.

i. an hourly profile of a typical location's aggregated charging load over a one year period;

The Company does not currently forecast the hourly profile of a location's aggregated charging load over a one-year period.

j. the type and size of the existing utility service at a typical location;

The type and size of the existing utility service vary based on the location.

k. the type and size of utility service needed to support the EV charging use case;

[109] *Id*.

Generally, existing service for residential and commercial customers can support Level 1 or Level 2 EVSE. Quick charging and/or deployments of several Level 2 EVSE may require a service upgrade and/or network reinforcement. The appropriate level of service will likely become clearer as the Company receives more service requests at different locations and in different design configurations. To date, service requests for quick charge stations have ranged between 800 and 3,000 Amps to support up to 500 kW. Additionally, market availability of technology may drive utility service requirements.

2) Describe and explain the utility's priorities for supporting implementation of the EV charging use cases anticipated in its service territory.

The Company's priorities for encouraging EV adoption are to support public charging options and encourage off-peak vehicle charging, which the Company is advancing by testing a range of EV enablement activities. Based on the experiences of the demonstration projects and pilots, the Company can assess where it can make the largest impact on market growth and create the most benefits.

Con Edison's activities prioritize market segments based on the Company's analysis of TCO for several EV types and end uses specific to Con Edison's service area. Among other insights, the analysis illuminated end use cases with the most near-term economic potential (e.g., transit buses, passenger vehicles) and which cost drivers affect end use TCO (e.g., access to charging).

This analysis also sets priorities for incentive mechanisms. The analysis supports publicly accessible EVSE as a critical enabler for the many vehicle owners without access to off-street parking and private EVSE. For example, quick charger hubs, analogous to conventional fueling stations, reduce the "range anxiety" barrier to EV adoption. The Company is supporting public charging through the BIR, which provides discounts for publicly accessible quick charging stations and a quick charge demonstration project in partnership with developers. The demonstration project will provide valuable data on the quick charge business model, such as utilization, operations, economics, and customer acceptance. It will also help the utility understand the engineering and planning needs, from a network perspective, to install EVSE, and how to align locations best for utility infrastructure with those that maximize EVSE utilization.

Further support for public charging will come through the curbside charging demonstration project in partnership with the NYC DOT and an EVSE network provider. These parties will identify and equip dedicated EV parking locations with chargers across New York City. Chargers will be available for public use and city fleet vehicles. The demonstration project will test the public charging business model, provide data on charging behavior patterns of fleet and private EV owners, and increase public exposure to EVs.

Additionally, the Company encourages off-peak charging, which limits the impact of new EV charging loads and limits customers' exposure to higher charging costs. Con Edison offers TOU rates to incentivize off-peak charging, including a one-year price guarantee for EV charging loads. The SmartCharge NY program, discussed above, provides incentives for eligible EV drivers for installing and activating a free connected, plug-in car device from FleetCarma and charging in Con Edison's service territory at off-peak times.

These activities are consistent with the EV Readiness Framework. Under the Framework, the Joint Utilities proactively support EV adoption in a nascent market, while helping achieve and, where possible, accelerate the long-term potential of transportation electrification. The Joint Utilities have prioritized charging infrastructure planning, streamlining charging infrastructure deployment in New York, advancing rate design considerations that will improve the customer experience while minimizing impacts to utility system operation, and conducting education and outreach efforts that raise awareness about EVs.

3) Identify and describe all significant resources and functions that the utility and stakeholders use for planning, implementing, monitoring, and managing EV charging at multiple levels in the distribution system.

a. Explain how each of those resources and functions supports the utility's needs.

Given the infancy of the EV market in Con Edison's service territory and the limited EV adoption to date, the Company is still identifying what resources and functions it may need in the future for planning, monitoring, and managing EV charging that are beyond its normal processes for new service connections. Con Edison expects the demonstration projects to provide more information about EV charging technology, driver usage and charging patterns, rate and other incentive mechanisms to shape charging behavior, and requirements for using EVs as a grid resource. The Company expects to be able to provide more detail on the necessary resources and functions and how they support utility and stakeholder needs in the next DSIP.

b. Explain how each of those resources and functions supports the stakeholders' needs.

See response to 3a above.

4) Identify the types of customer and system data that are necessary for planning, implementing, and managing EV charging infrastructure and services and describe how the utility provides those data to interested third-parties.

The Company's requirements for customer data for planning EV infrastructure and services includes vehicle types, consumer driving ranges and locations, and driving and charging patterns. The Company is collecting this type of data through SmartCharge NY for customers enrolled in the program. The Company may share aggregated data from the program with third parties, including the public, to inform charging patterns in the service area, subject to the applicable privacy standard. If this aggregated data does not meet the privacy standard, sharing of the data will require the consent of the customer(s) or site host(s) covered by the dataset.

For system planning purposes, the Company collects customer charging load data via a "load letter" submitted through the project center process. The process is similar for any customer request. The load letter provides key information to identify any necessary system reinforcements and/or excess distribution facilities needed to deliver the service request. Sharing this customer data with third parties requires customer consent.

Additionally, the Joint Utilities have identified a subset of the higher priority data that will be required for planning, implementing, and managing EV charging infrastructure and services, including:

- *Customer load profile* - The utility will need to know the customer load profile, including charging capacity pre-installation of EV charging infrastructure to help understand the impact on the customer as well as system-level impacts.
- *Likely EV charging demand* - In workplace or other non-residential types of EV charging, the utility would need to know the anticipated charging demand (e.g., how many EVs are likely to be charging, and at what level, such as Level 2 charging versus DC fast charging). This will help characterize the charging capacity required at the facility. For a residential installation, the utility would need to know the level of charging that the customer is seeking, namely Level 1 or Level 2. Note that it is unlikely that the utility plays a substantive role in deploying Level 1 charging infrastructure.
- *Distribution asset load profile* - The utility will need to know the load profile on the nearest substation or similar distribution asset to understand the likely impact that may arise from increased load attributable to EV charging. This will enable the utility to update its asset management strategy for that substation or feeder.

- *Potential location of EV charging infrastructure* - To the extent that "implementation" of EV charging infrastructure is inclusive of installation, the layout of the proposed installation, namely the location of the physical hardware, will help determine the associated costs. More specifically, the trenching and cutting costs associated with the installation of EVSE at existing facilities can vary significantly depending on the location of the planned installation relative to the point of connection with utility service.

5) **By citing specific objectives, means, and methods describe in detail how the utility's accomplishments and plans are aligned with New York State policy, including its established goals for EV adoption.**

Con Edison's objective is to support EV adoption in the Company's service area, and the primary means of support is to encourage public charging stations and incentivize customers to charge off-peak. These combined goals are consistent with the goals of the State's Charge NY program. In addition, ZEV compliance is the foundation of the EV load forecast to align system planning with State policy goals. As described above, the Company has several efforts underway to encourage EV adoption and off-peak charging.

6) **Describe the utility's current efforts to plan, implement, and manage EV-related projects. Information provided should include:**

   a. **a detailed description of each project, existing and planned, with an explanation of how the project fits into the utility's long range EV integration plans;**
   b. **the original project schedule;**
   c. **the current project status;**
   d. **lessons learned to-date;**
   e. **project adjustments and improvement opportunities identified to-date;**
   f. **next steps with clear timelines and deliverables;**

The Company describes its demonstration projects in the following tables.

Table 13: SmartCharge NY

Description	Con Edison's SmartCharge NY program encourages off-peak EV charging. The program will help Con Edison understand charging behavior and EV driver response to incentives. The program offers incentives to eligible EV drivers for charging in Con Edison's service territory at off-peak times and provides a $150 incentive for installing and activating a free connected car device from FleetCarma that plugs into the vehicle's diagnostic connector and allows users (and the Company) to know where, when, and how much energy an EV consumes during charge events. Participating customers receive $5 per month for keeping the device plugged in and charging in the Con Edison service territory, as well as earn $0.10 per kWh for charging between midnight and 8 a.m. on any day in the Con Edison service territory. During the summer (i.e., June 1 to September 30), customers receive an additional $20 when they avoid charging between 2:00 p.m. and 6:00 p.m. on weekdays.
Schedule	SmartCharge NY has been available to customers as of April 2017 and the Company anticipates continuing it through the 2020 – 2023 rate period.
Status	As of July 1, 2018, 1,317 EVs are actively enrolled in the program.
Lessons learned	(1) The enabling technology must not be a barrier to enrollment. The Company is working with car dealerships to assist EV buyers and owners with installation of the FleetCarma device. (2) Partner with car dealerships as a channel to increase enrollment. The car dealers can now earn an incentive for customer enrollment in SmartCharge NY.
Adjustments/Improvements	An increase in the off-peak incentive from $0.05/kWh to $0.10/kWh in early 2018, and a proposal filed March 1, 2018 to expand the eligibility criteria for the SmartCharge NY program for light-duty vehicles to include medium- and heavy-duty vehicles, including buses.
Next Steps	Next steps include continued marketing and customer outreach effort to increase enrollment.

Table 14: School Bus V2G Demonstration

Description	In this demonstration project, Con Edison seeks to prove operational viability of electric school buses and test school bus potential and value as V2G assets. This demonstration will include a partnership between: (1) Con Edison, (2) National Express (bus operator), (3) Lion Electric (bus manufacturer), (4) First Priority Green Fleet (project lead), and (5) NYSERDA. First Priority Green Fleet, the North American dealer for Lion Electric, will be the project lead on V2G technology, ensuring the buses provide reliable, grid quality power that does not interfere with National Express's operational needs. Lion Electric is

	manufacturing the five buses. The five buses will serve White Plains public schools. They will park and perform V2G for Con Edison from National Express's Northern White Plains depot from June 15 to August 31 (buses' summer period) over 8 hours at an aggregate 75 kW (15 kW per bus). This demonstration project will produce a new revenue stream for the bus operator, which can improve TCO of electric school buses. It also has the potential to foster a long-term supply of lower-cost energy storage for the grid.
Schedule	The Company issued an RFP in April 2017 and made a selection later that year. The Company expects implementation of the buses for National Express in fall 2018, and use as energy storage in summer 2019. The demonstration is scheduled to run through summer 2021.
Status	DPS Staff approved the proposal in June 2018.
Lessons learned	N/A
Adjustments/Improvements	N/A
Next Steps	Preliminary project implementation schedule states the buses will be operational fall 2018 and available as energy storage in summer 2019.

Table 15: Curbside Level 2 Charging

Description	The Company plans to install 100 public and 25 city fleet Level 2 charging units at a number of locations throughout New York City's 5 boroughs. Con Edison will partner with a company that has deployed Level 2 curbside chargers across several cities, and with the NYC DOT to secure dedicated street parking for EVs. The project will test charger utilization, installation process, hardware durability, and customer acceptance.
Schedule	The Company issued RFPs in April 2017 and selected finalists later that year. Installation of curbside chargers would begin with a scaled installation through 2019. The project is scheduled to run through at least 2021.
Status	Con Edison is negotiating a non-binding term sheet with its partner.
Lessons learned	N/A
Adjustments/Improvements	N/A
Next Steps	Con Edison currently plans to submit a filing in fall 2018 and have Staff review shortly thereafter.

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Table 16: Quick Charge Stations

Description	Con Edison will support development of DC quick chargers available for public use and in high enough concentration to minimize customer wait times. Con Edison will locate two to four quick charge stations on its properties, allowing for separate metering and public use. As part of the project, the Company will look at cost savings and utilization drivers in an effort to improve the New York area business model.
Schedule	The Company issued RFPs in April 2017 and made a selection later that year. The demonstration is scheduled to run through 2021.
Status	Con Edison has selected a vendor and is currently negotiating terms and conditions of implementation. Con Edison is reviewing available properties for the demonstration.
Lessons learned	N/A
Adjustments/Improvements	N/A
Next Steps	Con Edison expects to submit the filing by fall 2018 and have Staff review shortly thereafter.

7) Explain how the Joint Utilities are coordinating the individual utility EV-related projects to ensure diversity of both the EV integration use cases implemented and the technologies/methods employed in those use cases.

The Joint Utilities EVSE stakeholder engagement group coordinates individual utility EV initiatives and initiatives from other EV stakeholders. The EV Readiness Framework summarizes this coordination and documents the consistent approach to EV integration agreed to by the individual utilities, considering input from other key stakeholders. [110] The document also highlights a summary of utility EV demonstration projects. Through these stakeholder engagement meetings, the utilities collaborate on different ideas and models to support EVs, as appropriate for their individual customer base and service areas.

8) Describe how the utility is coordinating with the efforts of the New York State Energy Research and Development Authority (NYSERDA), the New York Power Authority (NYPA), New York Department of Environmental Conservation (DEC), and DPS Staff to facilitate statewide EV market development and growth.

Con Edison has collaborated with state agencies, authorities, and other stakeholders for years on EVs and has been engaged in the EV space. In addition to the fleet testing and development of electric products from a multitude of manufacturers, Con Edison served as the East Coast technical service center from Maine to Florida for Toyota's introduction of the electric RAV4. The Company worked to develop some of the first fast chargers ever used for over-the-road EVs in the Manhattan facility and were involved in the development of the American National Standards Institute Standardization Roadmap for EVs and numerous efforts by industry stakeholders in response to solicitations in

[110] http://jointutilitiesofny.org/resources/. Note 93, *supra*.

the electric transportation space. The Company has closely coordinated its commitments and efforts with NYSERDA, NYPA, DEC, and DPS Staff.

Con Edison continues to coordinate directly with stakeholders to support EV adoption, including regular meetings with government, non-profit, and industry stakeholders to share information, project updates, and creativity. The Company also coordinated with NYSERDA on a demonstration project to provide financing for the five electric school buses in White Plains. Finally, the Company will participate, both individually and with the Joint Utilities, in the proceeding regarding EVSE and infrastructure.

2.6. EE INTEGRATION AND INNOVATION

Context and Background

Recent developments in New York State increasingly underscore the critically important role of EE in not only helping to meet the State's environmental policy objectives, but also in supporting distribution system and customer needs. Utility actions will facilitate the growth in EE, such as enhancing EE programs and enabling the development of a robust, dynamic EE marketplace for third-party products and services. Responding to the Governor's State of the State address in January 2018, DPS Staff and NYSERDA issued *New Efficiency: New York* ("EE Whitepaper") that set EE targets as part of the larger effort to reduce GHG emissions and promote clean energy jobs.[111] The new targets represent a significant acceleration of EE achievements, with a goal of achieving annual efficiency savings of three percent of utility electric sales by 2025 and an average of over two percent over 2019-2025. For Con Edison, these goals represent an approximate tripling of the Company's maximum EE targets for 2018.

The EE Whitepaper outlines a set of potential strategies for meeting the 2025 goals, as well as an initial plan for stakeholder engagement, including technical conferences and working groups. Consistent with the goals of REV, some of the strategies focus on expanding market-based approaches to EE, leveraging private capital, and driving innovation. The EE Whitepaper proposes a mix of activities to drive additional savings including, but not limited to, capturing deeper savings in new and existing buildings, exploring the potential for heat pumps, and broadening the scope of utility programs to include new measures. The EE Whitepaper offers the following strategic priorities, among others, to guide investments and activities:

- More useful data to support customers and service providers in their decision-making.
- Clearer valuation of EE as a grid resource to improve the economics of the most valuable projects.
- Stability in program scale and design to enable the market to develop with confidence.[112]

Con Edison shares the goal of utilizing EE as a resource and generally supports the goals and priorities outlined in the EE Whitepaper. Con Edison has long relied on competitive solicitations as a central procurement approach of its EE programs and continues to diversify its portfolio in support of market-based outcomes, including expanding its delivery channels and moving upstream in the supply chain to encourage vendors and retailers to stock and promote energy efficient equipment, which allows the Company to reach more customers. Con Edison also works closely with NYSERDA and the other New York utilities to facilitate increased adoption, maximize value to customers, advance market-based initiatives, and support complementary or reinforcing efforts, such as the recently concluded working group processes established originally by the Commission through its Clean Energy Advisory Council.[113]

The Company's existing suite of programs offers a strong foundation for continued progress. The Company's EE initiatives include programs funded by the authorizations provided under the Energy Efficiency Transition Implementation Plan ("ETIP") and under the Company's rate case, as well as those offered through REV demonstration projects and NWS. The Company manages its ETIP and rate case portfolios as an integrated whole with the goal of maximizing energy savings and value delivered to customers and the broader system. The Company submitted its final proposed 2017-2020 ETIP on December 22, 2017. The ETIP presents the current portfolio of initiatives the Company is

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[111] Department of Public Service Staff and NYSERDA, *New Efficiency: New York* (issued April 20, 2018).
[112] *Id.*, p. 16.
[113] http://www3.dps.ny.gov/W/PSCWeb.nsf/All/F287BFCBBA89475885257FCE006D2DBF?OpenDocument

implementing or intends to implement from 2017 to 2020, noting that the portfolio can be expected to evolve over that period as the Company draws lessons from the implementation of initiatives and as technologies develop, economic trends shift, and customer preferences and behavior patterns change.

The Joint Proposal in the Company's 2016 electric rate case, adopted by the Commission, significantly altered the Company's EE program by increasing the EE targets and budget, establishing new initiatives, and authorizing an earnings adjustment mechanism to motivate the Company to achieve ambitious targets and facilitate additional desired outcomes. [114] The Proposal contributes to energy and demand savings through new market-oriented initiatives and "go to market" channels that are above and beyond what was authorized under the ETIP.

During the next rate period, all of the Company's EE programs are expected to be funded through base rates. The ETIP will transition to a System Energy Efficiency Plan ("SEEP"), which the Commission states should "describe[s] the entirety of the utility's expanded reliance on and use of cost-effective EE to support their distribution system and customer needs."[115] The Company will file the SEEP separately from the DSIP pursuant to forthcoming Commission guidance. However, future DSIPs will include greater discussion on how EE is being integrated into core utility planning and forecasting functions.

Demonstration projects also test market-oriented approaches to EE. For example, the purpose of the Building Efficiency Marketplace demonstration project is to determine how Con Edison can leverage interval meter data analytics to enable targeting and multi-channel engagement of commercial customers with high potential for EE savings and demand reduction. A key element of this demonstration project is its use of a web-based portal to bring customers and a community of vendors together. Similarly, the Connected Homes demonstration project is designed to help residential customers understand what DER solutions (including EE) are best for them given their load profile and usage and guides them to a marketplace offering DER solutions.

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[114] Con Edison 2016 Electric Rate Case, Joint Proposal (filed September 19, 2016) ("Joint Proposal"), Order Approving Electric and Gas Rate Plans (issued January 25, 2017).

[115] Case 15-M-0252, *In the Matter of Energy Efficiency Programs*, Order Authorizing Utility-Administered Energy Efficiency Portfolio Budgets and Targets for 2019-2020 (issued March 15, 2018), p. 29.

Implementation Plan, Schedule, and Investments

Current Progress

Summary of Achievements

- Significantly increased program achievements and exceeded rate case targets in 2017, saving 300 GWh, which is equivalent to the electricity consumed by over 33,000 U.S. households in a year, and achieving 61 MW of peak reduction.
- Targeted new customers at different levels of the vertical supply chain.
- Developed multiyear partnerships with large commercial customers to drive additional savings.
- Enhanced customer targeting and marketing, resulting in greater customer engagement and savings.
- Increased LMI offerings.
- Collaborated with NYSERDA, leveraging joint efforts to achieve more benefits.
- Developed processes that result in a more robust sales pipeline.
- Leveraged REV demonstration projects, including the Online Marketplace, to test new approaches to engage customers and motivate incremental energy savings.
- Expanded the Test and Learn ("T&L") framework discussed in the 2016-2018 ETIP.

The Company's EE and peak reduction goals continue to increase, driving additional effort and innovation. For example, the Company is focused on identifying and engaging customers that are heavy energy users. Customer segments, such as hospitals, schools, and the banking sector, are some of the areas where Con Edison sees significant potential for longer-term partnerships and additional savings. Con Edison's Strategic Energy Partnership ("SEP") further engages customers as they participate in programs. Each SEP customer has a designated Con Edison representative to support EE initiatives, including helping to navigate program offerings. SEP customers are able to secure incentive rates for Con Edison's Commercial and Industrial ("C&I") and/or Multifamily programs over longer terms and for multiple EE projects.

The Company also works to introduce new efficient products, services, and program models as technologies develop, economic trends shift, and customer preferences and behavior patterns change. In 2018, the residential electric portfolio transitioned from a downstream rebate program to an upstream model, where incentive funds flow through the distributor to customers. The transition upstream is designed to capture the multiplier effect of resources being inserted higher up in the supply chain and to lower administrative costs by reducing the application processes for contractors and program administrators. An upstream program model also engages distributors and contractors, who are in a position to encourage customers to choose EE equipment. The Company is also exploring upstream C&I offerings for lighting and HVAC measures.

The Company employs a host of strategies and operational improvements to better serve customers in a more innovative and market-oriented manner. This includes giving customers multiple options and opportunities to reduce their energy use based on their unique needs. Examples for residential customers include accessing rebates and incentives through market partners, shopping directly through the Online Marketplace, managing energy and demand through programmable thermostats and Wi-Fi-enabled air conditioners, and benefiting from market-based partnerships between Con Edison and mid- and up-stream retailers and manufacturers.

The Company continues to refine its portfolio to serve all customers, including LMI customers. The Company recently partnered with food banks to distribute LEDs within Con Edison's territory and is exploring additional strategies to expand its programs to this market.

The Company's EE programs also seek to increase customer engagement and choice. The Company provides customers with actionable insights and the ability to efficiently manage their energy needs, while creating broader system and grid benefits. For example, the Company provides energy audits, educational materials, access to information on efficient products and services, and promotion of controllable technologies. As customers become more savvy energy consumers, the Company is taking steps to facilitate animation of a robust market of third-party actors. The Company has provided training programs to more than 1,000 independent contractors and will continue to engage market partners through such programs so they can best leverage Company incentives, education, and tools.

Con Edison coordinates with NYSERDA and works closely to leverage pilot offerings, furthering the reach of EE investments. This partnership helps develop new markets and achieve synergies to increase effectiveness, while also delivering energy savings needed to achieve policy goals. Con Edison is working closely with NYSERDA to complement the Company's efficiency and demand management programs, as well as initiatives piloted by NYSERDA to facilitate development of the market for increased adoption, maximize value to customers, and advance market-based initiatives. Through collaboration, the Company aims to transform markets and improve EE adoption beyond what uncoordinated efforts could achieve individually.

In 2017, NYSERDA and Con Edison began discussions of a joint Pay for Performance ("P4P") pilot program. P4P is a type of EE program that provides financial incentives for EE projects that produce meter-based energy savings below a weather-normalized forecast of energy usage. Con Edison and NYSERDA have agreed to at least one phase of the P4P pilot, beginning with small and medium businesses with smart meters in Staten Island and Westchester County. The main goals of the pilot are to test new business models for offering EE projects and meter-based savings calculation methods, understand how these projects perform on a portfolio basis, and increase confidence in meter-based savings for customers, contractors, investors, and utilities. Con Edison and NYSERDA expect to launch the P4P pilot program in summer 2019.

To continue the portfolio's development, build upon successes, and prepare for the future, the Company introduced an ongoing T&L strategy in the 2016 ETIP filing, described as a systematic method of identifying, designing, and implementing new technologies, programs, initiatives, and campaigns. The Company uses the T&L strategy to identify new measures and delivery mechanisms for existing offerings, and to identify and test new programs and initiatives before full-scale implementation is undertaken. As a T&L initiative reaches maturity, the Company will evaluate its long-term viability and potential for success in the marketplace, after which the initiative will be incorporated into the broader portfolio of EE programs, or retired or retooled, as appropriate. A recent program that came through the T&L process is the Smart Kids program, which delivers LEDs, faucet aerators, and showerheads to fifth-graders across the service territory and is paired with an in-classroom educational lesson plan on energy. The increase and diversification of customer participation channels allow for an increased reach of services provided to customers across the service territory.

Finally, the Company is constantly seeking to more efficiently use available financial resources by driving down costs where possible. Recent success in achieving cost efficiencies include administering portions of the C&I initiative internally, targeting new customers at different levels of the vertical supply chain, developing a robust multi-year sales pipeline, leveraging REV demonstration projects including the Online Marketplace, developing multiyear partnerships with large commercial customers, and expanding the T&L framework discussed in the 2016-2018 and 2017-2020 ETIPs.

Summary of Future Actions

- Participate in ongoing stakeholder processes related to the EE Whitepaper and the future of EE in New York.
- Explore new and innovative approaches to enable competitive markets and new EE products and services.
- Continue development of LMI strategies.

Con Edison is seeking to further grow its EE services and offerings to achieve a higher level of savings and lower costs for customers, spur and drive innovation in the market, and create system benefits. Additionally, the Company continues to explore new and innovative approaches that seek to enable competitive EE markets and effect market transformation through a focus on different parts of the supply chain. Further, the Company is also making efforts to explore new channels and new “go-to-market” strategies to deliver new energy solutions and services to meet customer expectations. Solicitations for market-based NWS include the consideration of EE as part of a portfolio of options that are designed to enable deferral of infrastructure needs on the distribution system. The Company notes that EE is a critical portion of the portfolio of solutions used in the BQDM program and expects that in the future EE will both continue to be a solution considered for future NWS and provide marginal deferral and environmental benefits when implemented in non-NWS areas.

Con Edison will actively participate in the ongoing stakeholder processes related to the EE Whitepaper and use information obtained from that process to help inform EE plans and portfolio development efforts.

Risks and Mitigation

Con Edison supports integrating EE as part of the core utility business and generally supports the goals and priorities of the EE Whitepaper regarding a significant and ambitious scaling up of EE efforts in the State, especially by further leveraging utility efforts and investments. While the EE Whitepaper significantly advances the discussion on the future of EE in New York State, it does not address all issues, specifically those related to targets that utilities will be expected to achieve and the timelines for achieving them. The Company will engage DPS Staff and NYSERDA to discuss the potential implications of the goals and corollary issues to be addressed, such as clarity related to funding and incentives, cost recovery, and inclusion of EE as a core utility business area. Additionally, the Company will explore strategies for overcoming challenges in meeting the ambitious goals put forth in the EE Whitepaper, including:

- Statewide target for EE equivalent to three percent of investor-owned utilities’ sales by 2025 with an average of over two percent between 2019 and 2025 represents a significant ramp-up that will become more challenging the later the efforts commence.

- Certain lower-cost, higher-benefit measures, such as efficient lighting, are no longer available due to baseline changes or because they reach market saturation, while deeper EE savings to replace them are precluded as a result of higher costs being disallowed.

The Company will continue to work to reduce costs and expects in the short-term to benefit from those efforts in some of its programs. However, despite efforts to reduce unit costs, the Company recognizes that as lower-cost measures and programs, such as lighting, reach saturation, and as the Company works with customers to achieve greater and deeper levels of savings per residential or commercial building, the per unit cost of energy saved may increase over the medium to longer term.

Stakeholder Interface

The Company will continue to partner with NYSERDA and coordinate with the Joint Utilities to facilitate EE market development and growth. The Company regularly communicates and coordinates with NYSERDA and has developed a "co-invest, co-save" model to pursue and enhance partnerships on programs, in order to offer complementary and non-duplicative efforts and programs that result in enhancing EE adoption and transforming EE markets. This coordination is achieved through regular communication and meetings between specific EE and DM personnel at all levels, including at the program manager and other subject matter expert level. The Company also communicates with other electric utilities to exchange lessons learned, coordinate where it can result in meaningful increases in EE adoption, and avoid overlap of EE programs and demonstration projects. Finally, Con Edison is working with NYSERDA to create innovative, market-stimulating partnerships that take advantage of each entity's strengths. This includes, but is not limited to, a pilot P4P program that leverages meter-based energy savings measurement and innovative project financing, and upstream incentives for heat pump technologies. The Company will continue this close coordination with NYSERDA and other stakeholders to facilitate EE market development and growth.

Additional Detail

This section responds to the questions specific to EE integration.

1) **The resources and capabilities used for integrating energy efficiency within system and utility business planning, including among other things, infrastructure deferral opportunities as part of NWAs, peak and load reduction and/or load or energy shaping with an explanation of how integration is supported by each of those resources and capabilities, or other shared savings / benefits opportunities.**

Con Edison's EE programs play a significant role in reducing system peak, minimizing demand growth, and deferring large utility investments. The EEDM group, which runs the EE and DM programs, is within the larger Customer Energy Solutions ("CES") organization, which also includes groups leading procurement of NWS, demonstration projects, and distribution planning, among others. There is close collaboration among the groups to leverage EE as a resource, including targeting EE temporally and spatially to help meet system needs. Section 3.1 provides more detailed discussion of the CES organization.

These groups coordinate with other groups across Con Edison to integrate EE into other business planning processes. For example, EEDM provides volume and peak reduction forecasts to the relevant user groups within Con Edison for budget and capital project/system expansion planning purposes. Appendix A describes in detail how the Company uses these forecasts as load modifiers, reducing the system forecast.

2) **The locations and amounts of current energy and peak load reductions attributable to energy efficiency and how the utility determines these.**

Historically, Con Edison has treated EE as a system resource in the load forecast. Through the BQDM program and other NWS projects, Con Edison is starting to deploy EE to target identified local distribution system needs. For targeted projects (e.g., NWS projects), the Company has a good idea of when and where it can realize EE savings.

For more generalized programs, the Company tracks program participation down to the customer premises, where applicable. The Company uses this information to review and improve the effectiveness of existing programs and inform future program design. As the Company pursues upstream and midstream delivery channels[116] to reach additional customers, it captures participation data at a higher level, such as by vendor or local store, as opposed to individual end-user. The Company is currently developing and testing the methods and models it uses to attribute savings to programs where the Company does not currently have end-user participation data.

3) **How the utility develops and provides its short and long-term forecasts of the locations, times, and amounts of future energy and peak load reductions achievable through energy efficiency.**

Appendix A details how the Company distributes expected energy savings from EE and DM programs across the electric networks in the forecast using planned program growth, historic program achievements, historic consumption data, and customer demographic information. The Company then converts these energy savings to peak demand savings using annual hourly load curves, which vary with the measures and specific customer segment related to each program. The Company applies a geographic uncertainty factor to the expected demand reductions to reflect the uncertainty of where it will realize the future savings from system-wide programs.

Beginning with the 2018 forecast, which Con Edison will complete in the fall, the EE forecast will shift from a bottom-up approach to a more top-down approach that aligns with State policy goals and assumes sufficient funding will be available to meet the goals. Con Edison distributes the system savings among programs based on portfolio expectations given current trends. For the current forecast, the Company annually projects incremental EE program savings into the future as far out as the programs have funding.

For DM and DR programs, forecast data comes from an internal strategy team tasked with developing a vision of the Company's EE portfolio in future years based on expected changes to measure mix, cost-effectiveness, and savings calculations. For DR programs, the Company applies discount factors to enrolled MWs for network forecasts based on the size and diversity of enrollments in each individual network. Con Edison does not include DR programs in the volume forecast because the energy savings are both uncertain (programs may or may not be called) and de minimis (even if events are called).

4) **How the utility assesses energy efficiency as a potential solution for addressing needs in the electric system and reducing costs.**

As noted above, the Company's EE programs reduce overall system peak and demand growth. Recent efforts, through BQDM and other NWS projects, are directing EE measures to areas of the grid where they can address localized system needs, including the use of incentive adders to drive additional participation in NWS areas. For example, the Company is pursuing 4 MW of EE as part of the Water Street NWS portfolio to meet near-term system needs. Sections 2.13 and 2.14 discuss the process of identifying potential NWS candidates as part of the capital planning process and building NWS portfolios that are cost-effective per the BCA Handbook.

5) **How the utility collects, manages, and disseminates customer and system data (including energy efficiency project and load profile data) that is useful for planning, implementing, and managing energy efficiency solutions and achieving energy efficiency potential.**

[116] Examples are providing incentives directly to manufacturers, vendors, and retailers.

Sections 2.8 and 2.11 describe how the Company's investments in AMI and GBC are making more granular customer data available. These same datasets are useful in planning, implementing, and managing EE solutions. Additionally, the Company uses prior program participation data to identify, target, and evaluate potential program structure and marketing efforts.

Section 2.7 describes the system data that is available and how to access it. System data that is relevant to planning, implementing, and managing EE includes network share of consumption data, as well as network and system peak times and load shapes.

Con Edison collects project-specific information, such as the installed measure, customer type, and customer address. Some evaluation efforts may collect EE project-specific and load profile data as part of their operations. In the future, Con Edison expects to use AMI data to improve in this area.

6) **How the utility's accomplishments and plans are aligned with New York State climate and energy policies and incorporate innovative approaches for accelerating progress to ultimately align with a new 2025 energy efficiency target called for in Governor Cuomo's 2018 State of the State Address.**

The Company has exceeded its recent EE and DM program targets through a suite of products and services offered to customers of all sizes and business types. Regulatory certainty concerning available funding and cost recovery as a regulatory asset comparable to NWS and infrastructure investments will allow the Company to ramp-up program achievements in alignment with ambitious State climate and energy goals.

The Company actively engages with stakeholders to improve program design and implement programs that cost-effectively meet the needs of customers and communities. The Company's current and planned REV demonstration projects and NWS, as well as innovative EE, system peak reduction, and EV programs, align with the shared goals of the Company, Commission, and stakeholders. These efforts will result in a more efficient consumption profile while continuing to provide reliable, safe, and sustainable energy service.

7) **A description of lessons learned to date from energy efficiency components of REV Demonstration Projects with specific plans for scaled expansion of successful business model demonstrations. In addition, provide a description of each hypothesis being tested as part of energy efficiency components of ongoing Demonstration Projects and the anticipated schedule for assessment.**

The Joint Utilities have identified two key mechanisms that can be used to boost customer participation and engagement in EE initiatives and enable new utility business models. The first is to provide customers with greater visibility into their energy use patterns and the wide variety of available products and services tailored to their energy needs. Con Edison's Connected Home demonstration project is an example of this strategy. The second mechanism is building specific awareness of EE opportunities through carefully crafted marketing strategies. These may include project-specific incentives for large C&I customers; distribution channel partnerships with Energy Service Companies ("ESCOs"), retailers, and contractors; new homeowner and school-based education and awareness initiatives; and targeted marketing to customers through the online marketplace platform, based on customers' usage patterns and specific energy needs.

Building on these findings, several successful business models tested in the Joint Utilities' REV demonstration projects will be expanded for permanent implementation. For example, after successful piloting in the Connected Home demonstration project, the HERs are now part of the residential EE portfolio and sent to 1.1 million customers.

Below Con Edison provides additional detail on its REV demonstration projects with significant EE components—Building Efficiency Marketplace and Connected Homes. Con Edison submitted both projects for approval on July 1, 2015. Con Edison filed implementation plans shortly after Commission approval and has been successfully executing those plans.

Building Efficiency Marketplace

The Building Efficiency Marketplace demonstration project uses a web-based portal, analytics, and a community of vendors to increase commercial customer engagement. The Company designed the project to examine how Con Edison can leverage data analytics to enable targeting and multi-channel engagement of commercial customers with high potential for EE savings and demand reduction. Con Edison developed a web-based portal (Energy Insights Portal) that allows customers to identify specific measure-level recommendations and develop potential projects via the Action Plans page. After developing a project in the Portal, customers are able to submit their project scopes to market partners through the Energy Insights Marketplace to elicit project proposals from market partners.

Figure 33 portrays the basic program delivery model.

Figure 33: Building Efficiency Marketplace Program Delivery Model

The Company is finding that this more personalized or "high-touch" outreach is the best method to engage commercial customers, who often have specialized needs and competing priorities. Through more direct discussions, Con Edison has expanded its understanding of commercial customer needs and unique challenges and is refining its technology offerings in response. The Company has also observed that the virtual energy assessments are reasonably accurate, but can be refined to be even more effective. [117]

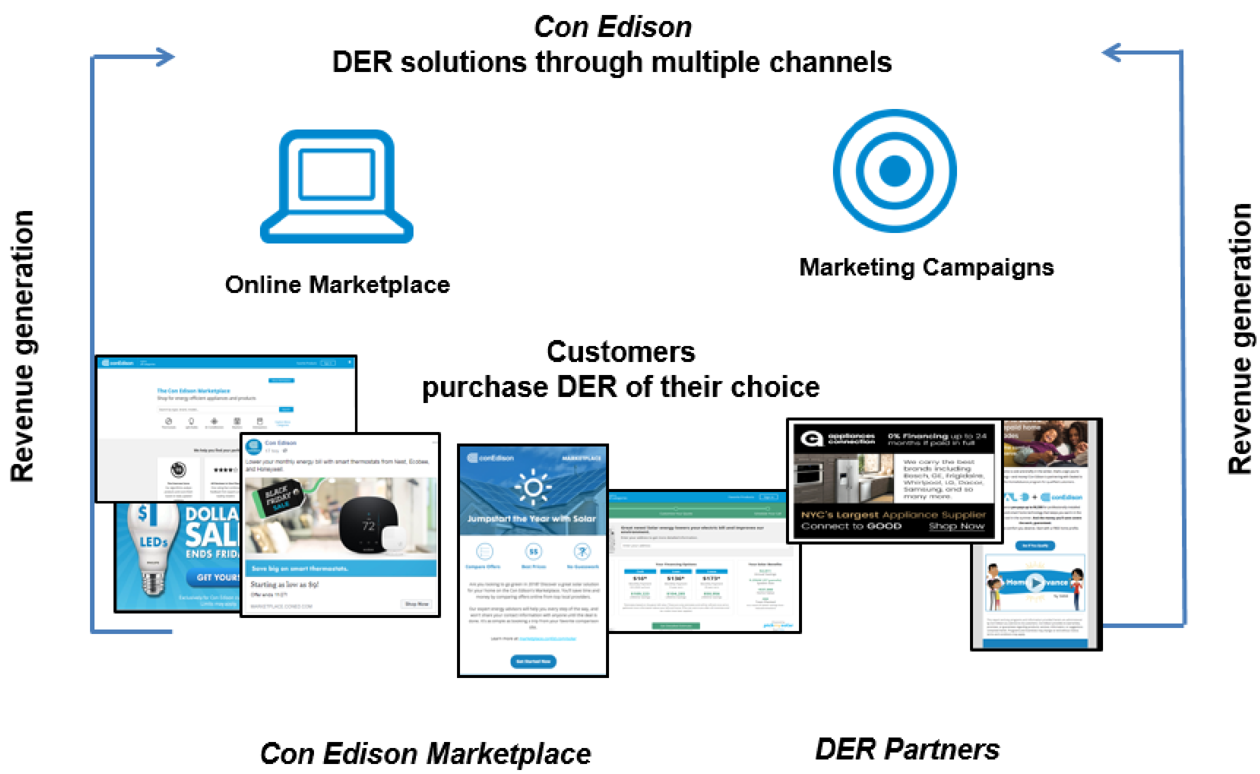
Connected Homes

The Connected Homes demonstration project provides residential customers with a set of tools designed to proactively connect them with cost-effective EE products and services, as well as DG offerings. It is designed to remove barriers to residential adoption of DER and animate the DER market.

[117] http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={6A520AC9-6873-42FC-9225-440B1A86992E}

The Connected Homes platform uses data analytics to match customers with specific DER solutions via an online marketplace (Con Edison Marketplace). On the Marketplace, customers can compare energy-saving products by energy score, price, and customer reviews. Customers can also apply for Con Edison appliance rebates, purchase small items such as LEDs, smart thermostats, and smart power strips, and receive instant rebates where applicable. Additionally, customers can receive bids for solar systems through a partnership with Pick My Solar, which is a solar concierge service aiming to simplify the experience of going solar. The figure below illustrates the basic program delivery model.

Figure 34: Con Edison Connected Homes Program Delivery Model



The demonstration project supports new business models by allowing the Company to generate revenue from third-party partners through a combination of strategies including lead generation, customer aggregation, and acting as a partner.

The Company successfully worked through Phase 0 (Project Development) and Phase 1 (Project Launch) and is now working through Phase 2 (Demonstration Implementation) and Phase 3 (Project Optimization). Throughout 2018, the project team will continue to optimize marketing efforts through a mix of emails, sweepstakes, and other digital channels to take advantage of seasonal events. Con Edison will adjust the mix dynamically to meet site traffic, sales volume, and revenue targets.[118]

The main activities for 2018 and 2019 include:

[118] http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={28B6C774-0A3B-4143-9852-669BAD2FDC5E}

- Expand the number and type of Marketplace product categories.
- Emphasize smart home products and applications, and integrate Con Edison's Smart Homes Hub Tool.
- Expand the solar marketplace to multifamily units (2-4) and add community solar functionality.
- Include partnerships with providers of home services offerings.
- Add bundled products and services such as EV chargers with installations.
- Include app that allows processing of appliance instant rebates at retailer sites.
- Add offerings for insurance/warranties for products.
- Test various channels of revenue business models.
- Assess customer feedback through Net Promoter Score and customer surveys.
- Expanded sponsorship opportunities across all marketing activities.
- Test two customer-centered design initiatives.

Additionally, the project team is exploring a range of new revenue opportunities for later in 2018, leveraging the Marketplace platform, including instant rebates for additional products and appliances, product warranties, and contractor services. Con Edison is evaluating these Marketplace offerings based on their ability to improve the customer experience, increase EE savings, and generate revenue to offset program costs.

In its quarterly reports, the Company identified several lessons learned from the various channels of customer engagement. The Company also analyzed results from the array of efforts deployed and made adjustments to the project in order to improve customer engagement, DER relationships, and to expand revenue models. The Company provides a summary of lessons learned below.[119]

HERs w/ Targeted Offerings

- Testing messaging variables is key to gaining a better understanding of what inspires customers to engage with the Company and with third-party partners. For instance, campaigns with messaging around "trending," "smart," and "comfort" drove significantly more engagement as opposed to messaging around "save," "control," and "waste."
- Digital forms of communication drive more leads and sales than HERs. HERs are an effective method for generating cost-effective behavior savings and for driving customer satisfaction; however, they are not as effective in driving leads and sales for third-party partners by including advertisement as part of the report content.
- Customer survey indicates 89 percent readership of HERs, 65 percent of customers are satisfied with the reports, and 34 percent of the customers are more satisfied with Con Edison as a result of receiving reports.

Marketplace

- Results indicated positive engagement as a result of the Marketplace emails.
- Traffic to the site relies significantly on regular marketing campaigns and through a variety of offerings.
- Improved segmentation of email lists results in higher open and conversion rates.

[119] REV Proceeding, Amendment to Implementation Plan (filed May 14, 2018), pp. 4-5.

- Marketplace is successful in promoting EE appliance rebates and serving as a channel to the rebate application process.
- Direct sales of small products (e.g., thermostats, LEDs, smart power strips) prove to be successful in generating energy savings and providing instant EE rebates.
- Revenue generation is challenging and requires a good deal of innovation and variety of strategies. In addition to earning a margin on sales of products, the Marketplace showed revenue potential in channels such as third-party advertisements and sponsorships, referral fees from retailers, and cost-per-click referrals.
- Campaign messaging impacts email click through rates. Customers seem to react better to simple, short and to the point messaging.

Additionally, based on lessons learned from multiple campaigns in Q1-2018, the project team determined that cross-promotions of different programs (e.g., a light bulb promotion that included a banner for solar) yielded significant additional engagement and lead generation. Additionally, the success of the third-party sponsorship in terms of conversions and open rates has led to additional effort being applied to add new sponsorship opportunities to editorial and educational emails. This approach will provide a new revenue stream and an additional channel to encourage energy savings by Con Edison customers.

8) Explain how the utilities are coordinating on energy efficiency to ensure diversity of both the models demonstrated and the technologies/methods employed in those applications.

The Joint Utilities have pursued a variety of REV demonstration projects focused on developing a better understanding of how to effectively deploy innovative EE programs. While the utilities are developing and implementing these EE demonstration projects independently, they have learned collectively from the different aspects of products and services that the projects have addressed, including online portals to connect customers with energy products and services, expansion of SHRs with accompanying home energy reporting capabilities, building efficiency initiatives, and incentive programs for demand reduction.

As part of their continuing coordination efforts, the Joint Utilities participate in a working group to share information regarding development and testing of new EE programs and strategies. These coordination efforts address topics such as distribution channel marketing, home energy reporting, online energy marketplaces, and SHRs. This coordination will inform current and future EE efforts, and help the utilities design a diverse portfolio of projects targeting a broad range of customers.

The Company also continues to work closely with NYSERDA, including through participating in NYSERDA's innovation sprints and providing solicitation information to NYSERDA's REV Connect portal.[120]

9) Describe how the utility is coordinating and partnering with NYSERDA's related ongoing statewide efforts to facilitate energy efficiency market development and growth.

The Company is working with NYSERDA to create innovative, market-stimulating partnerships that take advantage of each organization's strengths. This includes, but is not limited to, a pilot P4P program that leverages meter-based energy savings measurement, innovative project financing, and upstream incentives for heat pump technologies. The

[120] https://www.nyserda.ny.gov/All-Programs/Programs/REV-Connect

Company will continue this close coordination with NYSERDA and other stakeholders to facilitate EE market development and growth.

The Company has also developed a “co-invest, co-save” model with NYSERDA to pursue and enhance partnerships on programs, in order to offer complementary and non-duplicative efforts and programs that result in enhancing EE adoption and transforming EE markets. The Company achieves this coordination through regular communication and meetings between specific EE and DM program managers and other subject matter experts.

2.7. DISTRIBUTION SYSTEM DATA

Context and Background

The REV initiative emphasizes the role of system data in facilitating market development and greater DER adoption.[121] Con Edison's 2016 Initial DSIP served as an initial vehicle for sharing system information for these purposes. That document included extensive discussion on then-current practices and presented several datasets the Commission identified as essential for improving the transparency of utility planning and operations and aiding market growth. The Company's 2018 DSIP continues this data sharing by providing load and energy forecasts (Appendix A) and information on how to access additional system data.

Since the Initial DSIP, Con Edison has made available significant amounts of system data through the Company's online data portal, which is accessible through the DCX web interface and linked from the Joint Utilities central data portal. This data provides greater transparency into areas of the Company's system that present high value for DER interconnection, greater insight into areas with potentially lower interconnection costs, and greater visibility into system characteristics and needs, all of which foster DER market development.

Con Edison, working with the Joint Utilities, continues its commitment to increase the amount of data that is available, make it easier to access system data both across the utilities and within individual utility online portals, and support stakeholder data needs. The Joint Utilities System Data Working Group continues to engage stakeholders on the use cases for system data, identify additional datasets to share, and respond to stakeholder requests to improve ease of access to system information.

Implementation Plan, Schedule, and Investments

Current Progress

Summary of Achievements

- Established online data portal to provide advanced levels of Con Edison system data.
- Worked with the Joint Utilities to establish a central portal for utility system data.
- Increased the system data available through the hosting capacity map, which provides a single point of reference for relevant system data, including 8,760 forecasts at the network level and queued and connected DG.
- Continued discussions with stakeholders to identify the range of system data currently available and to better understand who is using the data, for what purposes, and how often, in order to prioritize future enhancements.

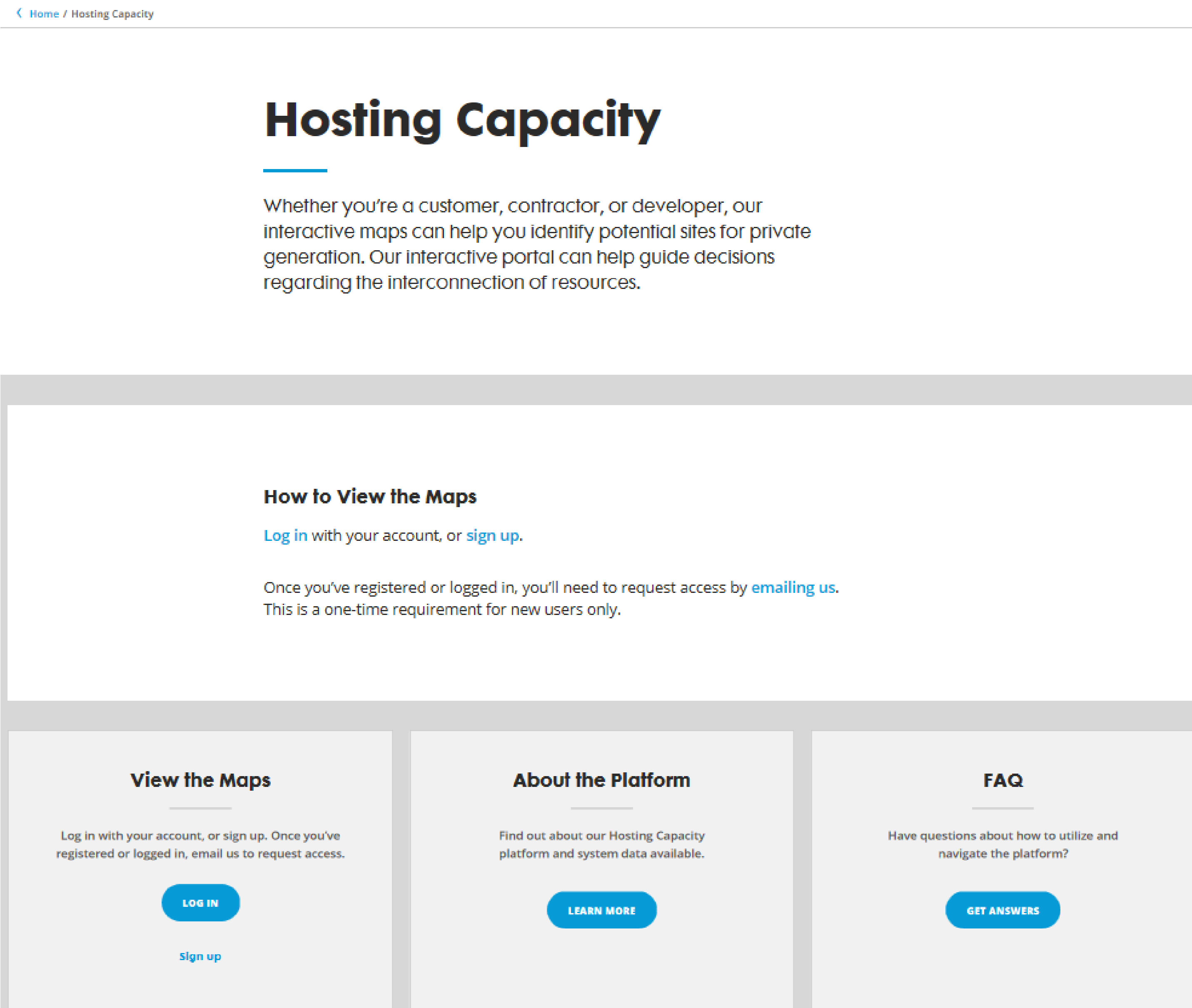
Con Edison currently provides extensive system data as part of the hosting capacity platform within the system data

[121] System data broadly includes grid information such as load data, real and reactive power consumption, power quality, reliability; information on planned capital projects, beneficial locations, and hosting capacity; and other system characteristics.

portal. Interested parties can locate the data portal and hosting capacity map through multiple channels, including Con Edison's DSP website,[122] the Joint Utilities' website,[123] and internet searches. Con Edison's DSP website is the entry point to the Company's hosting capacity platform, which allows users to access relevant system data by location. Figure 35 shows how the hosting capacity home page links to background information on calculation methods and site use instructions on how to access the available system data. [124]

[122] *See* https://www.coned.com/en/our-energy-future/our-energy-projects/distribution-system-platform
[123] *See* http://jointutilitiesofny.org/system-data/
[124] *See* https://www.coned.com/en/business-partners/hosting-capacity

Figure 35: Con Edison Hosting Capacity Home Page



Using the hosting capacity map, a developer can view and download 8,760 load profiles for a particular network, which gives the developer an indication of the duration of peak and off-peak periods. The hosting capacity map also provides substation-level data requested by stakeholders, including queued and connected DG, as Figure 36 shows below.

Figure 36: Substation Level System Data

Substation Level System Data: Circuit 6262	
Substation Name	BROWNSVILLE NO.2
Substation Connected DG (MW)	6.91
Substation Queued DG (MW)	5.72
Substation Total DG (MW)	12.62
2017 Substation Peak (MW)	342.00
Substation Refresh Date	04/06/2018

Third parties can also access system data from a central portal maintained by the Joint Utilities. The central portal includes company-specific links to an expanded range of useful information, including:

- DSIPs
- Capital investment plans
- Planned resiliency and reliability projects
- Reliability statistics
- Hosting capacity
- Beneficial locations
- Load forecasts
- Historical load data
- NWS opportunities
- Queued and installed DG
- SIR pre-application information

Con Edison has engaged stakeholders to understand their current and future needs regarding access to system data. Based on feedback, Con Edison has found that stakeholders are generally satisfied with the level of system data currently available as it relates to their current needs, and that the most incremental value in making enhancements is in further refining data visualization and formats.

Summary of Future Actions
• Work with the Joint Utilities System Data Working Group to continue focusing on updates to and consistency of individual utility data portals, as well as refining and/or expanding system data use cases to better meet stakeholder needs. • Work with the Joint Utilities to evaluate the system data requested as part of the Energy Storage Roadmap. • Coordinate with stakeholders and the Customer Data Working Group to advance the definitions and implications of basic and value-added system data and customer data.

Con Edison will continue to enhance its system data portal and the data that is available within it. Section 2.12 on hosting capacity discusses how the Company is leveraging the hosting capacity platform to provide a more comprehensive and useful view of the factors influencing project success, including overlaying visualization of LSRV and NWS solicitation areas with hosting capacity data. This is part of the Company's efforts to facilitate DER deployment and improve the information available for developer analysis and business use cases.

Con Edison will continue to engage in the System Data Working Group, which is focusing on updates to and consistency of online portals and refining and/or expanding system data use cases to better meet stakeholder needs, as well as discussing the additional datasets requested as part of the Energy Storage Roadmap.[125] The Joint Utilities will also continue engaging stakeholders on business use case discussions. These discussions provide a forum for further dialogue around potential value-added information, such as improved access to more refined datasets the Company can develop through analysis or analytic applications. This may offer a more valuable alternative to stakeholders compared to directing business developers to the basic data resources, where they need to derive the required information on their own. Some use case discussions identified that some of the requested information may already exist or the Company could easily create it without requiring additional effort and cost to the utilities and their customers. The System Data Working Group will continue to coordinate with stakeholders and the Joint Utilities Customer Data Working Group to advance the definitions and implications of basic and value-added system data and customer data.

Risks and Mitigation

The Company will work with stakeholders to meet their system data needs, while maintaining security. The Company has adapted existing tools for data creation and exchange, which may not perfectly align with a data sharing use case. The scoping of future systems, such as GIS and DERMS, includes the collection and sharing of system data. Integrating these systems and bringing them to full functionality is a complex process that could be subject to delays during implementation. The Company is investing significant time and resources at the outset of project scoping to understand the use cases and build a detailed project plan that includes risk management.

The Company also recognizes the risks associated with malicious software attacks and maintains a comprehensive cybersecurity program as outlined in Section 2.9 of this filing. This program is designed to protect Company computers,

[125] Energy Storage Proceeding, Energy Storage Roadmap, pp. 61-62.

servers, business applications and data, and high-value networks from unauthorized access and control from both external and internal threats.

Stakeholder Interface

Con Edison, with the Joint Utilities, continued discussions with stakeholders in 2017 and 2018, building on discussions initiated in 2016. To raise awareness of the significant amount of system data already available, during the first stakeholder engagement session in April 2017, the Joint Utilities presented an overview of publicly available system data, informing stakeholders of the types, format, and granularity of information currently available, and how to locate the information. This included a discussion of Con Edison's previously established DSP online portal for obtaining system data. The Joint Utilities also solicited feedback on the current system data inventory, the types of data made available, and the ease of access.

Stakeholder feedback underscored the need for improved ease of access to system data through a centralized utility data portal. In response, in June 2017, the Joint Utilities published a central portal containing links to utility-specific websites with available system data (https://jointutilitiesofny.org/system-data/).

The Joint Utilities also sought to better understand who is using the data, for what purposes, and how often. Following the April 2017 stakeholder engagement session, the Joint Utilities met with interested stakeholders for one-on-one conversations framed around developer use case examples. As an outcome of these discussions, the Joint Utilities have greater clarity on what constitutes the "need to have" and "nice to have" data that enables each use case. The discussions also highlighted the volume of requested information that is already publicly available, but previously may not have been easily accessible. To improve accessibility, the Joint Utilities website now provides web links to locations where developers can find all the "need to have" pieces of information requested, with the understanding that the level of granularity may vary across utilities. In parallel, the Joint Utilities have been able to dive deeper into the specificity of the information requested by developers and the business reasons behind the requests, and subsequently have made progress in providing additional information that is of greater value to developers.

The use case discussions also provided a way to share with stakeholders why certain information may have a low probability of being shared. For example, stakeholders requested data on conductor size, but because utility planning models embed this information, it is not readily available for public consumption. Further discussion may be needed if this becomes a "need to have" piece of data, which will include discussion around the potential to provide it as a value-added service.

Additional Detail

This section responds to the questions specific to distribution system data.

1) Identify and characterize each system data requirement derived from stakeholder input.

Throughout 2017 and 2018, Con Edison, as part of the Joint Utilities System Data Working Group, engaged stakeholders in one-on-one discussions to better understand use cases and determine any existing gaps in system data or areas of future improvement. These discussions revealed that stakeholders were generally satisfied with the data elements Con Edison's system data portal currently provides; most inquiries focused on the ability to download the data and its presentation rather than the content itself.

Stakeholders expressed a preference for geographic representation as a way to more readily identify potential beneficial locations, as opposed to raw datasets available on a website. Once developers focus on an area, they want to be able to access all relevant system data for that location. In response, Con Edison linked system data elements to the associated data pop-up boxes that the hosting capacity maps display when navigating substation, network, and feeder levels. Many developers and third parties found that the ability to layer multiple elements of information, such as NWS areas and available hosting capacity, can help fine-tune and accelerate searches for beneficial locations.

2) Describe in detail the resources and methods used for sharing each type of distributionsystem data with DER developers/operators and other third parties.

Con Edison currently provides extensive system data as part of the hosting capacity platform within the system data portal. Interested parties can access the data portal and hosting capacity maps through the DCX web interface,[126] the Joint Utilities' central data portal website,[127] and internet searches. The hosting capacity home page[128] provides background information on calculation methods and site use instructions.

Table 17 summarizes the data available in the hosting capacity platform and, for each data element, the format in which users can download or export it.

Table 17: Format of Available System Data

Data	Format
24 hour peak and minimum load duration curves (by network)	PDF
8,760 hourly load forecast data (by network)	Excel file
Substation weather-adjusted peak for prior year	Hosting Capacity data box
Aggregated DG values available for both queued and installed projects by substation and feeder	CSV file

The Company provided 8,760 historical actual load data until the Company started providing 8,760 hourly load forecast data. Additionally, the Company's 2018 DSIP shares load and energy forecasts, including DER forecasts, and potential NWS candidates.

3) Describe where and how DER developers and other stakeholders can readily access,navigate, view, sort, filter, and download each type of shared distribution system data.

See response to 2) above.

4) Describe how and when each type of data provided to DER developers/operators andother third parties will begin, increase, and improve as work progresses.

Con Edison's hosting capacity map currently provides:

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[126] *See* https://www.coned.com/en/our-energy-future/our-energy-projects/distribution-system-platform
[127] *See* http://jointutilitiesofny.org/system-data/
[128] *See* https://www.coned.com/en/business-partners/hosting-capacity

- Network and non-network hosting capacity analysis.
- Network-level 24-hour peak load and minimum load duration curves.
- 8,760 hourly load forecasts at the network level.
- Substation connected and queued DG.
- Aggregated DG values for both queued and installed projects by substation and feeder (overhead).
- Weather-adjusted peak for prior year.

Based on stakeholder feedback, stakeholders are generally satisfied with the level of system data currently available. They expressed that the most incremental value is in further refining data visualization. Con Edison and the Joint Utilities will continue to engage stakeholders through one-on-one discussions to understand and meet evolving system data needs. For example, the Company continues to refine hosting capacity at the sub-circuit level and provide more granular system data in NWS solicitations. Additionally, the Company recognizes the need to incorporate data use cases into the future of grid planning tools (i.e., DERMS), so as to refine accuracy and continue to reduce the effort needed to produce the data.

5) Identify and characterize the use cases which involve third party access to sensitive distribution system data and describe how the third party's needs are addressed in each case.

As discussed above, Con Edison provides a wealth of system data to assist DER developers in opportunity identification, business planning, and project scoping. The available data appears to be largely meeting developer needs, making the provision of sensitive distribution system data, such as utility planning models, unnecessary. Further, this proprietary data requires significant expertise and experience to properly interpret and apply. Should a third party require specific sensitive distribution system data or models for legitimate business purposes, Con Edison may provide that data to the requesting third party under the terms of a Non-Disclosure Agreement ("NDA"). For example, Con Edison provided models to academic institutions under an NDA to facilitate their participation in the NY-SUN program.

6) Identify each type of distribution system data which is/will be provided to third parties and whether the utility plans to propose a fee.

Third parties can also access system data from a central portal maintained by the Joint Utilities. The central portal includes company-specific links to an expanded range of useful information, including:

- DSIPs
- Capital investment plans
- Planned resiliency and reliability projects
- Reliability statistics
- Hosting capacity
- Beneficial locations
- Load forecasts
- Historical load data
- NWS opportunities
- Queued and installed DG
- SIR pre-application information

Within the hosting capacity map, Con Edison provides:

- Network and non-network hosting capacity analysis.
- Network-level 24-hour peak load and minimum load duration curves.
- 8,760 hourly load forecasts at the network level.
- Substation connected and queued DG.
- Aggregated DG values for both queued and installed projects by substation and feeder (overhead).
- Weather-adjusted peak for prior year.

At this time, the Company has not identified additional types of distribution system data that it would offer for a fee.

7) Describe in detail the ways in which the utility's means and methods for sharing distribution system data with third parties are highly consistent with the means and methods at the other utilities.

The Joint Utilities' stakeholder engagement sessions in 2016 identified the desire for and broad value of information, and how the utilities could work to enhance what information is provided. In response to stakeholder feedback, the Joint Utilities developed a central data portal on the Joint Utilities' website in June 2017 with links to utility-specific web portals with available system data. The Joint Utilities' website (https://jointutilitiesofny.org/system-data/) includes utility-specific links to an expanded range of useful information.

This new Joint Utilities web portal, in addition to hosting the links to the enhanced utility-specific web portals, has increased access to and improved the usability of useful stakeholder-requested information. The Joint Utilities have advanced their efforts to release additional data in more accessible formats and stakeholders now have a better understanding of the data currently available through utility-specific web portals. This data provides greater transparency into locations on the distribution system where DER integration may have higher value relative to other locations, greater insight into areas with potentially lower interconnection costs, and greater visibility into system characteristics and needs, which fosters market development.

Through the business use case work, and in response to stakeholder comments, the Joint Utilities are evolving the system data effort to focus more on user experience, data presentment, and potentially more analytic information presentment. The discussions around business use cases have identified the volume of requested information that is already publicly available, but previously may not have been easily accessible. As a result, the Joint Utilities have enhanced the accessibility and similarity of the information provided, with the understanding that granularity may vary across utilities. In parallel, the Joint Utilities have been able to delve further into the specificity of the information requested by developers and the business reasons behind the requests, and subsequently have made progress in providing additional information that is of greater value to developers.

The Joint Utilities System Data Working Group will continue focusing on updates to and consistency of individual utility data portals, as well as refining and/or expanding system data use cases to better meet stakeholder needs. The Joint Utilities will also continue engaging stakeholders on business-use case discussions, which will also continue to provide a forum for further dialogue around potential value-added information by improving access to more refined "information sets" developed through analysis or analytic applications. This may offer more value to stakeholders when compared to directing business developers to the basic data resources they need to derive the needed information on their own. Some of the use-case discussions highlighted that some of this information may already exist or the utilities could easily create it without requiring additional effort and cost to the utilities and their customers.

8) Describe in detail the ways in which the utility's means and methods for sharing distribution system data with third parties are not highly consistent with the means and methods at the other utilities. Explain the utility's rationale for each such case.

See response to 7) above. The utilities have worked together to be consistent in the datasets and formats available to third parties.

2.8. CUSTOMER DATA

Context and Background

The availability of customer data is critical to the success of market development under REV. Providing customers with more granular and timely usage and cost data improves energy literacy and empowers customers to make better energy choices. Improved access to customer data can help DER developers and third parties tailor their products and services and conduct well-informed business prospecting. Finally, customer data can help local governments, State agencies, and academic institutions to analyze impacts of policies and create action plans. For these reasons, Con Edison supports easier access to more comprehensive data for customers and third parties with the appropriate privacy and cybersecurity protections.

Customer data can be customer-specific or aggregated, such as at the building or community level. Con Edison, with the Joint Utilities, has been actively exploring ways to improve access to customer-specific and aggregated data to support market development, while also protecting customers' privacy. Based on discussions with stakeholders, Con Edison and the Joint Utilities have pursued a middle course that provides useful information that meets the needs of most stakeholders while securing customer information.

Substantial levels of customer data have been made available to customers and third parties since Con Edison's 2016 Initial DSIP. For example, customer-specific data is now available through GBC and DER providers can access customer data through EDI transactions.[129] As required by the Commission, the Company also extended its EDI platform to DER providers to offer an additional machine-to-machine option for third-party data access.[130] Historically, EDI has been the mechanism for sharing data with ESCOs for purposes of retail access.[131] As of late 2017, DER providers also have access to EDI, subject to the Uniform Business Practices ("UBP") and satisfaction of applicable registration requirements.[132] The many data fields available through EDI include service address, electric account number, customer's number of meters and meter numbers, usage type, and electric interval data for customers with smart meters.

> *GBC*
>
> GBC is a nationwide protocol that provides a process for customer authorization, data transfer, and standardized data formatting for sharing data.
>
> Third parties who register with the Company to receive data this way—and successfully complete the technical onboarding process—are automatically presented to customers as eligible for data sharing.
>
> Once a customer provides proper authorization, the exchange of data with the third party is fully automated and does not include any personally identifiable information ("PII").

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[129] https://www.coned.com/en/accounts-billing/share-energy-usage-data/share-my-data

[130] Case 15-M-0180, *In the Matter of Regulation and Oversight of Distributed Energy Resource Providers and Products* ("DER Proceeding"), Order Establishing Oversight Framework and Uniform Business Practices for Distributed Energy Resource Suppliers (issued October 19, 2017) ("UBP-DERS Order"), p. 28.

[131] ESCOs can also access customer data via the Retail Access Information System, a web interface that displays account-level information.

[132] https://www.coned.com/en/business-partners/become-electronic-data-interchange-certified-distributed-energy-resource-supplier

Con Edison is also making aggregated customer data more widely available by providing it to NYSERDA's UER. The UER is an online platform being developed by NYSERDA that will provide streamlined public access, subject to privacy standards, to aggregated data for electricity and natural gas customers, segmented by customer type and municipality, zip code, or county (depending on location). The UER will support energy and community planning across New York State. Third parties can leverage UER data in combination with system data to develop and better target innovative products and services. Con Edison will continue to provide aggregated data to NYSERDA for the UER twice a year. The Company also offers aggregated whole-building data[133] and CCA program data[134] upon request.

The Company takes protection of customer information, including personally identifiable information ("PII") and customer usage data, seriously. For customer-specific data, the Company does not share information without customer consent to third parties except where required by Commission order, such as with CCA, or shared with utility contractors and vendors to carry out utility EE programs or fulfill other Company business. For all GBC and EDI transactions, the Company requires all parties to execute a Data Security Agreement ("DSA") and submit a Data Self-Attestation prior to receiving customer data. The self-attestations are designed to expeditiously identify any material gaps in current best practice cybersecurity controls. [135] The DSA is also used in conjunction with CCA data requests to protect customer data.

The Company gives customers choices in how their information is used and disclosed to third parties, as outlined in the Con Edison Privacy Statement.[136] Specifically, customers may unsubscribe from the list of customer information that the Company shares with third parties, unsubscribe directly from any emails sent to them by other third parties, or call the Company at 718-802-6079 to unsubscribe. In the GBC platform, customers control which third parties have permission to receive their data, what information is received, and how long the data is made available to individual third parties. Customers utilizing the GBC platform can also opt to receive a monthly report with the names of third parties accessing their account information through GBC and number of times the third party has accessed their information through GBC.[137]

For aggregated customer data, the Company continues to work with the Joint Utilities and other stakeholders to find a balance between sharing customer data, particularly energy usage, and providing sufficient anonymity to maintain customer privacy. This is relevant in the context of specific requests for aggregated data and public access to aggregated data through the UER.

The Company's efforts are informed by continued collaboration with the Joint Utilities and ongoing discussions with stakeholders. During the prior two years, the Joint Utilities, as part of the Customer Data Working Group, have advanced several customer data efforts, including:

- Submitted several joint filings on customer privacy standards and approaches.
- Defined datasets and costs in support of CCA efforts through development and filing of CCA tariffs.
- Worked with DPS Staff and NYSERDA on development of the UER and appropriate privacy standards.
- Evaluated potential opportunities for aggregated data automation.

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[133] https://www.coned.com/en/commercial-industrial/aggregated-building-energy-consumption-data
[134] https://www.coned.com/en/business-partners/become-a-supply-partner/community-choice-aggregation
[135] Case 18-M-0376, *Proceeding on Motion of the Commission Regarding Cyber Security Protocols and Protections in the Energy Market Place*, Order Instituting Proceeding (issued June 1, 2018).
[136] https://www.coned.com/en/conedison-privacy-statement
[137] This functionality is not available on the EDI platform.

- Solicited feedback from stakeholders to inform future customer data needs and means of accessing that information.
- Participating in proceedings, such as the Cyber Security in the Energy Market Place proceeding, to address emerging data security threats.

Implementation Plan, Schedule, and Investments

Current Progress

Summary of Achievements

- Provided easier access to expanded range of customer-specific data through implementation of GBC Phase I.
- Customers with smart meters can access and download their near-real time energy usage (i.e., 30-45 minutes after the interval ends).
- Established a process to help DER providers navigate the technical and procedural requirements of EDI access.
- Developed a central landing page for prospective CCAs that outlines the process and requirements for receiving aggregated customer data.
- Launched a web service that automatically imports aggregated whole building data directly into the Portfolio Manager® benchmarking tool.
- Proposed data privacy standards that attempt to balance meeting clean energy objectives with customer protection.

The Company continues to increase the breadth and granularity of customer data available and expand methods of accessing data. Ongoing investments in AMI, GBC, and other digital platforms are resulting in more data being available in a format that is more usable to third parties, thus supporting market development. As discussed below, the Company finalized Phase I of GBC implementation and is on track to complete Phase II by the end of 2018. The Company is also providing guidance and support to third parties on how to register for data access and receive data through GBC and EDI.[138] To facilitate building benchmarking, the Company launched a web service that automatically imports building data directly into Portfolio Manager®, which is the U.S. EPA's online tool for benchmarking energy and water consumption compared to similar buildings nationwide.[139]

Customer-Specific (Non-Aggregated) Data

As part of the Company's AMI deployment and Customer Engagement Plan,[140] the Company is improving the customer experience through enhancements to Con Edison's website and other communication tools and implementing GBC to

[138] https://www.coned.com/en/business-partners/access-customer-data
[139] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager
[140] Con Edison 2015 Electric Rate Case, AMI Customer Engagement Plan (filed July 29, 2016) ("AMI Customer Engagement Plan").

improve its customer data sharing capabilities. In addition to website, texting, e-mail, and apps enhancements, as of mid-July 2018, customers with smart meters can access and download their near-real time energy usage (i.e., 30-45 minutes after the interval ends).

By using a phased approach to implementing GBC, Con Edison is able to incorporate best practices and lessons learned from other utilities that have implemented GBC. The first phase of GBC implementation was completed in December 2017, in coordination with O&R, under the branding of Share My Data.[141] Share My Data allows customers to authorize registered third parties to access their energy data through an automated process in machine-readable format. Datasets available include meter number, energy or net energy usage data (kWh, net kWh, ccf), and reactive power (kVAR). Third parties can access 15-minute interval data for residential customers with smart meters and 5-minute interval data for commercial customers with smart meters.[142] Share My Data provides up to 24 months of data, currently at a one-day lag, with plans to provide near-real time (i.e., 30-45 minutes after the interval ends) usage data to third parties by the end of 2018.

Con Edison began onboarding interested third parties to GBC in February 2018. This process includes completing an online registration form, DSA, and Data Self-Attestation, as well as completing technical onboarding on the system. After completing onboarding, the third party is listed as a DER provider option on the customer's My Account page and is ready to be authorized by a customer to receive their data. As of July 1, 2018, 16 third parties have expressed interest in accessing GBC and 3 have initiated the technical onboarding process and submitted materials.

On October 2, 2017, Con Edison and O&R filed their GBC Phase II Report,[143] which outlined the additional datasets to be provided through the platform, as discussed below. Customers will have the choice to authorize access to the new datasets as part of their third-party authorization.

The Company's Initial DSIP included a commitment to offer a new data exchange for interested ESCOs to access their customers' usage information, using the same RESTful Application Program Interfaces ("APIs") developed for the GBC tool as a foundation.[144] These APIs will be available to ESCOs by the end of 2018 and include all of the datasets available to third parties through Share My Data, including near-real time interval data.

As mentioned above, authorized DER providers now can receive customer data through EDI transactions. To help DER providers navigate the technical and procedural requirements of EDI data access, the Company established a process for authorizing DER providers and launched a webpage that describes the testing and authorization process that must be properly completed to access customer data through EDI.[145] Testing includes the exchange of connectivity information, submission of a statement of EDI readiness, connectivity testing, and transaction set testing.

Aggregated Customer Data

The primary intended use cases for aggregated customer data within Con Edison's service territory are building benchmarking, compliance with Local Laws 84 and 133 requirements in New York City, prospecting for CCA programs,

[141] https://www.coned.com/en/accounts-billing/share-energy-usage-data/share-my-data
[142] Customers with legacy interval meters will also able to share their data using GBC.
[143] Con Edison 2016 Electric Rate Case, Consolidated Edison Company of New York, Inc. and Orange and Rockland Utilities, Inc. Green Button Connect My Data® Phase II Report (filed October 2, 2017) ("GBC Phase II Report").
[144] DSIP Proceeding, Initial DSIP, p. 197.
[145] https://www.coned.com/en/business-partners/become-electronic-data-interchange-certified-distributed-energy-resource-supplier

and community planning. The Company has taken many steps to facilitate the provision of aggregated customer data. For example, the Company has developed a central landing page for prospective CCAs that outlines the information municipalities or the CCA administrator issuing the RFP must provide to receive the aggregated data and the process for approved aggregators to receive the data. Once an energy supplier is selected and under contract with a Commission-approved CCA program, the approved ESCOs may begin receiving customer-specific information (i.e., customer name and address) for eligible CCA customers to implement the opt-out enrollment process in conjunction with the CCA administrator.[146]

Additionally, Con Edison launched a web service that automatically imports aggregated whole-building data directly into Portfolio Manager®. After a building owner creates a Portfolio Manager® account and requests property-specific information via the Company website,[147] Con Edison will automatically upload the building's energy consumption via Portfolio Manager® Data Exchange, which feeds into the benchmarking tool. This service is intended to minimize the level of effort required to comply with New York City Local Laws 84 and 133.

Privacy Standards and Protocols for Sharing Customer Data

The Company continues to collaborate with the Joint Utilities, stakeholders, and DPS Staff to strike the right balance between advancing clean energy objectives and maintaining customer privacy and data security, using actual data user needs and requests to inform proposed privacy standards. For example, as part of the Customer Data Working Group, the Joint Utilities developed a common process for tracking aggregated data requests and responses. This information is used to catalog non-standard aggregations requested by stakeholders and identify additional high-value aggregated customer datasets.

As the Joint Utilities continue to make more customer data available, they share the Commission's interest and long-standing policy of protecting the confidentiality of customer information and carefully evaluating disclosure exceptions on a case-by-case basis.[148] The protection of customer information, including (but not limited to) energy usage data, account numbers, assistance program participation, and PII, is part of each utility's core responsibilities and commitment to its customers.

<u>Data Privacy Standard for Aggregated Data</u>

The Commission adopted a 15/15 privacy standard for general aggregated datasets, including data provided for purposes of community planning and CCA programs. A 15/15 standard requires that an aggregated dataset may be shared only if it contains at least 15 customers, with no single customer representing more than 15 percent of the total load for the group. The Commission acknowledged that the 15/15 standard is conservative and directed the Joint Utilities to track all aggregated data requests and be prepared to report on the number of requests that do not clear the 15/15 standard.[149]

To date, the number of aggregated data requests has been very limited, with the exception of building benchmarking-driven requests in the New York City area. The Joint Utilities will continue to track aggregated data requests as they

[146] https://www.coned.com/en/business-partners/become-a-supply-partner/community-choice-aggregation
[147] https://www.coned.com/en/commercial-industrial/aggregated-building-energy-consumption-data
[148] Cases 07-M-0548 *et al.*, *Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio,* Order on Rehearing Granting Petition for Rehearing (issued December 3, 2010), pp. 3-5, 17-21.
[149] DSIP Proceeding, DSIP Order, pp. 26-27.

arise, and will use the inventory process to track instances where some or all of a requested aggregated data set do not pass the applicable privacy standard.

On December 15, 2017 the Commission issued a notice requesting additional comments on privacy standards for aggregated datasets, particularly relating to data publicly available through the UER. The Joint Utilities collectively filed comments supporting UER implementation and requesting a consistent privacy standard screen for all aggregated customer datasets, including the UER. The privacy standard would include a two-part test consisting of customer count and usage percentage thresholds. The Joint Utilities also proposed a high-level methodology to apply when datasets failed the privacy standard. On April 20, 2018, the Commission issued the *Order Adopting Utility Energy Registry*,[150] directing the utilities to report to NYSERDA by July 30, 2018 aggregated data for each zip code (for New York City), municipality, and county for the UER groupings of Residential, Small Commercial, and Other, subject to the aggregation standard of 15/15 for Residential and 6/40 for Small Commercial and Other Groups.

<u>Data Privacy Standard for Whole-Building Aggregated Data for Building Energy Management and Benchmarking</u>

The Joint Utilities proactively engage with stakeholders to share their proposals for aggregated customer data and progress in improving the types of data available and the process for accessing customer specific data with proper customer authorization. In addition, the Customer Data Working Group hosted one-on-one conversations with DER developers to better understand their data needs, share current practices, and inform their future data sharing plans.

The Commission required the Joint Utilities to propose building energy management and benchmarking data standards for the Commission's consideration.[151] On June 7, 2017, the Joint Utilities proposed a 4/50 privacy standard as the basis for utilities providing whole-building aggregated data to building owners or their authorized agents. The 4/50 privacy standard requires the building to have at least 4 accounts where no single account represents 50 percent or more of the annual energy use of the building. Building owners that must comply with existing laws and ordinances, such as Local Laws 84 and 133 in New York City, are exempt from the privacy standard. In addition to the privacy standard for whole building data, the requestor must agree to the Joint Utilities' uniform terms and conditions before data can be requested.

Stakeholders filed comments in October 2017, with some stakeholders voicing support for the 4/50 privacy standard and others offering alternative proposals. On April 20, 2018, the Commission adopted the 4/50 privacy standard for whole building data aggregation, as proposed by the Joint Utilities on the June 7, 2017 filing, and directed the utilities to file proposed uniform data access terms and conditions by June 19, 2018.[152] The Joint Utilities filed proposed terms and conditions for building owners or their agents to obtain aggregated whole building data on June 19, 2018.[153]

[150] Cases 17-M-0315 *et al.*, *In the Matter of the Utility Energy Registry,* ("UER Proceeding"), Order Adopting Utility Energy Registry (issued April 20, 2018).
[151] *Id.*, p.28.
[152] DSIP Proceeding, Order Adopting Whole Building Energy Data Aggregation Standard (issued April 20, 2018).
[153] DSIP Proceeding, Joint Utility Aggregated Whole Building Data Terms and Conditions (filed June 19, 2018).

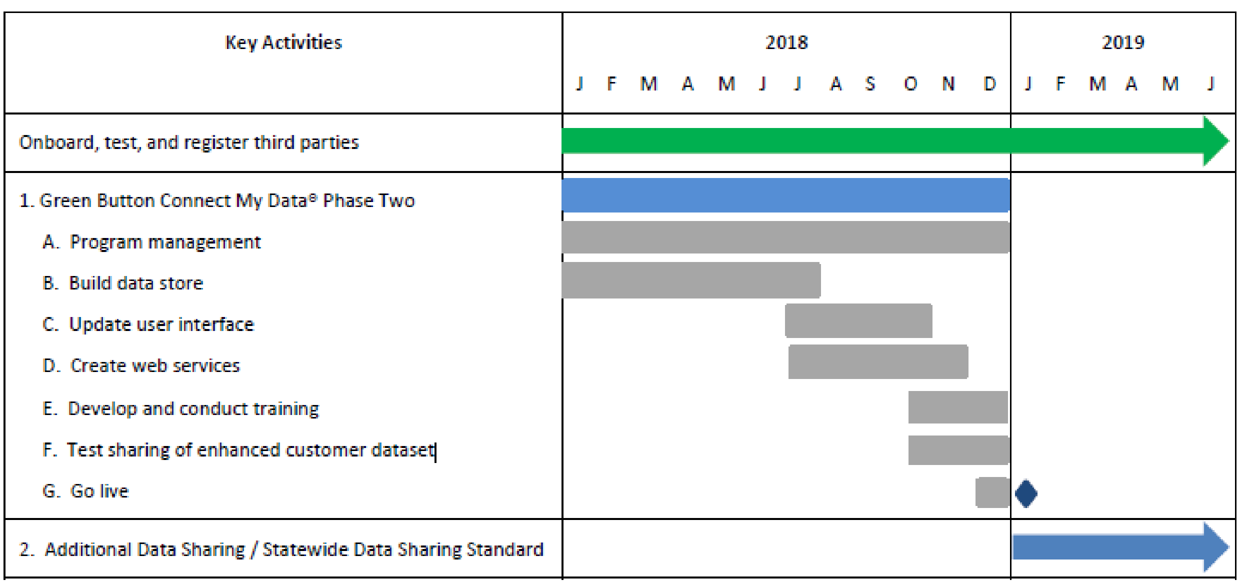
Summary of Future Actions

- Provide near-real time data (i.e., 30-45 minutes after the interval ends) to authorized third parties by the end of 2018.
- Implement GBC Phase II by the end of 2018, which will expand available datasets.
- Further refine GBC, including consideration of additional datasets and exploring potential functional improvements.
- Engage stakeholders, in collaboration with the Joint Utilities and the Customer Data Working Group, to continue expansion of the statewide data sharing standard for implementing GBC Phase II.
- Provide aggregated community-level data to NYSERDA in support of the UER.
- Monitor ongoing proceedings or groups related to customer data.

The Company will continue to enhance its data-sharing capabilities, while complying with approved customer-data protections. Additionally, the Company is moving forward with GBC Phase II, which is currently scheduled to go live by the end of 2018. Phase II is an incremental, no-regrets step toward broader evolution of New York's statewide data sharing standard. Phase II will expand the datasets automatically available to registered third parties, including electric and gas utility bill costs per billing period (current and previous), customer account number, service address, ICAP tag, demand (kW), and tariffed service classifications.

Figure 37 shows the phased implementation of GBC Phase II.

Figure 37: GBC Phase II Implementation Timeline



The provision of additional datasets beyond Phase II will depend on customer and third-party feedback, evolution of New York's statewide data sharing standard, changes to national GBC specifications, and technological developments. The Company will continue to engage stakeholders, in collaboration with the Joint Utilities and the Customer Data

Working Group, to identify and evaluate additional customer datasets to support customer choice, the development of DER markets, and broader REV objectives. The Joint Utilities plan to hold another customer data stakeholder engagement session in 2018 to provide updates on the Customer Data Working Group activities and implementation plans, educate stakeholders on the available methods to access customer data, and gather feedback to continue to improve processes and datasets.

Finally, the Company remains committed to working with third parties to expand access to customer data with the appropriate customer protections. The Customer Data Working Group will continue to monitor the ongoing customer data related proceedings, such as:

- Retail Access (Case 12-M-0476)
- DSIP (Case 16-M-0411)
- CCA (14-M-0224)
- UER (17-M-0315)
- VDER (15-E-0751)
- Clean Energy Fund (14-M-0094)
- Comprehensive EE Initiative (18-M-0084)
- Cyber Security in the Energy Market Place (18-M-0376)

The Company will also coordinate with other working groups, such as the System Data and DER Sourcing Working Groups.

Risks and Mitigation

The implementation of Phase II and any future phases of GBC could be affected by system integration issues and changing priorities that could shift resources away from GBC implementation. The Company is monitoring GBC implementation progress closely to keep the project on schedule.

With the increase in data sharing, there is also the risk of security breaches. As discussed in the Section 2.9 on cybersecurity, in order to protect individual customer data, the utilities will follow current practices, which require express customer authorization for data to be released to other than utility contractors or vendors or by law or Commission order. The Joint Utilities have also developed a common Cyber and Privacy Framework to manage cybersecurity risks that is applicable to the expanded data sharing in the evolving DSP environment. [154] The framework focuses on people, processes, and technology as being the foundation for a comprehensive cybersecurity and privacy governance program.

Additionally, the Company manages data security risks by requiring all parties utilizing or accessing utility systems to sign the DSA, an agreement between the utility and third party that governs the exchange of customer data. The DSA terms and conditions include, but are not limited to, an attestation that the third party has received the customer's consent to access the data and the notice requirements when there is a data security incident. The DSA also includes the Data Self-Attestation, whereby third parties attest to meeting the data security procedures and requirements listed.

[154] DSIP Proceeding, Supplemental DSIP, pp. 148-160. Note 70, *supra.*

The Commission's UBP-DERS Order also lays out the terms under which the Joint Utilities are expected to share customer data with DER providers.[155] The Joint Utilities have all incorporated these requirements into their tariffs and created processes for DER providers to begin receiving customer data via EDI.

Stakeholder Interface

Con Edison will continue to engage with stakeholders through the Customer Data Working Group to provide updates on customer data sharing mechanisms, implementation updates, and gather their feedback on processes or new data requests. In addition, the Customer Data Working Group will continue to have one-on-one stakeholder meetings to explore any additional use cases that can become relevant to advance DER market development.

Additional Detail

This section responds to the questions specific to customer data.

1) Date Types, Description and Management Processes

a. Describe the type(s) of customer load and supply data acquired by the utility.

The Joint Utilities acquire customer load (use) and supply injection data by capturing information that the customer meter(s) measures and records. These can be interval, AMI, and/or register-read meters. There are differences in the type and granularity of the customer load and supply data the individual utilities acquire based on customer types, existing metering, and the extent to which the utility has adopted AMI. In some cases—generally commercial and industrial customers—the utility will also acquire additional data, such as demand (kW) and reactive power (VAR) data, as required for billing under the applicable tariff. As the Joint Utilities implement new technologies such as AMI, they will capture more granular (interval) data and will then evolve the data sharing mechanisms and standards as appropriate.

b. Describe the accuracy, granularity, latency, content, and format for each type of data acquired.

All utility meters meet the metering performance requirements and specifications set forth in the Official Compilation of the Rules and Regulations of the State of New York 16 Part 92, which establishes the guidelines for testing and maintaining electricity meters to promote a high degree of metering performance. Table 18 describes the granularity and latency of data acquired by Con Edison at the time of this filing based on customer and type of meter at the premise.

[155] DER Proceeding, UBP-DERS Order, Note 131, *supra*.

Table 18: Energy Usage Data Available By Customer and Meter Type

Customer and Meter Type	Energy Usage Data
All electric and gas customers with non-interval meters	Monthly energy usage (kWh, kW, ccf)
Electric commercial customers with smart meters	5-minute energy usage data (kWh)
Electric residential customers with smart meters	15-minute energy usage data (kWh)
Electric customers with legacy interval meters	15-minute energy usage data (kWh)
All gas customers with smart meters	1-hour energy usage data (ccf)

As noted above, as of mid-July 2018, electric customers with smart meters can view their near-real time data on My Account at a latency of 30-45 minutes after the end of each 15-minute interval (note: commercial electric customers with smart meters will see 3 new 5-minute intervals every 15 minutes). Near-real time data will be available for customer-authorized third parties at the end of 2018 through Share My Data.

c. Describe in detail the utility's means and methods for creating, collecting, managing, and securing each type of data.

As described above, customer load and supply data collected by the utility depends on the customer and type of meter on the premises. Meter data is collected through an MDMS and is stored in EDAP. Details regarding Con Edison's privacy standards are outlined above and again below in the response to 2b. For additional information regarding Con Edison's cybersecurity program, please refer to the Section 2.9 of the DSIP.

2) Data Uses, Access and Security

a. Describe the means and methods that customers and their properly designated agents can use to acquire their load and supply data directly from their utility meters without going through the utility, should they want to.

The Company provides several methods for customers and their properly designated agents to acquire a customer's data automatically, without a written or verbal request to the Company. These include the My Account and Customer Care portals for customers, and EDI transactions and Share My Data for properly designated agents. The Company also offers pulse output metering to customers for a fee, as described in its electric tariff (PSC No. 10, General Rule 17.2(i), Leaf 124). The pulse output from the meters is used in conjunction with customer recorders and building energy management systems for customers or their agents to obtain real-time energy data without going through the utility systems.

b. Identify and characterize the categories of legitimate users beyond customers and their properly designated agents who will be provided access to each type of data.

For customer-specific data, the Company does not share information without customer consent to third parties except where required by Commission order, such as with CCA, or shared with utility contractors and vendors to carry out utility EE programs or fulfill other Company business. For aggregated customer data, third-party access is based on the type of data being provided, and it must pass a privacy screen before it is shared. As discussed herein, the Company is working with NYSERDA and the Joint Utilities to make certain aggregated customer data publicly available through the Utility Energy Registry. While utilities will not necessarily know how the data provided by the UER is being used, the information is intended to, at a minimum, aid in community energy planning and CCA program development. Other types of aggregated data are only shared with certain parties, such as aggregated whole-building data, which is only shared with a building's owner or their designated agent, and CCA data, which is only shared with CCA Administrators and/or municipalities and their contracted ESCO(s).

c. For each type of data, describe how its respective users will productively apply the data and explain why the data provided will be sufficient to fully support each type of application.

The Joint Utilities have been proactively engaging with stakeholders to share proposals for providing aggregated customer data consistent with customer privacy standards and their progress in improving the type of data and the process for accessing customer-specific data with proper customer authorization. In addition, the Joint Utilities are actively conducting one-on-one conversations with DER providers and developers to better understand their specific customer usage data needs, share current practices, and inform future data sharing plans. Through the targeted conversations, utilities not only understand the underlying basis for the requests, but stakeholders gain better insight to the information currently available and how to access it. Based on these discussions, the initial sets of customer data provided in EDI, Share My Data, and the UER—or as otherwise outlined in the Company's tariff (e.g., CCA data and aggregated whole-building data)—are sufficient for third parties to provide customized products and services to customers, while preserving customer privacy.

Through collaboration with Staff and stakeholders, the Joint Utilities are finalizing development on sharing aggregated data for whole buildings and through the UER, at the municipal level (and zip code level in New York City). These new offerings will allow building owners to better manage and benchmark their building energy usage and allow communities to make informed decisions on community-based DG projects, CCA programs, and EE initiatives.

d. For each type of data, describe in detail the utility's policies, means, and methods for securely providing legitimate users with efficient, timely, and useful access to the data. Include information which thoroughly describes and explains the utility's approach to providing customer data to third parties who would use the data to identify and design service opportunities which benefit the utility and/or its customers.

In accordance with applicable UBP issued by the Commission, the Company provides ESCOs and DER providers, who are assumed to have customer consent upon the provision of a valid information request, customer data via EDI. [156] Third parties are also able to access customer data upon explicit customer consent through Share My Data. Both EDI and Share My Data involve machine-to-machine protocols to transmit data, which provides third parties with timely access to customer data. EDI enhances the security of transactions by exchanging data utilizing security standards. The North American Energy Standard Board Energy Services Provider Interface standard[157] is the basis for Share My Data, which requires that a customer first authenticate themselves on the utility portal with a login and password before explicitly granting permission to a third party and enabling the secure transfer of data. Additionally, third parties that submit a

[156] http://www3.dps.ny.gov/W/PSCWeb.nsf/All/8DD2B96E91D7447E85257687006F3922
[157] https://www.naesb.org/espi_standards.asp

Letter of Authorization with a customer's written consent can also access the customer data specified on a one-time basis.

Once launched, the UER will be a publicly available online tool administered by NYSERDA that allows users to view historic monthly aggregated energy data for municipalities or by zip code in New York City and counties throughout New York State. Separately, CCA data and aggregated whole-building data are made available to requestors according to the terms timelines specified in the Company's tariff. If a CCA administrator has designed a CCA program to include an EE or DER offering, additional aggregated data, if available, may be provided to support the CCA program design.

e. Describe how the utilities are jointly developing and implementing uniform policies, protocols, and resources for controlling third party access to customer data.

The Joint Utilities are actively working through numerous processes to develop and implement uniform policies and approaches in response to the Commission and stakeholder requests through the use case conversations with DER developers. Since the Initial DSIPs, the Joint Utilities have collaborated in the Customer Data Working Group to advance several customer data efforts, including:

- Submitting multiple joint filings on customer privacy standards and approaches.
- Defining datasets and costs in support of CCA efforts through development and filing of CCA tariffs.
- Working with DPS Staff and NYSERDA on development of the UER and appropriate privacy standards.
- Evaluating potential opportunities for aggregated data automation.
- Soliciting feedback from stakeholders to inform future customer data needs and means of accessing that information.

Currently, there are a number of channels that the Joint Utilities use to share customer data with customers and their authorized third parties, subject to proper security to interact with Company systems. These include utility bills, the My Account and Customer Care portals for customers, GBC, EDI, UER, Secure File Transfer Protocol, File Transfer Protocol with PGP encryption, online third-party data platforms, and the data identified in UBP for DERS.

To support the REV initiative, the Joint Utilities formed the Customer Data Working Group to coordinate on all issues related to customer data. As outlined in the Supplemental DSIP, in addition to complying with the regulations established by the Commission regarding third-party access to customer data, the Joint Utilities have "developed a common approach to managing these new cybersecurity and privacy risks in the evolving REV environment," which includes the Joint Utilities Cybersecurity and Privacy Framework.[158]

f. Describe in detail the utility's policies, means, and methods for rigorously anticipating data risks and preventing loss, theft, or corruption of customer data.

In coordination with the Joint Utilities, Con Edison has developed and implemented a process to manage risks associated with authorized third-party access to customer data. All parties utilizing or accessing utility systems must sign the DSA, an agreement between the utility and third party that governs the exchange of customer data. The DSA terms and conditions include, but are not limited to, an attestation that the third party has received the customer's consent to access the data and the notice requirements when there is a data security incident. The DSA also includes the Data Self-Attestation, whereby third parties attest to meeting the data security procedures and requirements listed.

[158] DSIP Proceeding, Supplemental DSIP, pp. 148-160. Note 70, *supra*.

The Commission's UBP for DERS also lays out the terms under which the Joint Utilities are expected to share customer data with DER suppliers. The Joint Utilities have all incorporated these requirements into their tariffs and created processes for DER suppliers to begin receiving customer data via EDI.

As aggregated data use cases have been identified and developed, aggregated data privacy policies and standards have evolved. To inform the development of these policies and standards the Joint Utilities have conducted benchmarking, met with stakeholders, developed terms and conditions for whole building data, and measured the pass/fail rates of potential privacy standards against sample data. The efforts have produced three aggregated data privacy standards that are applied to specific use cases.

Each privacy standard consists of a two-part test, a customer count threshold and a usage threshold, as described above.

g. Identify each type of customer data which is/will be provided to third parties at no cost to the recipient, and the extent to which the practice comports with DPS policies in place at the time, as appropriate.

As outlined in the Supplemental DSIP, the Joint Utilities have developed a common framework for defining the basic level of customer data that would be provided at no cost to third parties. Consistent with the Commission's direction in REV,[159] the Joint Utilities proposed that basic data for non-interval metered customers includes cumulative kWh, net kWh, and the maximum recorded kW (if a demand meter is present) and for interval metered customers includes energy use (kWh, net kWh, kW, kVAR) at interval specific to the customer's meter, as well as cumulative kWh, minimum/maximum kW, and kVAR.[160] As Commission policies have evolved, Con Edison, with the Joint Utilities, has adjusted the scope of customer data that are or will be provided to third parties at no cost.

On October 19, 2017, the Commission adopted the UBP-DERS.[161] Consistent therewith, the Company provides at no charge electric and gas consumption history through EDI. The customer data to be provided free of charge includes the customer's service address, account number, energy usage and usage type, and meter number(s).

Also in 2017, the Commission redefined basic data as data "retained and stored by way of the utilities' enterprise systems and is not readily or reasonably available by other means, but the provision of that data is essential for fundamental customer/provider relationship (e.g., billing) or provides broad system-wide benefits."[162] In addition, in 2018, the Commission directed utilities to provide historical aggregated monthly usage data to NYSERDA's Utility Energy Registry on a semi-annual basis at no charge to NYSERDA.[163] The data is arranged into Residential, Small Commercial, and Other groupings with the potential to combine groupings if the aggregated data does not pass the approved privacy standard described above. In addition to usage data, total ICAP and a customer count of CCA ineligible customers are provided for each aggregation. As stated above, UER data will be provided by NYSERDA to the public free of charge.

As specified in the Company's tariff, a building owner or an owner's authorized agent can request aggregated whole building data. Aggregated whole building data requested for compliance with New York City's benchmarking law is uploaded directly to the EPA's Portfolio Manager. Aggregated data requested for purposes other than local law compliance must pass the 4/50 privacy standard and is provided directly to the building owner or their agent. Con Edison ceased charging for aggregated whole-building data in 2017.

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159 REV Proceeding, REV Track Two Order, p. 142.
160 DSIP Proceeding, Supplemental DSIP, p. 121.
161 DER Proceeding, UBP-DERS Order.
162 UER Proceeding, CCA Data Fees Order, p. 19.
163 *Id*.

h. Identify each type of customer data which the utility proposes to provide to third parties for a fee, and the extent to which the practice comports with DPS policies in place at the time, as appropriate. For each data type identified, describe the proposed fee structure and explain the utility's rationale for charging a fee to the recipient.

In the REV initiative, the Commission allowed utilities to charge for information beyond basic customer data and stated utilities may "continue to charge ESCOs and other vendors for providing monthly customer data for a period in excess of 24 months. Utility charges may also be assessed for data that is more granular and/or more frequent than the basic data described below."[164]

In the Supplemental DSIP, the Joint Utilities further defined value-added data as going beyond basic data by having one or more of the following characteristics:

- Is not routinely developed or shared.
- Has been transformed or analyzed in a customized way (i.e., aggregated customer data).
- Is delivered more frequently than basic data.
- Is requested and provided on a more ad hoc basis.
- Is more granular than basic data.[165]

The Commission redefined the categories of customer data and stated that "value-added data will fulfill more nuanced needs such as customized requests and requests by market participants to pursue market opportunities. For value-added data, fees may be permitted to promote fair contribution to system costs by beneficiaries and to avoid undue burden on non-participants."[166] In response, the Company currently charges $0.80 per account for CCA data.[167] The Company will continue to evaluate other opportunities to charge for value-added data.

i. Describe in detail the ways in which the utility's means and methods for sharing customer data with third parties are highly consistent with the means and methods at the other utilities, and the extent to which these practices comport with DPS policies in place at the time, as appropriate.

As discussed in the Supplemental DSIP, the Joint Utilities are committed to establishing a statewide standard around customer data and "plan to enhance their respective customer data platforms to address data sharing needs in a consistent manner."[168] However, each utility may be on a different schedule for AMI implementation, resulting in utilities implementing customer data platforms at different times. While Con Edison and O&R are already implementing the GBC standard through "Share My Data," other utilities that are pursuing AMI investments have plans for implementing GBC or an alternate standard in alignment with their AMI implementation. As described above, on October 2, 2017, Con Edison and O&R filed their GBC Phase II Report,[169] which outlined the additional datasets that would be made available to customer-authorized third parties. In developing the Phase II Report, Con Edison and O&R coordinated with the Joint Utilities to affirm that the proposal outlined in the Phase II Report aligned with the

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[164] REV Proceeding, REV Track Two Order, p. 140.
[165] DSIP Proceeding, Supplemental DSIP, p. 121.
[166] UER Proceeding, CCA Data Fees Order, p. 19.
[167] *Id.*, p. 22.
[168] REV Proceeding, Supplemental DSIP, p. 141.
[169] Con Edison 2016 Electric Rate Case, GBC Phase II Report. Note 144, *supra*.

anticipated evolution of the statewide data sharing standard. The additional datasets to be provided through Share My Data represent an incremental, no-regrets step that will be incorporated in the broader statewide data sharing standard.

Additionally, as noted above, each of the Joint Utilities make customer data available to DER providers through EDI transactions in compliance with the UBP for DERS.

j. Describe in detail the ways in which the utility's means and methods for sharing customer data with third parties are not highly consistent with the means and methods at the other utilities. Explain the utility's rationale for each such case.

See response to i) above. The Company has worked with the Joint Utilities to align the datasets and formats available to third parties.

3) Green Button Connect Capabilities

a. Describe where and how DER developers, customers, and other stakeholders can readily access up-to-date information about the areas where customer consumption data provided via Green Button Connect (GBC) is available or planned.

The Company has developed several webpages where DER developers, customers, and other stakeholders can readily access up-to-date information about Share My Data. Additional information is available at https://www.coned.com/en/accounts-billing/share-energy-usage-data/become-a-third-party/faq.

b. Describe how the utility is making customers and third parties aware of its GBC resources and capabilities.

The Company is making customers and third parties aware of GBC and its capabilities through the targeted energy forums being held in support of AMI customer engagement. The Company also plans to implement a targeted email and social media campaign when several third parties have successfully completed the registration process.

c. Describe the utility's policies, means, and methods for measuring and evaluating customer and third-party utilization of its GBC capabilities.

As part of the AMI reporting requirements that resulted from the Joint Proposal,[170] the Company is tracking and reporting on the number of customers who share their data via Share My Data in the reporting period, plus the number of customers who continue to share their data based on elections made in the prior reporting period. The Company will provide the first report on this metric on April 30, 2019.

[170] Con Edison 2016 Electric Rate Case, Joint Proposal, pp. 35-36. Note 115, *supra.*

2.9. CYBERSECURITY

Context and Background

Cybersecurity and the prevention of security breaches and cyber events are essential responsibilities and priorities of the Joint Utilities. The Supplemental DSIP outlined a common and comprehensive approach to managing cybersecurity risks in the evolving REV environment. The Joint Utilities Cyber and Privacy Framework focuses on people, processes, and technology to maintain data security. [171] The Framework requires the implementation of an industry-approved risk management methodology and an alignment of control implementations with the control families in the NIST SP 800-53 revision 4. The Joint Utilities periodically assess the need for updates to the Framework. The current version, initially published in the Supplemental DSIP, remains relevant with no updates required.

The cybersecurity industry continues to evolve, as does technology. The trend is for former best practices to become essential components of a cybersecurity program over time. As an example, several years ago, many companies viewed cyber insurance as optional and discretionary. Now cyber insurance is considered essential, with the question being how much cyber insurance coverage is sufficient. It is the same with technology. Multi-factor authentication used to be a voluntary protection and now it is considered a baseline requirement.

The Joint Utilities are working together to keep pace with evolving cyber needs. For example, the Joint Utilities use vendor risk forms to assess the cyber-preparedness of its partners and vendors. After a recent incident related to ESCOs and an EDI provider, the Joint Utilities have undertaken an effort to improve the cybersecurity posture of ESCOs and EDI providers because these entities "touch" utility systems. This effort is expected to improve cybersecurity for all data users and the utilities.

Implementation Plan, Schedule, and Investments

Current Progress

Summary of Achievements

- Collaborated with the Joint Utilities to share lessons learned and maintain the Joint Utilities Cyber and Privacy Framework.
- Participated in the North American Electric Reliability Corporation's ("NERC") GridEx IV, which is a sector-wide grid security exercise designed to simulate a cyber/physical attack on electric and other critical infrastructures across North America.

In the Supplemental DSIP, the Joint Utilities committed to maintain active individual cyber and privacy management program and participate in industry Working Groups, including the New York State Security Working Group. Con Edison has taken a leadership role within that group, serving as the current vice chair. The Company is also involved in several other industry efforts to share best practices and intelligence, including collaboration with the Edison Electric Institute, American Gas Association, the U.S. Department of Energy, the U.S. Department of Homeland Security, Northeast Power

[171] DSIP Proceeding, Supplemental DSIP, pp. 148-160. Note 70, *supra.*

Coordinating Council, Inc., Electricity Information Sharing and Analysis Center, and New York City. The Company is also coordinating with the NERC and actively participated in NERC's GridEx IV, which is a sector-wide grid security exercise designed to simulate a cyber/physical attack on electric and other critical infrastructures across North America. The Company also participated in the development of the NERC CIP-013-1 (Supply Chain Risk Management).

The Joint Utilities have also agreed to share lessons learned and advancements in security technology among themselves and continue to meet to discuss multiple security topics.

Future Implementation and Planning

Summary of Future Actions
• Maintain coordination with the Joint Utilities and other industry cybersecurity activities.

As noted above, the Joint Utilities periodically assess the need for updates to the Framework. The current version continues to satisfy needs, with no updates required at this time.

Risks and Mitigation

The Company has robust cybersecurity protections already in place and is continuously monitoring and responding to emerging cybersecurity risks.

Stakeholder Interface

As noted above, Con Edison is engaged in a number of industry efforts to share best practices and intelligence and participates in national, regional, and local security exercises. Section 2.8 discusses the protection of customer data and the vetting of third parties who seek access to customer data.

Additionally, the Company meets with Staff quarterly at the NYS Security Working Group and meets annually to evaluate privacy protections. The Company also provides a cybersecurity update as needed either specifically for cyber or as part of the Company's risk discussions and communicates with Staff via phone as needed. The Company is willing to establish a more frequent cadence of cybersecurity updates should Staff find that valuable.

Additional Detail

This section responds to the questions specific to cybersecurity.

1) **Describe in detail the utility policies, procedures, and assets that address the security, resilience, and recoverability of data stored and processes running in interacting systems and devices which are owned and operated by third-parties (NYISO, DER operators, customers, and neighboring utilities). Details provided should include:**

   a. **the required third-party implementation of applicable technology standards;**
   b. **the required third-party implementation of applicable procedural controls;**
   c. **the means and methods for verifying, documenting, and reporting third-party compliance with utility policies and procedures;**
   d. **the means and methods for identifying, characterizing, monitoring, reporting, and mitigating applicable**

risks;

e. **the means and methods for testing, documenting, and reporting the effectiveness of implemented security measures;**
f. **the means and methods for detecting, isolating, eliminating, documenting, and reporting security incidents; and,**
g. **The means and methods for managing utility and third-party changes affecting security measures for third-party interactions.**

Con Edison recognizes the increased cybersecurity supply chain risks, especially with regard to data the Company's vendors and partners store and process. The Company has built robust processes to mitigate this risk through Data Self-Attestations, cybersecurity requirements within terms and conditions, architecture reviews, cybersecurity insurance mandates, and the use of Defense in Depth strategy for vendor system implementations. In addition, Con Edison built strong partnerships with third parties and implemented tools and processes to identify, alert, and respond to potential vulnerabilities and immediate cybersecurity concerns.

2) Describe in detail the security, resilience, and recoverability measures applied to each utility cyber resource which:

a. **contains customer data;**
b. **contains utility system data; and/or,**
c. **Performs one or more functions supporting safe and reliable grid operations.**

The Company adheres to strict standards for the protection of system and customer data and will continue to actively mitigate growing risks in part through careful attention to cyber and privacy practices. The Company maintains a Cybersecurity and Privacy Program to manage cybersecurity risk to an acceptable level, in line with the REV Cybersecurity and Privacy Framework the Joint Utilities developed and published in the Supplemental DSIP. The Cybersecurity and Privacy Framework focuses on people, processes, and technology as the foundation for a comprehensive cybersecurity and privacy governance program. The Framework requires the implementation of an industry-approved risk management methodology and an alignment of control implementations with the control families in the NIST SP 800-53 revision 4. The Joint Utilities periodically assess the need for updates to this framework. The current version, which the Supplemental DSIP includes, remains relevant with no updates required.

3) For each significant utility cyber process supporting safe and reliable grid operations:

a. **Provide and explain the resilience policy which establishes the utility's criteria for the extent of resource loss, damage, or destruction that can be absorbed before the process is disrupted;**
b. **Provide and explain the recovery time objective which establishes the utility's criteria for the maximum acceptable amount of time needed to restore the process to its normal state;**
c. **Provide and explain the plan for timely recovery of the process following a disruption; and,**
d. **Describe each process, resource, and standard used to develop, implement, test, document, and maintain the plan for timely process data recovery.**

Con Edison has developed incident response and recovery plans, which it practices on a regular basis for its key processes, systems, and departments.

4) Identify and characterize the types of cyber protection needed for strongly securing the utility's advanced metering resources and capabilities. Describe in detail the means and methods employed to provide the required protection.

AMI devices add risk to the Company as they are outside the Company's physical security controls. Accordingly, the design of all external devices and systems supports the integrity of the network and data sent back to Company-managed systems. Cyber protection follows the standards described above, as well as the following requirements for all physically uncontrolled devices (e.g., meters, energy storage systems):

- The manufacturing process must identify all devices intended for the Company's system.
- Authentication to and use of dedicated, encrypted networks for the secured transmission of data from external devices.
- The Company collects and temporarily stores all external data in a "Low Trust" zone until it pulls it into the corporate environment from a "High Trust" zone.
- All control/change activities initiated from management systems to external devices authenticate to the external device.
- The Company receives all software/firmware updates from the vendor via secured and validated means.
- Authorization and authentication controls from the management system initiate all physical access to external devices for a defined period of time.
- Logs of all approved changes/commands with alerting of unauthorized activities.

The Company reviewed the AMI vendor cybersecurity practices as part of the RFP process and incorporated them into the terms and conditions of the Company's contract with its selected vendor.

5) **Identify and characterize the requirements for timely restoring advanced metering resources and capabilities following a cyber disruption. Describe in detail the means and methods employed to provide the required recovery capabilities.**

The Company's response to 3) highlights that Con Edison has developed incident response and recovery plans, including for AMI, which it practices on a regular basis for key Company processes, systems, and departments.

2.10. DER INTERCONNECTIONS

Context and Background

Bringing DER online quickly and cost-effectively is a critical component to increasing DER deployment. To this end, in the REV initiative, the Commission calls for utilities to streamline their interconnection processes for DG projects, increase the transparency of their interconnection approval process, and adequately prepare for greater amounts of DG deployment.[172] This includes eliminating unnecessary procedural delays and reaching an interconnection decision in a timely and efficient manner, as well as giving developers greater visibility into project application status. The importance of an efficient interconnection process is underscored in the EAM for interconnection, which offers incentives to utilities based on (1) SIR timeliness, and (2) an independent third-party customer satisfaction survey.

To define the process improvements necessary to streamline the interconnection process, the Commission and NYSERDA engaged EPRI to assess state interconnection procedures in the *New York Interconnection Online Application Portal Functional Requirements* ("IOAP Report"),[173] which has served as an initial reference guide for increasing the automation of the online portal. The IOAP Report includes a three-phase roadmap for achieving increased automation:[174]

- Phase 1: Automate Application Management
- Phase 2: Automate SIR Technical Screening
- Phase 3: Full Automation of All Processes

The goal of Phase 1 is to automate the application management portion of the process, including application submittal, validation, tracking, and approval. The second phase focuses on automation of the SIR technical screens for projects above 50 kW, including but not limited to review of the point of common coupling, certification status of specified equipment, and compatibility of the line configuration with the interconnection type. Phase 2 specifically requires integration of multiple utility systems, such as billing, CIS, work management systems, and load-flow software programs, to allow for the push and pull of data in common formats between systems. This phase also requires the ability to calculate SIR screens A to F based on utility data and return a pass or fail determination.[175] Finally, Phase 3 calls for automation of all processes, including the integration of the interconnection process into the broader distribution system planning process.

These process improvements occur within the context of the SIR.[176] Established by the Commission in 1999, the SIR provides an evolving framework for processing applications to interconnect DG systems to the state's investor-owned utilities' electric distribution systems. In December 2017, Staff released proposed changes to the SIR based on written feedback received from the Joint Utilities and the developer community.[177] The proposed changes fell generally into three categories: (1) incorporating energy storage into the SIR, (2) updating preliminary and supplemental screens, and (3) minor editorial revisions. The Commission responded by formalizing several changes to align the SIR with changes

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[172] REV Proceeding, Track One Order, pp. 88-89.
[173] IOAP Report. Note 61, *supra*.
[174] *Id.,* pp. 13-17.
[175] *Id*., p. 24
[176] New York State SIR. http://www3.dps.ny.gov/W/PSCWeb.nsf/All/DCF68EFCA391AD6085257687006F396B
[177] Case 18-E-0018, *In the Matter of Proposed Amendments to the New York State Standardized Interconnection Requirements (SIR) for Small Distributed Generators* ("SIR Proceeding"), Redline SIR Staff Proposal (issued December 20, 2017).

adopted in the VDER proceeding and accommodate energy storage, including the configuration of storage projects and certain mechanics related to the expanded eligibility of projects up to 5 MW and adding fields, screens, and process flows specific to energy storage. The SIR changes also extended the timelines for making certain interconnection payments to allow developers to address local permitting requirements, enhance information sharing related to construction schedules, and permit certain insurance requirements. [178]

Implementation Plan, Schedule, and Investments

Current Progress

Summary of Achievements

- Streamlined the interconnection process for developers, including creation of DG checklists and automation of the interconnection process consistent with IOAP Phase 1 requirements.
- Licensed PowerClerk® interconnection software and continued integration with other Company systems, such as the CPMS, resulting in several enhancements to the platform.
- Updated PowerClerk® and CPMS to reflect recent SIR changes, including addition of fields for energy storage, which streamlines the interconnection process for storage applications.
- Developed several technical documents with the Joint Utilities and ITWG to clarify and formalize aspects of the interconnection process.
- Collaborated with EPRI on white paper discussing how utilities can use smart inverters to allow more DER to interconnect.
- Engaged developers to understand user experience and identify potential improvements.

Con Edison has made significant strides in streamlining and improving the transparency of the interconnection process, including successful completion of IOAP Phase 1 requirements and ongoing enhancements to the PowerClerk® platform. As discussed below, to promote statewide standardization, Con Edison collaborated with the Joint Utilities, ITWG, and Interconnection Policy Working Group ("IPWG") to identify and vet changes to the SIR and develop technical guidance documents. The Company also developed internal guidelines for microgrid interconnection and contributed to an EPRI paper on leveraging smart inverters to reduce interconnection costs.[179]

Interconnection Process Improvements

The Company continues to improve the speed and transparency of the interconnection process, enabled in part by licensing Clean Power Research's PowerClerk® interconnection software as the customer-facing, automated interconnection application management portal and continuing to integrate PowerClerk® with the Company's CPMS. The result for developers is greater ease of access and a more transparent and user-friendly internal and external user

[178] SIR Proceeding, Order Modifying Standardized Interconnection Requirements (issued April 19, 2018). Most recently, the Commission issued a clarification of the SIR. SIR Proceeding, Order Granting Clarification (issued July 13, 2018).
[179] EPRI, *Voltage Regulation Support From Smart Inverters.* ("Voltage Reduction Report"). https://www.epri.com/#/pages/product/000000003002012033/

experience. For example, developers are now able to submit and advance an application online and track its progress through detailed status updates throughout the application approval process. This information lets developers know exactly where they are in the process, reducing uncertainty about next steps. Additionally, each step of the process is timed in accordance with SIR timelines and the system generates reminder emails if action is still pending. Figure 38 illustrates how Con Edison maintains an internal dashboard to track project status, which adds visibility and accountability to the workflows.

Figure 38: Dashboard Example

DG EAM SIR compliance - Executive Summary

CPMS DG Case Process Pending

Process Type	Due Today	Due in 0 to 5 days	Due in 5 to 10 days	Due in 10 to 15 days	Due in 15 to 30 days	Due in 30 or more days	Past Due	Pending Customer	Total Active Cases
Application Document Review (10 Days)								9	9
Preliminary Screen (15 Days)				2					2
Preliminary Screen Meeting (10 Days)			2						2
Supplemental Review (20 Days)									
Supplemental Review Meeting (10 Days)									
CESIR Document Review (10 Days)		4						13	17
CESIR Study (60 Days)			2			9			11
Company Signed Contract (15 Days)			2						2
Schedule Verification Test (10 Days)									
Send Verification Test Results (15 Days)			1						1

To help applicants adhere to timelines, the system issues an automated response notifying applicants of incomplete applications and sends reminder emails when an applicant has 10 days remaining to provide required documentation to avoid cancellation of the application as inactive.

Other efforts include the automation of preliminary screens, as scoped in IOAP Phase 2. Con Edison met the goal of automating the preliminary technical screens, referred to as screens A through F, as follows:

- Screen A: Is the PCC on a Networked Secondary System?
- Screen B: Is Certified Equipment Used?
- Screen C: Is the Electric Power System (EPS) Rating Exceeded?
- Screen D: Is the Line Configuration Compatible with the Interconnection Type?
- Screen E: Simplified Penetration Test.
- Screen F: Simplified Voltage Fluctuation Test.

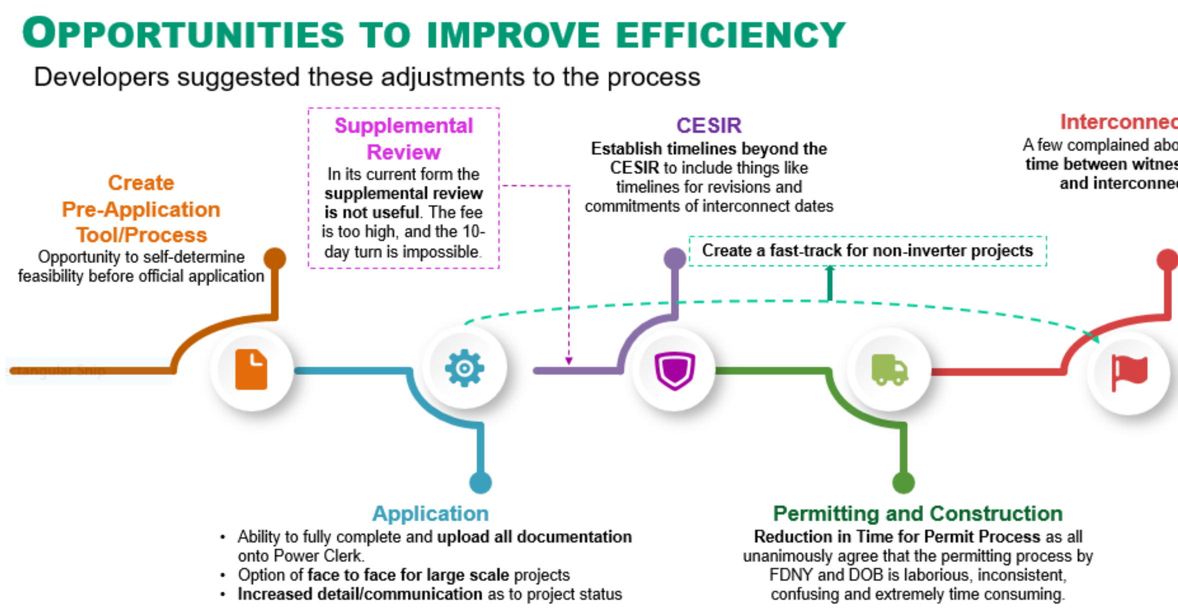
Con Edison continues to work with Staff and the ITWG to understand the challenges of automating the entire interconnection process, including the supplemental screens G through I, as part of Phase 3. As the SIR changes are formalized and supplemental screens are updated or clarified, the Company can explore additional automation.

The Company is also taking steps to facilitate easier installation and reduce interconnection costs. As part of a pilot project, the Company has installed ConnectDER™ meter collars on 30 residential PV installations in Staten Island, with plans to install an additional 200 ConnectDER™ units across Staten Island, along with an AMI net meter. The ConnectDER™ device provides a convenient exterior point of interconnection, foregoing the need to enter a customer's home and interface with the electrical panel, resulting in lower interconnection costs. The Smart ConnectDER™

measures the PV production and communications capabilities via a utility-accessible web interface utilizing a two-way cellular network connection that can both send PV production and local electrical characteristic data measured at the house meter connection (e.g., voltage, frequency), as well as receive commands and firmware upgrades from the ConnectDER™ Cloud. Additionally, the Smart ConnectDER™ incorporates a remotely-operated isolation relay on the generator circuit that allows for remote operations through the ConnectDER™ Cloud. Receiving the production data and having remote disconnection capabilities also enables an increase in solar penetration on electric distribution systems.

Developers are responding positively to the enhancements. In February 2018, Con Edison invited 12 DER development firms, representing PV solar, battery, fuel cell, and CHP, to participate in focus groups, to gain insight into developer needs and identify opportunities to further improve the interconnection process. Overall, the feedback validated that the significant efforts over the past several months are improving the interconnection experience for developers and supporting developers in getting projects approved. There is general satisfaction with the PowerClerk® platform, with many developers finding it intuitive, easy-to-use, and useful in accelerating the application and approval process. With these issues addressed, the developers suggested incremental enhancements to PowerClerk®, such as the ability to fully complete and upload all project-related documentation. Figure 39 shows that other suggestions included creating a pre-application tool or process that would allow developers to self-determine project feasibility before submitting an application, creating a fast track for non-inverter projects, and shortening the wait time between the witness test and interconnection.

Figure 39: Developer Suggestions on Improving the Interconnection Process



This continued collaboration will help Con Edison continue to identify and implement improvements. The Company is looking at ways to incorporate developer feedback into PowerClerk® and CPMS functionality, and expects to send periodic reports of implemented improvements to the developer community.

Technical Guidance and Standardization

Con Edison is leveraging its growing experience interconnecting DER to support ongoing learning and standardization. For example, the Company continues to participate in the ITWG and IPWG and coordinate with the Joint Utilities on interconnection issues. The ITWG's role is to promote consistent standards across the utilities to address technical concerns affecting the DG community and interconnection procedures. The IPWG's role is to explore non-technical issues related to the processes and policies relevant to the interconnection of DG in New York.

The initial priorities identified for the ITWG included anti-islanding protection; remote M&C; technical screening process; and substation backfeeding, including the required protection upgrades, such as protective relays. Since filing the Supplemental DSIP, the Joint Utilities, as part of the ITWG, have developed several technical documents addressing the ITWG priorities while also clarifying and formalizing aspects of the interconnection process, including:

- Interim requirements on anti-islanding.
- M&C requirements.
- Recommended changes to EPRI's proposed modifications to the SIR screens to improve effectiveness and support future automation.
- Proposed energy storage application requirements.
- Standard template for reporting Coordinated Electric System Interconnection Review ("CESIR") results to developers.[180]

MARCUS GARVEY VILLAGE COMMUNITY DER

This multi-technology solution includes a 400 kW solar PV system, 400 kW fuel cell and 300 kW/1.2 MWh lithium-ion battery-based energy storage system.

Once completed, this system will serve the power and energy needs of residents and businesses at the apartment complex in Brooklyn's Brownsville area.

Con Edison continues to interconnect storage to its distribution system and has posted its guide to storage interconnection on its website.[181] Given the expected increase in energy storage interconnection applications, the Joint Utilities are working to address the interconnection of storage, including developing a standardized technical screening process for energy storage interconnection applications. This process would standardize the materials required at the time of the application and formalize the review process to help streamline storage applications. The Joint Utilities are also discussing the potential need to restructure the timing and cost structure of the SIR review for energy storage in light of heightened complexity of storage relative to solar PV. This includes the additional time and resources needed to adequately evaluate the protection and controls required for a safe and reliable interconnection under various operating conditions.

The Joint Utilities are working through the ITWG to give the appropriate level of review to energy storage applications without the process becoming too costly or burdensome to the customer. While energy storage is a focus for the ITWG, Con Edison intends to continue actively supporting the ITWG's goal to facilitate entry of all DER types, and working collaboratively with DPS Staff and stakeholders to provide greater predictability of interconnection costs to the customer.

The Company is also preparing for increased adoption of microgrids and improving microgrid interconnection. Specifically, the Company developed engineering specifications for interconnecting microgrids to utility distribution systems. Microgrids currently in development will be interconnected under the specification, with the experience informing future iterations.

[180] This template may not apply to low-voltage mesh network systems.
[181] https://www.coned.com/en/save-money/using-private-generation-energy-sources/specifications-for-private-generation

Finally, the Company shares its experiences and advances thought leadership in the industry. For example, Con Edison worked with EPRI to explore how smart inverters could be used to limit the impact of voltage changes caused by intermittent DG, which is a primary constraint in interconnecting solar PV and other DER. The paper draws on Con Edison's experience interconnecting 33 rooftop PV installations in one of its secondary networks.[182] The Company has implemented a number of strategies to accommodate the DG, including updating network protector settings, adding SCADA equipment at four network protectors, and operating smart inverters with VVO capabilities. The smart inverters limited the number of network protectors requiring upgrades, resulting in lower interconnection costs. To promote smart inverters as solutions to these types of issues, the Company is working with the state to adopt IEEE 1547 standards.

Future Implementation and Planning

Summary of Future Actions

- Adapt the interconnection process to accommodate new technologies and configurations.
- Refine the interconnection process through ongoing innovations in the PowerClerk® platform.
- Conduct annual focus group to hear from developers on what is working well and where there is room for improvement.
- Engage in, and provide technical guidance to, the ITWG and IPWG to vet and influence potential changes to the SIR.
- Coordinate with the ITWG on aspects of the construction schedule to improve reporting and transparency.

Con Edison's future efforts focus on adapting the interconnection process to accommodate new technologies, such as energy storage, and continuous refinement of the interconnection process through innovations in the PowerClerk® platform (as available and permitted by the SIR), internal process reviews, and ongoing dialogue with developers. For example, Con Edison is leveraging the flexibility of PowerClerk® to incorporate the VDER registration process for purposes of managing the assignment of LSRV value streams. Additionally, the SIR is expected to continue to evolve as interconnection applications increases, further experience is gained, and utility and developer needs evolve. Potential modifications to the SIR are vetted in the ITWG and IPWG. Con Edison and the Joint Utilities will remain engaged with these Working Groups, with outstanding items for ITWG discussion including smart inverter technology, voltage flicker, and energy storage metering. Similar to the resolutions reached on anti-islanding and M&C, the ITWG will post future interim requirements online until they can be appropriately added to the individual utility or state-level interconnection requirements.

Going forward, Con Edison will explore the possibility of using PowerClerk® for the immediate transfer of the relevant system information, such as kW, kVA ratings, and DER technology type, to the utility DERMS database upon finalizing an interconnection agreement. Once noted as an available asset by PowerClerk®, the utility DERMS can integrate the new interconnection into the existing DER portfolios for more immediate integration into operation systems and ultimately participation in transactive markets, providing faster access to multiple value streams.

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[182] Voltage Reduction Report. Note 180, *supra*.

The Company will also explore potential process improvements in construction management to increase the transparency and predictability of implementing system upgrades related to interconnection. Additionally, the Company is considering opportunities to facilitate DER interconnection through make-ready interconnection points as a platform service.

Risks and Mitigation

As noted above, Phase 3 of the IOAP roadmap involves automation of all processes capable of automation and the integration of the interconnection process into the broader distribution system planning process. One factor that could affect this timing is the technical issue of creating the system integration and functionality necessary to fully automate all processes. Another potential issue is the ability of automated processes to provide the same assurances that the equipment being interconnected will not impact system reliability or safety.

Con Edison continues to work with Staff and the ITWG to understand the hurdles of automating the supplemental screens as part of Phase 3. As the SIR changes are formalized and supplemental screens are updated or clarified, the Company will explore additional automation.

Stakeholder Interface

Con Edison will continue to engage as part of the IPWG and ITWG and seek regular feedback from developers on the interconnection process and tools. In addition, the Company will convene a focus group at least annually to hear from developers on what is working well and where there is room for improvement and also consider more frequent informal sessions to address emerging issues.

Additional Detail

This section responds to the questions specific to DER interconnections.

1) **A detailed description (including the Internet address) of the utility's web portal which provides efficient and timely support for DER developers' interconnection applications.**

Con Edison maintains a dedicated website for customers applying for interconnection of private generation resources, which provides the necessary resources for DER interconnection applications (https://www.coned.com/en/save-money/using-private-generation-energy-sources/applying-for-interconnection). This web portal provides easily viewable references with hyperlinks to the appropriate forms and documentation according to the DG size thresholds in the SIR. For example, a link to the SIR is provided for all systems below the 5 MW threshold, as well as a flow chart and links to the application portal for systems below 50 kW and between 50 kW and 5 MW. In addition to the necessary interconnection application documentation and guidelines, the website provides example materials, such as a copy of the customer authorization letter, standardized contract, and the DG documentation checklist. The DG application portal, PowerClerk®, links to reference material and a tutorial of how to use the PowerClerk® portal, as well as contact information for the appropriate parties at Con Edison to address any questions or concerns.

2) **Where, how, and when the utility will implement and maintain a resource where DER developers and other stakeholders with appropriate access controls can readily access, navigate, view, sort, filter, and download up-to-date information about all DER interconnections in the utility's system. The resource should provide the following information for each DER interconnection:**
   a. **DER type, size, and location;**
   b. **DER developer;**
   c. **DER owner;**

d. **DER operator;**
e. **the connected substation, circuit, phase, and tap;**
f. **the DER's remote monitoring, measurement, and control capabilities;**
g. **the DER's primary and secondary (where applicable) purpose(s); and,**
h. **the DER's current interconnection status (operational, construction in-progress, construction scheduled, or interconnection requested) and its actual/planned in-service date.**

The Commission website includes a range of information on DER interconnections and is updated monthly.[183] The information currently available on the Commission's website includes:

- DER type and size
- DER developer
- Connected substation and circuit
- DER's current interconnection status (operational, construction in-progress, construction scheduled, or interconnection requested)
- Actual/planned in-service date[184]

The following information is not currently available through the Commission website, nor is it provided by the utility due to privacy and competitive concerns:

- DER location
- DER owner
- DER operator

The following information is generally not collected by the utility during the interconnection process:

- Phase and tap
- DER's remote monitoring, measurement, and control capabilities
- DER's primary and secondary (where applicable) purpose(s)

The Company is open to exploring collecting and disclosing additional information, with appropriate customer consent, if requested by developers and other stakeholders.

3) **The utility's means and methods for tracking and managing its DER interconnection application process to ensure achievement of the performance timelines established in New York State's Standardized Interconnection Requirements.**

The performance timelines established in the SIR are one of the critical metrics for the Interconnection EAM. The Company's CPMS tracks the timeliness of each application. The CPMS uses built-in timers associated with each task in

[183] http://www3.dps.ny.gov/W/PSCWeb.nsf/All/286D2C179E9A5A8385257FBF003F1F7E?OpenDocument
[184] This information is on the Commission website, but only until the DG goes into operation. After the DG is operational, the Company does not track the live status of the DG at this time. The exception is large DG where the Company has monitoring equipment measuring the output of the DG (large CHP and in rare occasions large PV).

the SIR to track the progress of an application and generates automatic reminder emails if an application appears pending, which alerts Company personnel to outstanding items. In order to effectively manage the application status of each interconnection relative to the SIR timelines, Con Edison maintains an internal dashboard to track project status through each step of the SIR.

4) Where, how, and when the utility will provide a resource to applicants and other appropriate stakeholders for accessing up-to-date information concerning application status and process workflows.

Con Edison provides up-to-date information to applicants via the IOAP and the integration of PowerClerk® with the CPMS. The IOAP provides greater accessibility and transparency and is more user-friendly for applicants seeking information on their current application status.

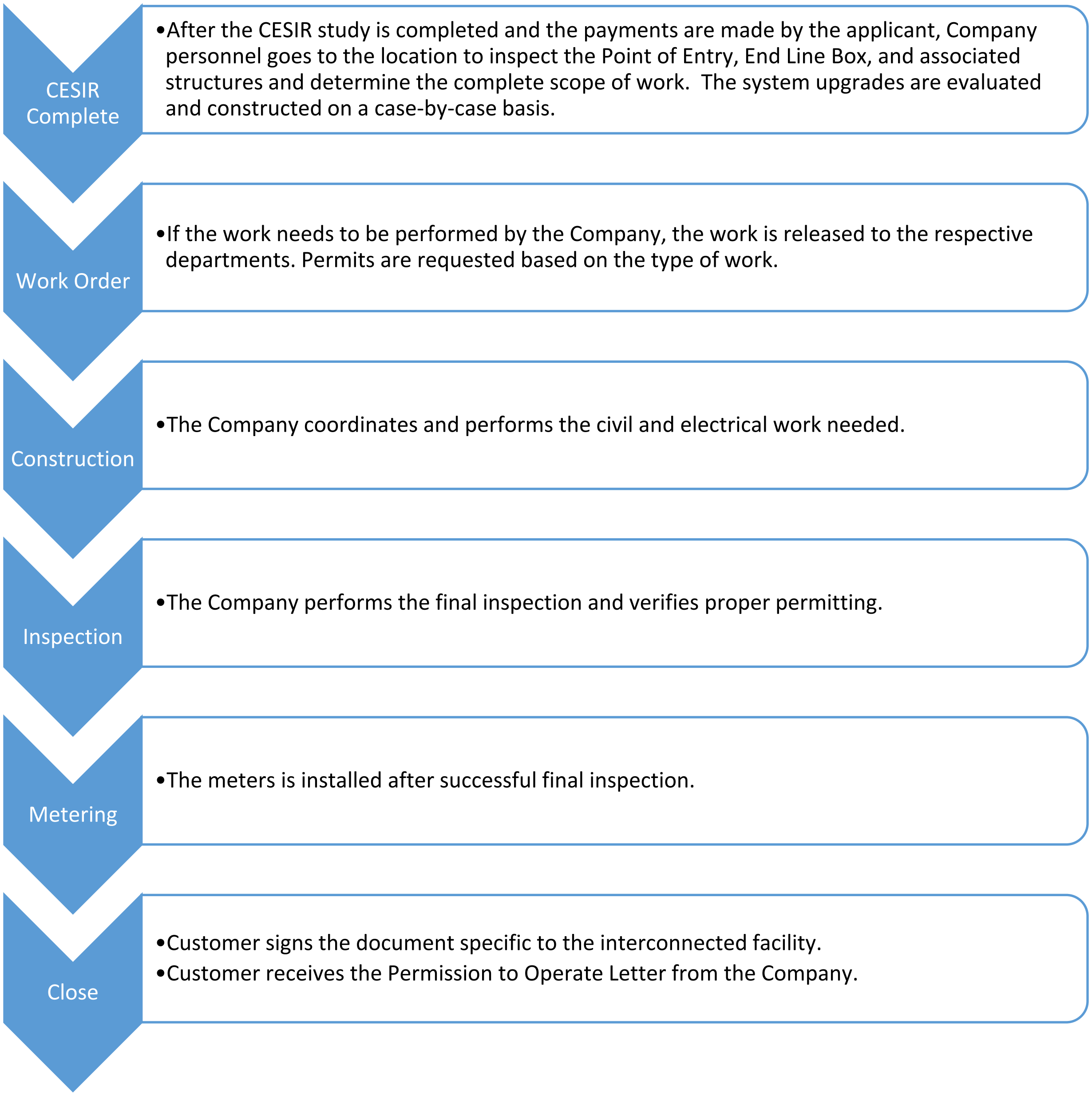
General process workflows are on the Company's interconnection web portal.[185] Con Edison limits the sharing of details of specific applications and their application status to the applicant to protect privacy.

5) The utility's processes, resources, and standards for constructing approved DER interconnections.

The Company manages construction for interconnections requiring upgrades to the utility system. This could include upgrading a service for a specific feeder, installing SCADA controllers, or upgrading network relay protections. Figure 40 shows the general process.

[185] https://www.coned.com/-/media/files/coned/documents/save-energy-money/using-private-generation/simplified-process-flow-chart.pdf?la=en

Figure 40: Process for Managing Construction for Interconnection Upgrades



6) The utility's means and methods for tracking and managing construction of approved DER interconnections to ensure achievement of required performance levels.

Con Edison has identified the tracking and managing of system upgrades related to DER interconnection as an emerging need, driven by the increase in DER interconnections. An approach similar to tracking SIR timeliness through the IOAP may provide a starting point. Other forums, such as continued engagement with stakeholders through the ITWG and IPWG and annual developer surveys, can also provide input on what construction milestones and performance guidelines are meaningful to applicants and where the Company can improve. The Company will report on tracking and managing construction of approved DER interconnections in the next DSIP.

7) **Where, how, and when the utility will provide a resource to DER developers and other stakeholders for accessing up-to-date information concerning construction status and workflows for approved interconnections.**

See response to 4) above.

2.11. ADVANCED METERING INFRASTRUCTURE

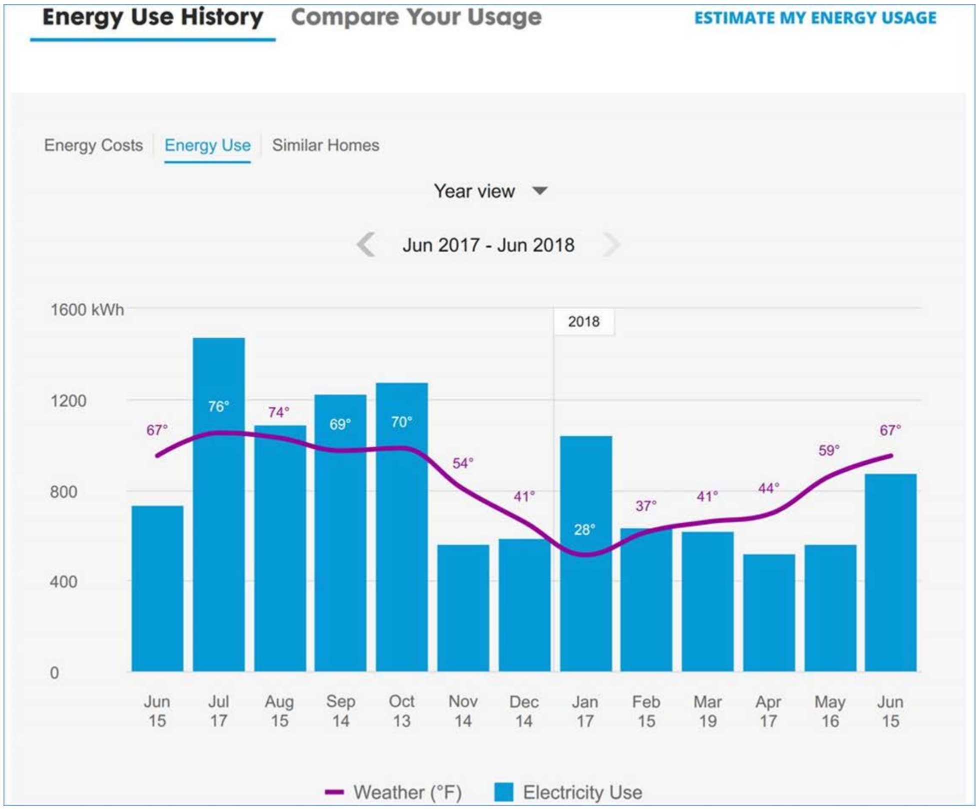
Context and Background

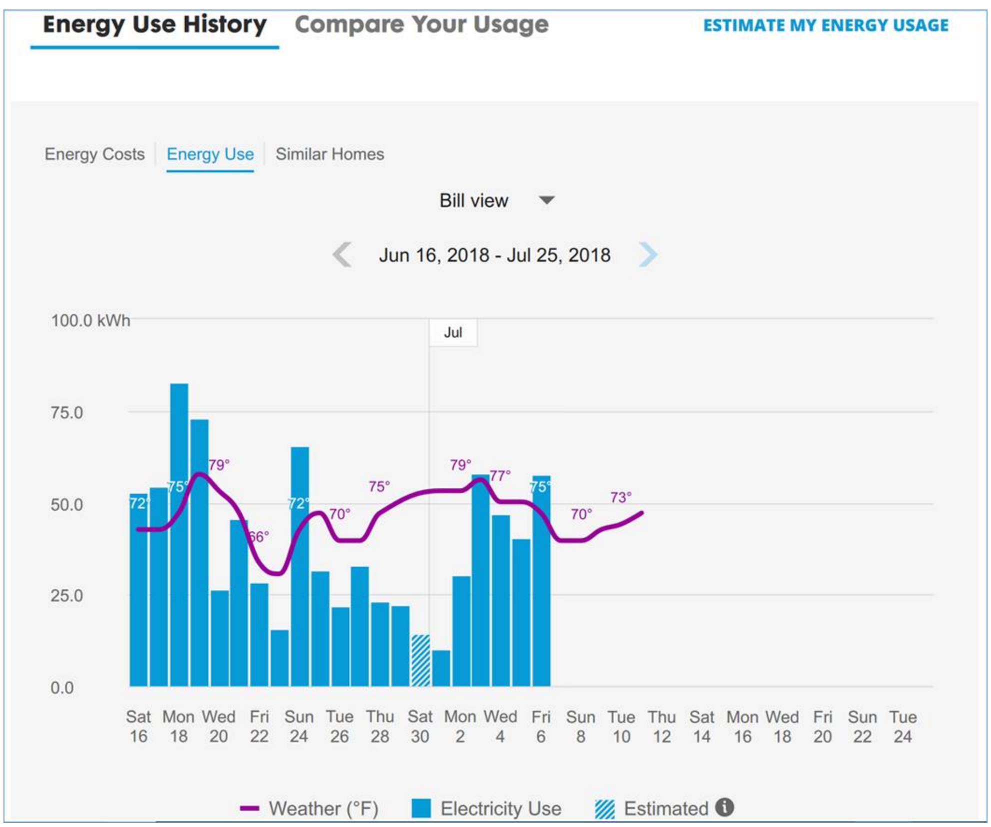
On November 16, 2015, Con Edison filed a detailed business plan for the deployment of AMI and associated communications network and back office IT systems to manage the two-way communications enabled by AMI.[186] On March 17, 2016, the Commission approved this plan, which includes the rollout of approximately 4.7 million advanced electric and natural gas meters.[187] AMI provides customers with the information necessary to help manage their energy usage, control costs, and become more active energy consumers. The robust communications network, implemented ahead of meter deployment, provides a critical, cyber-secure link to communicate with the smart meters, and also may allow operators to dispatch and control certain resources as DER markets develop.

The Company also filed its AMI Customer Engagement Plan on July 29, 2016 describing how the Company will engage customers and third parties and help them to understand and take advantage of the benefits of investments in AMI and DCX.[188] The engagement plan activities are intended to facilitate greater customer participation in the Company's DR programs, provide for other energy management opportunities offered through innovative value-added products and services by third parties, and increase access to EE tools. For example, the new website design developed as part of DCX offers customers additional data visualization and comparison tools to understand energy usage, such as the detailed energy usage and billing information Figure 41 shows below.

[186] Con Edison 2015 Electric Rate Case, AMI Business Plan (filed November 16, 2015).
[187] Con Edison 2015 Electric Rate Case, AMI Order.
[188] Con Edison 2015 Electric Rate Case, AMI Customer Engagement Plan. Note 141, *supra*.

Figure 41: Examples of Data Visualization Tools





A highlight of the Customer Engagement Plan is the implementation of GBC, which allows customers to share more granular customer data with authorized third parties in a machine-readable format. The Company's GBC initiative is discussed in greater detail in Section 2.8 on Customer Data.

Implementation Plan, Schedule, and Investments

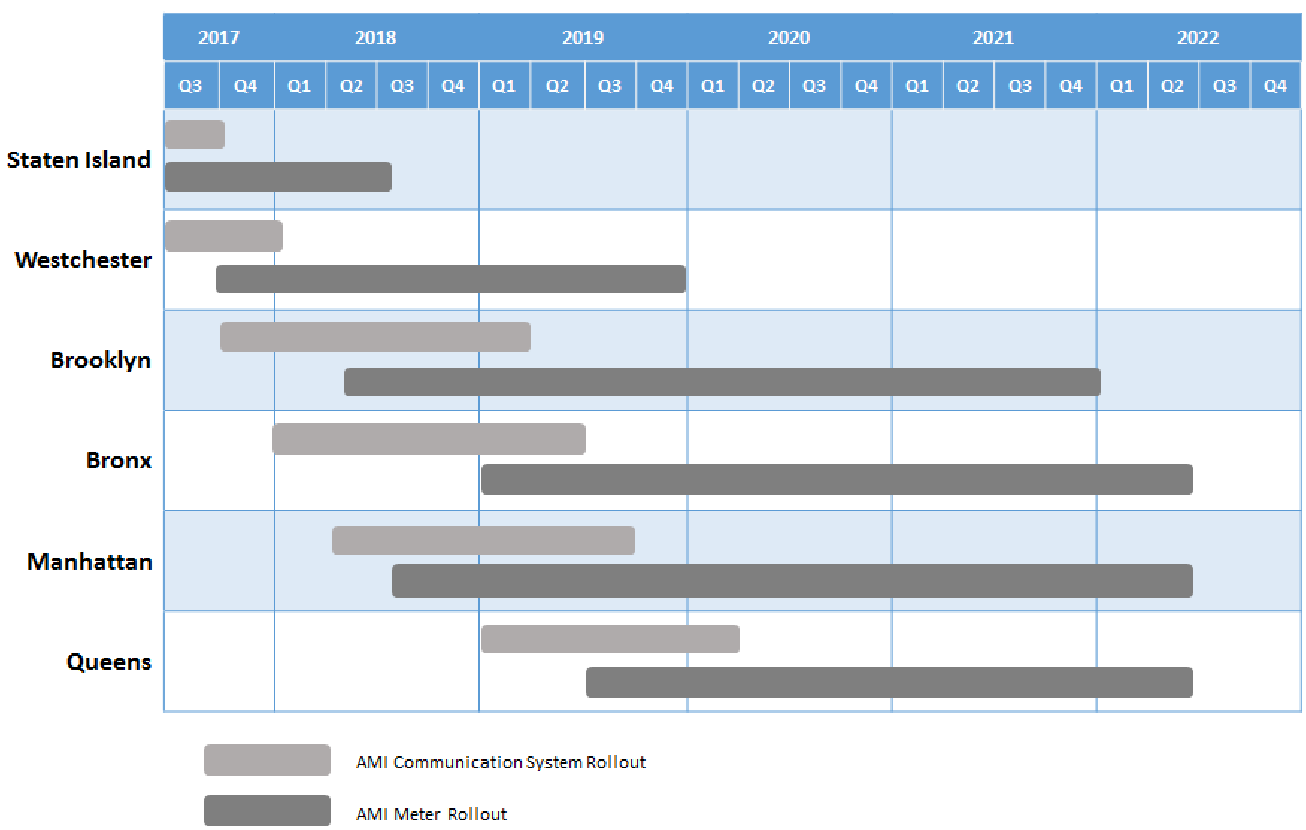
Current Progress

Summary of Achievements

- Successfully implementing AMI Business Plan, including installation of approximately 351,000 smart meters as of July 2, 2018.
- Beginning to leverage AMI capabilities, including sharing of more granular data and planning to implement CVO.

Con Edison's AMI meter rollout plan maximizes initial deployment success, allows a measured and controllable installation process across multiple boroughs, addresses impacts on people and processes, and yields initial benefits to customers. This rollout plan, which Figure 42 presents below, also accounts for the deployment of the AMI communications network ahead of meter installations to allow smart meters to be commissioned quickly.

Figure 42: AMI Rollout Plan



As shown in the chart above, AMI deployment is currently underway in Staten Island, Westchester County, Brooklyn, and Manhattan. Con Edison has deployed a total of approximately 351,000 smart meters as of July 2, 2018.

Future Implementation and Planning

Summary of Future Actions
• Continue implementing AMI Business Plan, which will deploy a total of 4.7 million smart meters and the communications network to support them. • Implement the value-added features enabled by AMI, including outage notifications, high bill alerts, enhanced customer data sharing, and pricing pilots.

AMI deployment in Manhattan started in July 2018 and will continue through June 2022. Installation in the Bronx and Queens is scheduled to start in 2019 and conclude in June 2022.

Risks and Mitigation

Con Edison is deploying AMI in four logical phases to reduce planning complexity and maximize control of the project. The Company is leveraging best practices to provide an optimal customer experience and reduce risk. Potential implementation risks that could affect the schedule include:

- Meter installation rate slower than projected.
- AMI communication system not installed in time for mass deployment of meters.
- Insufficient inventory of required equipment.

The Company is mitigating these risks by closely monitoring installation progress and also monitoring available installers and equipment supply to stay on schedule. For the communication system, the Company is closely tracking communications installations.

Stakeholder Interface

As noted above, the Company filed a Customer Engagement Plan describing a range of activities to raise awareness of the benefits of AMI and address customer questions and concerns. [189] Additionally, each customer receives a postcard 90 days before meter installation explaining the benefits of AMI and can view information on features and benefits, installation schedules, accessing data, and frequently asked questions on the Company's website (https://www.coned.com/en/our-energy-future/technology-innovation/smart-meters).

For DER developers, the launch of GBC facilitates the sharing of more granular data available from AMI through an automated process in machine readable format, which supports developers' business planning, marketing, and project scoping.

[189] Con Edison 2015 Electric Rate Case, AMI Customer Engagement Plan. Note 141, *supra.*

Additional Detail

This section responds to the questions specific to AMI.

1) Provide a summary of the most up-to-date AMI implementation plans, including where AMI has been deployed to date.

The AMI Order approved the Company's proposal to deploy a total of 4,715,000 smart meters across its service territory between 2017 and 2022.[190]

As of July 2, 2018, Con Edison has deployed approximately 351,000 smart meters. AMI meter installation began in June 2017 for new business customers and business-as-usual replacements. AMI deployment is currently underway in Staten Island, Westchester County, Brooklyn, and Manhattan. Table 19 shows the current AMI communications network and meter deployment schedule:

Table 19: AMI Communications Network and Meter Deployment Schedule

Phase	Region	AMI Communication Network Status*	Anticipated Meter Deployment Completion Date
1	Staten Island	Completed January 2017	August 2018[191]
2	Westchester	Completed December 2017	December 2019
3	Brooklyn	Anticipated Completion Q1-2019	December 2021
	Bronx	Anticipated Completion Q2-2019	June 2022
4	Manhattan	Anticipated Completion October 2019**	June 2022
	Queens	Anticipated Completion March 2020	June 2022

* Completion of communication reflects installation of access points and relays for radio frequency design in order to successfully communicate with all AMI meters.

** Manhattan Socket access point installation started in April 2018 and will continue through mid-2019.

In addition to the phased AMI implementation plan, Con Edison implemented a project to deploy an AMI system throughout MTA facilities in Manhattan, Brooklyn, the Bronx, and Queens starting in October 2017. The deployment is on target to complete in July 2018.

2) Describe in detail where and how the utility's AMI provides capabilities which:

a. help the utility integrate DERs into its system and operations;

[190] Con Edison 2015 Electric Rate Case, AMI Order.

[191] Approximately 550 TOU billing meters in Staten Island will be exchanged in Q4-2018.

The integration of AMI data into system planning provides better information at the grid edge. Smart meters collect usage and voltage information that aids the utility's analysis of its distribution system. An AMI meter provides kWh, kVAR, and voltage information collected every 5 minutes for commercial customers and every 15 minutes for residential customers. This information is delivered every 15 minutes to the Company's AMI systems.[192]

The Company can use AMI data to identify equipment overloads, enable distribution automation, improve the engineering analysis of distribution system equipment, optimize spending on capital infrastructure upgrades, and generate O&M savings. This could help reveal areas of higher demand and lower voltage, where a DER could provide useful capacity. Additionally, for customers installing solar, a bi-directional AMI meter eliminates the need for a second meter and a separate visit for meter work.

b. help DER developers plan and implement DERs;

The Company is building out GBC to facilitate the sharing of more granular data available from AMI, which supports developers' business planning, marketing, and project scoping. The first phase of GBC implementation was finalized in December 2017, in coordination with O&R, under the branding of Share My Data. Share My Data allows customers to authorize registered third parties to access their energy data through an automated process in a machine readable format. Datasets available include meter number, energy or net energy usage data (kWh, net kWh, CCF), and reactive power (kVAr). Third parties are able to request 15-minute interval data for residential customers with smart meters and 5-minute interval data for commercial customers with smart meters. Share My Data provides electric customers with up to 24 months of data in near-real time (i.e., 30-45 minutes after the interval ends).

c. help DER operators plan and manage operation of their DERs;

AMI will allow customers and operators to view DER output in near-real time, which can facilitate optimization of DER resources and early detection of potential performance issues. When operated by the Company, the DER asset can be leveraged to support system reliability.

d. enable or enhance the utility's ability to implement and manage automated Volt-VAR Optimization (VVO);

CVO is a subset of VVO that involves lowering voltage to reduce line losses and save energy. CVO is a significant benefit of AMI deployment. Lowering the voltage will reduce the amount of energy required to be purchased by customers to satisfy a given load, thus reducing generation and the associated carbon emissions. The Company has purchased and installed the necessary modems and controllers at 4 kV unit substations in Staten Island and expects to begin to implement CVO in Staten Island starting the end of 2018.

AMI provides control room operators with voltage information from across the system. With approximately 3.6 million new end-points providing voltage data every 15 minutes, the utility will have the granular data required for load-curve analysis by circuit, allowing operators to run the system at optimal voltages. This can be accomplished through manual analysis of AMI meter data and new substation voltage schedules based on this meter data (AMI-Assisted Manual Approach) or through a feedback loop from the smart meters to the substation that allows automatic voltage changes (AMI Feedback-Loop Approach). The AMI Feedback-Loop Approach can also enable VVO schemes to manage voltage levels and reactive power flows through real-time feedback of smart meters.

[192] This data is provided approximately 30 minutes after the read to allow the usage and voltage reads from every meter to be collected and validated by the information systems.

The current plan is to implement the AMI-Assisted Manual Approach. The goal is to use AMI data to develop new voltage schedules after the completion of a region's meter deployment.

e. improve the utility's ability to prevent, detect, and resolve electric service interruptions;

AMI will improve the Company's ability to prevent, detect, and resolve electric service interruptions through integration of AMI data with existing and new tools.

Preventing service interruptions will be accomplished through new integrations with existing distribution grid analysis tools. Engineering groups can then use the analysis gathered by the distribution grid analysis tools to generate new infrastructure upgrade plans ahead of periods of high system stress, such as summer heat events.

Detecting and resolving service interruptions will be improved with the meter's built-in functionality of generating alarms and events from a pre-determined set of rules and through integrations with new or upgraded tools, such as an upgraded OMS. The meters will inform and verify customer outages, restorations, voltage conditions, and other power quality conditions that can be used by operators to analyze and respond to an event. The integration of AMI meter data with the OMS will enable operators to proactively identify undesirable conditions, understand the full scope of a large outage quicker, and validate restorations as they occur in a large outage to more efficiently manage the restoration effort.

The initial phase of this combined functionality is expected to be in service by the end of September 2018 and further enhancements made in 2019. Additionally, the Company has implemented an AMI application to monitor MTA facilities, which enables the Company to detect outages on the sections of system serving MTA equipment.

f. improve the utility's ability to implement rate programs which facilitate and promote customer engagement, DER development, and EV adoption;

With fully-enabled AMI, all customers will have access to their interval electricity usage data, which may increase their ability to adjust their consumption patterns to reduce their electricity bill. This facilitates customer participation in new rate pilots, such as the Innovative Pricing pilot and SHR demonstration project, as well as DR programs offered by the Company and the NYISO. Additionally, Con Edison customers can enroll in whole house or dedicated EV TOU rates that promote off-peak consumption.

The Company, with O&R, submitted its AMI Customer Engagement Plan[193] on July 26, 2016, which included a pricing pilot intended to identify how innovative pricing structures can enhance customer benefits from AMI deployment in a cost-effective manner. Con Edison's proposed pilot[194] targets mass market (SC-1) and small commercial (SC-2) customers with AMI in Westchester County, Staten Island, and Brooklyn. The pilot timeline is largely driven by the timing of the AMI rollout, with the pilot going live in Staten Island and Westchester County approximately one year before the pilot is active in Brooklyn. Additionally, the opt-in customer group will begin the pilot approximately six months prior to the opt-out group. The pilot will run for a time period sufficient to capture load impacts over two summer peak periods.

The pricing pilot design includes three main components: (1) pricing of delivery service, (2) enabling technologies, and (3) education and outreach. The goal is to gauge customer acceptance and response to new prices, as well as estimate

[193] Con Edison 2015 Electric Rate Case, AMI Customer Engagement Plan. Note 141, *supra*.
[194] Letter to PSC Secretary Burgess from Con Edison, Innovative Pricing Pilot (filed July 6, 2018).

system impacts derived from changes in customer behavior. Additionally, the pilot will collect data to help estimate customer benefits and inform future mass market rate design. The pilot will test both opt-in and opt-out approaches to recruit customers.

The new delivery prices are based on demand, with one demand rate based on conventional methods for assessing demand charges and the other rate based on a subscription service that allows customers to choose different levels of demand. The Company is continuing to investigate enabling technologies that have the potential to benefit customers on demand-based rates in designing the pilot, such as smart thermostats, in-home displays, and app-based services.

In addition, on February 1, 2017, in response to a requirement of the REV Track Two Order[195] and as discussed in previous sections, the Company submitted an initial proposal for a SHR demonstration project to understand how residential customers and customer-sited DER assets respond to innovative pricing signals designed to better manage the grid and deliver benefits to customers. The premise is that a SHR paired with the right mix of DER and home automation technologies can result in homes that use less energy or export during times of system peak load and consume during hours when excess capacity is available. To that end, the SHR project has developed two rates that are technology agnostic and reflect cost causation and temporal and locational granularity for certain unbundled costs components. It has also formed partnerships to provide price-responsive home automation technology options and collect empirical data on participant's responses that will help gauge market opportunities.

Con Edison has defined two tracks for the SHR demo tracks, a rate comparison track paired with smart thermostats (Track 1) and a solar plus storage track paired with dynamic, time-varying components that closely reflect cost drivers for supply and delivery of electricity (Track 2). The implementation timeline consists of phases ranging from Q2-2017 to Q1-2020.

3) Describe in detail how the AMI enables secure communication with and among devices at customers' premises to support customer engagement, energy efficiency, and innovative rates.

As previously mentioned, AMI will offer customers greater visibility into their energy consumption through near-real time and/or prior day data presentment. The Company analyzes the data and sends out high bill alerts and potential cost savings opportunities on a personalized basis. Additionally, all electric smart meters include a ZigBee module. ZigBee is an open global standard for wireless technology designed for personal area networks. If enabled, the ZigBee technology may be used to establish Home-Area Networks ("HAN") that the customer can use for secure communication with smart devices, such as smart thermostats or water heaters, provided they are within range of the meter.

As the Internet of Things ("IoT") develops, consumers have a wide range of choices for controllable devices, many of which rely on wireless internet, as opposed to HAN or ZigBee technology. Given the trend toward IoT and the limitations of HAN in apartment building applications, the Company believes the market will determine the technology that will be predominately utilized across its service territory.

4) Describe where and how DER developers, customers, and other stakeholders can access up-to- date information about the locations and capabilities of existing and planned smart meters.

The Company continues to proactively communicate the benefits of AMI to customers. For example, the Company sends a postcard to customers 90 days before meter installation explaining the benefits of AMI. Additionally, the AMI

[195] REV Proceeding, REV Track Two Order, p. 156.

rollout plan is publicly available through the Company's website[196] and was promoted through extensive outreach activities, as described in previous sections.

[196] https://www.coned.com/en/our-energy-future/technology-innovation/smart-meters

2.12. HOSTING CAPACITY

Context and Background

Con Edison continues to advance its hosting capacity capabilities and make additional system data available to third parties. These actions support DER integration and DER market growth by guiding DER investments and marketing activities to areas of the grid where the costs of interconnection are likely to be the lowest, thus allowing prospective interconnection customers to make more informed business decisions prior to committing resources to an interconnection application.

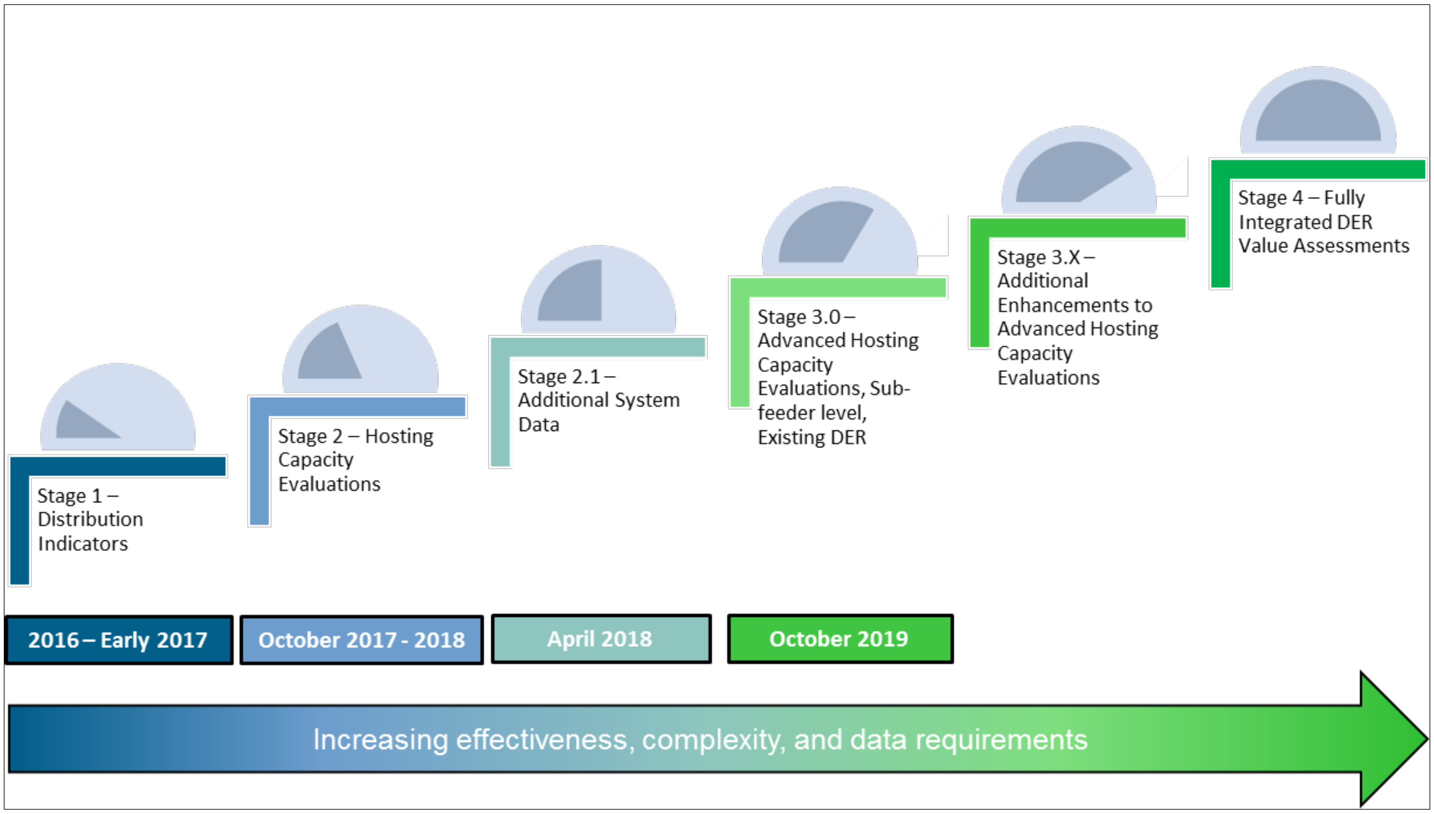
Hosting capacity is defined as the amount of DER that can be accommodated without adversely impacting power quality or reliability under existing control configurations and without requiring infrastructure upgrades to the primary line voltage and/or secondary network system.[197] The Joint Utilities calculate each circuit's hosting capacity by evaluating the potential power system criteria violations as a result of interconnecting large PV solar systems to three-phase distribution lines.[198] The Joint Utilities selected this approach to deliver usable information in a timely manner to the DER developers most active in New York State.

As initially presented in the Supplemental DSIP and modified with the addition of Stage 3.X in Figure 43 below, the Joint Utilities adopted a multi-phase approach for developing hosting capacity analysis capabilities that is paced with the evolution of hosting capacity tools, models, and processes. With each stage comes increased granularity, but also complexity.

[197] EPRI, *Defining a Roadmap for Successful Implementation of a Hosting Capacity Method for New York State*, Report Number 3002008848 ("EPRI Roadmap") (June 2016), p. 2. http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002008848.

[198] This refers to solar generation with an AC nameplate rating starting at and gradually increasing from 300 kW.

Figure 43: Joint Utilities Hosting Capacity Roadmap



Implementation Plan, Schedule, and Investments

Current Progress

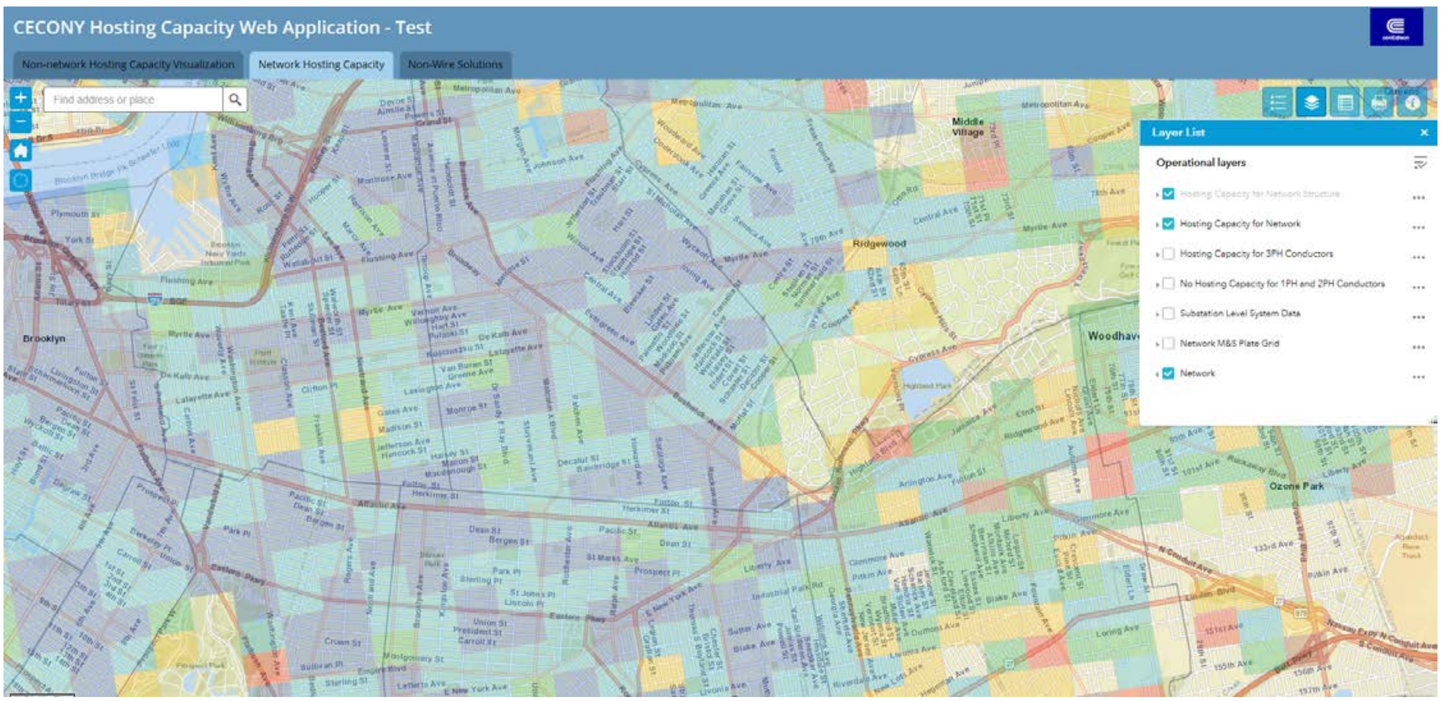
Summary of Achievements

- Published Stage 2 feeder-level hosting capacity analysis for non-network and network circuits, thus providing greater visibility across Con Edison's system.
- Added new layers to hosting capacity map for NWS and LSRV zones to provide developers with greater insight into favorable locations for DER.
- Provided additional system data elements in pop-up boxes, including aggregated queued and connected DG at the substation level.
- Continued progression with definition of Stage 3 approach, which will provide hosting capacity at the sub-feeder level and consider existing DER.

The Company continues to add new functionalities and data to the hosting capacity platform, with a goal of maximizing the value of the hosting capacity map to developers. Since the Initial DSIP and the Supplemental DSIP, Con Edison has progressed through Stages 1, 2, and 2.1, thus meeting the milestones set by the Commission in its DSIP Order. Specifically, Con Edison issued a static low-voltage network hosting capacity map for network and non-network distribution circuits in June 2016. The Company published a new hosting capacity map on October 1, 2017, which provided a visual representation using color coding standardized across the Joint Utilities of estimated available feeder-level hosting capacity for non-network circuits at 12 kV and above.[199] Con Edison published hosting capacity on 4 kV overhead circuits in December 2017 and the complete network and non-network hosting capacity map in June 2018. The network map is based on site-specific PVL studies and presents hosting capacity at the service box and secondary service level, making it one of the most advanced hosting capacity maps in the country for network systems.[200] Developers can narrow searches to available customer or project locations, as opposed to receiving high-level distribution network values that may or may not accurately reflect the values observed at the true point of interconnection.

Figure 44 provides a screenshot of the entry screen for the map, which contains tabs for non-network hosting capacity, network hosting capacity (selected), and NWS, and allows users to select different layers to display additional data.

Figure 44: Network Hosting Capacity Map

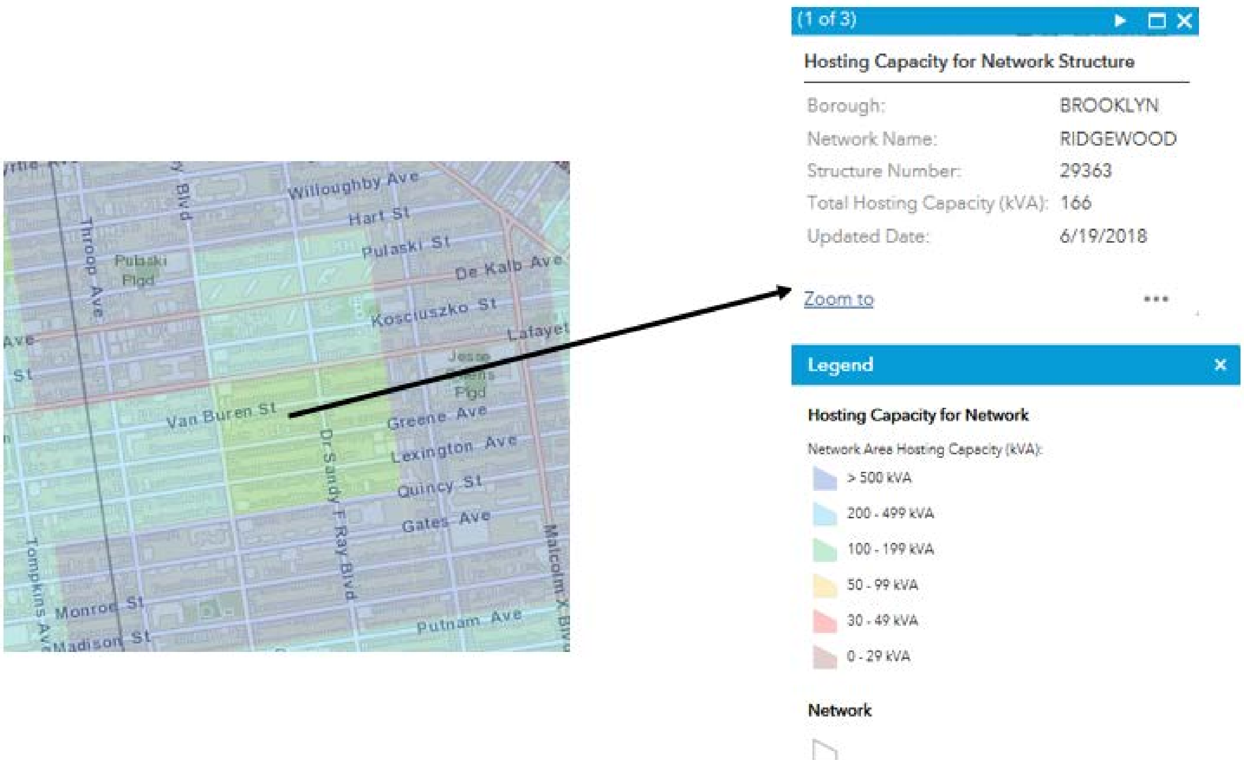


The colored squares visible in Figure 44 above and Figure 45 below provide a view of the main and service ("M&S") plate. By clicking on the square, a user can access additional data at that level, including hosting capacity and available system data.

[199] http://coned.maps.arcgis.com/apps/webappviewer/index.html?id=ce32722defd04152b16b594c36795490

[200] The Stage 2 analysis was completed using the EPRI Distribution Resource Integration and Value Estimation ("DRIVE") tool. The DRIVE tool leverages existing circuit models in a utility's native distribution planning software to carry out a streamlined analysis of hosting capacity. Because EPRI's DRIVE tool was designed for analyzing radial (non-network) circuits and is not configured to provide hosting capacity in the Company's low-voltage mesh grid, the Company worked internally to modify the static network maps to present network hosting capacity values on the mesh network.

Figure 45: Network Hosting Capacity View at the M&S Plate Level

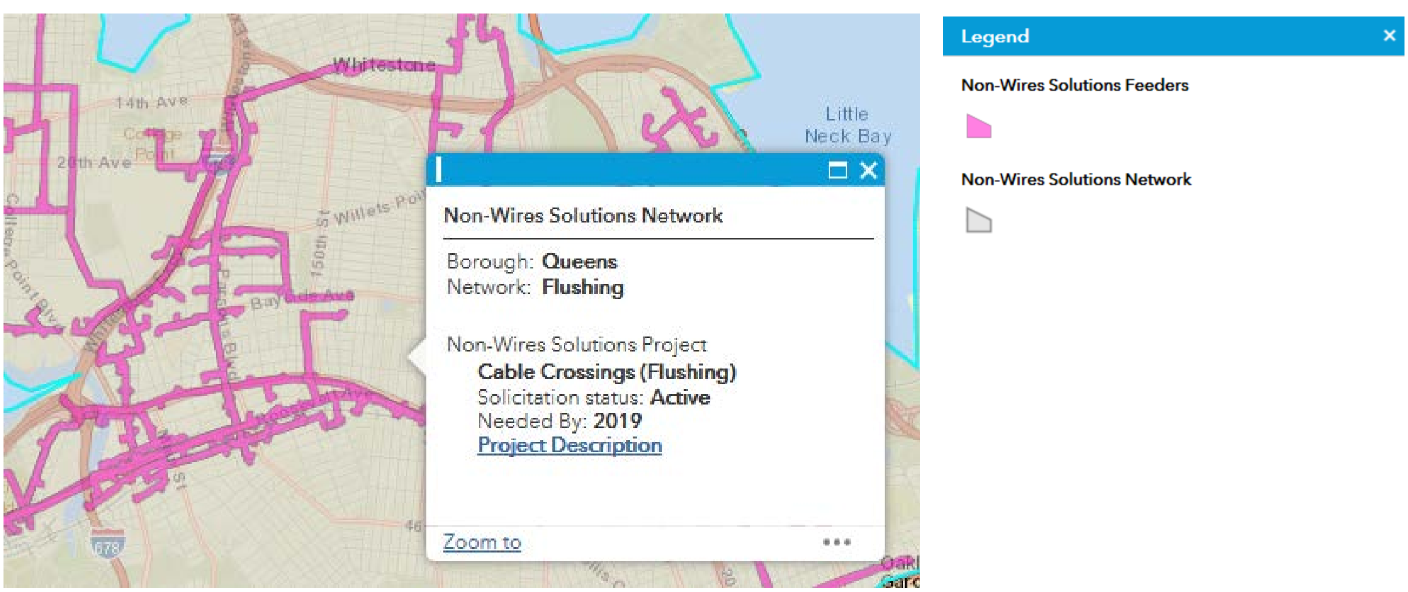


Users can further zoom in on the network area to view hosting capacity for individual structures, as shown in Figure 46.

Figure 46: Hosting Capacity for Individual Network Structures

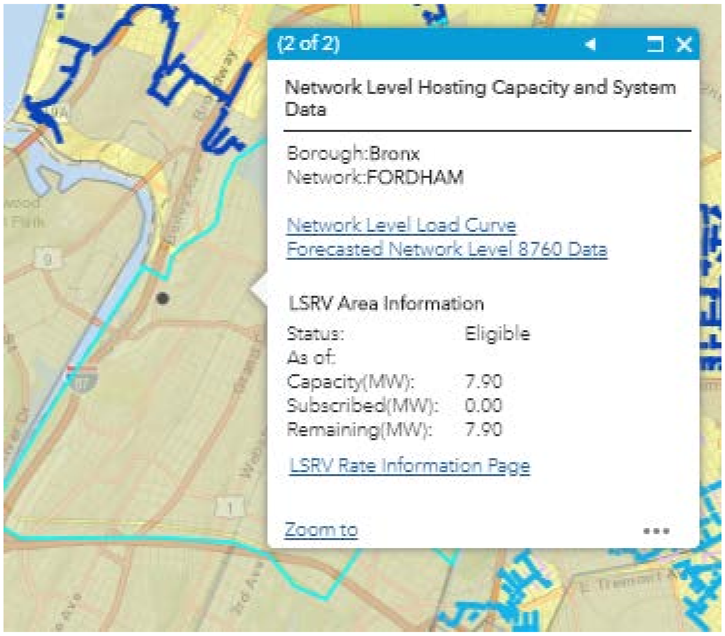
In addition to granular network and non-network hosting capacity, the platform now displays areas targeted for NWS and areas with positive LSRV, providing a more comprehensive view of beneficial locations. As shown in Figure 47 below, the NWS tab of the hosting capacity map displays an NWS-eligible area at the network level, the affected feeders, and the relevant system information, as well as a link to the project description.

Figure 47: NWS View



As shown in Figure 48 below, the Company added LSRV information to the system data pop-up boxes, including eligibility status and remaining capacity, as well as a link to the rate information page on the Company's website.

Figure 48: LSRV View



Providing this multi-faceted view allows developers to more readily see where there is higher potential value to be captured across the Con Edison distribution system, through supplemental LSRV value streams as part of the VDER tariff or NWS payment streams, and compare that to the hosting capacity of those areas for a more complete assessment of business opportunities.

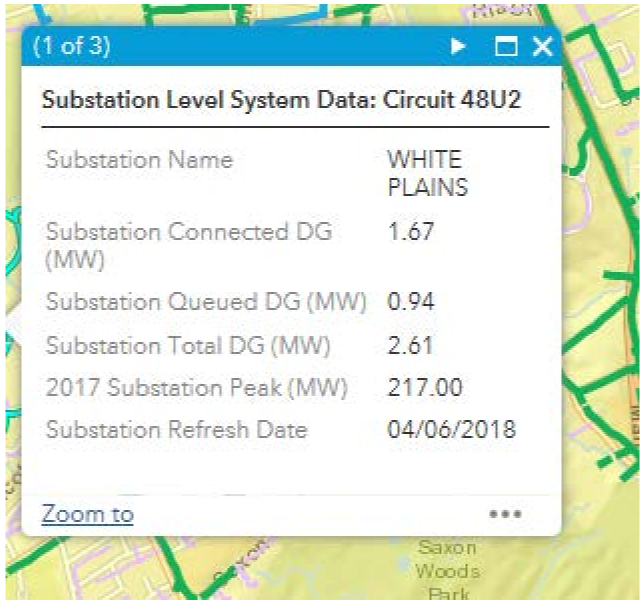
The Joint Utilities agreed to provide additional data elements identified in an April 2017 stakeholder engagement session as part of a "Stage 2.1" release, which went live in April 2018. The additional system data elements provided *at the substation level* include: [201]

- Installed and queued DG
- Total DG (sum of installed and queued DG)
- Previous year peak load

As Figure 49 shows below, the map uses pop-up boxes to provide this additional data, including minimum and maximum total feeder hosting capacity, voltage, and installed and queued DG values, the latter of which will be updated monthly. The installed and queued DG is of particular interest as the Stage 2 analysis did not include existing DER. For the network areas, the map includes links to network level load curves and 8,760 forecast data.

[201] Substation-level information may be provided at the individual substation transformer bank level when appropriate. A unique identifier is included noting the specific substation transformer bank in those instances.

Figure 49: System Data Pop-Up Box



Future Implementation and Planning

Summary of Future Actions

- Refresh hosting capacity analysis and Stage 2.1 data in October 2018 as part of the annual refresh.
- Complete Stage 3 hosting capacity analysis by October 2019.
- Hold stakeholder engagement sessions corresponding with the release of each stage.
- Continue to explore avenues to advance the hosting capacity roadmap to enhance the value of the information provided.

The next milestone, scheduled for October 2018, is the annual refresh of hosting capacity analysis and Stage 2.1 data initially released in April 2018. Con Edison will release Stage 3 analysis no later than October 1, 2019. Consistent with the Supplemental DSIP and aligned with stakeholder feedback,[202] the Stage 3.0 release will include modeling of existing interconnected DER[203] and sub-feeder level hosting capacity analysis. The evolution to more granular hosting capacity analysis will enable developers to identify more specific locations along a feeder with higher levels of hosting capacity and potentially lower interconnection costs. For example, while the impact of existing DER on circuit load curves was reflected in the Stage 2 results, the Stage 3.0 release will reflect installed DER in the circuit models directly to better

[202] The Joint Utilities captured and summarized a full list of the stakeholder recommendations on Stage 3 and posted it on the Joint Utilities website. http://jointutilitiesofny.org/wp-content/uploads/2017/12/JU-Hosting-Capacity-Stakeholder-Session-2017-11-02-Summary.pdf

[203] The impacts of all existing DER are reflected in the underlying circuit load curves and load allocations of the analysis in Stage 2. This enhancement incorporates the interconnected DER to date into the circuit models used for the hosting capacity analysis with a priority on large PV, which remains the DER technology with the most significant impacts on hosting capacity.

reflect their impact on PV hosting capacity. In addition, the increased granularity of data in the Stage 3.0 release will provide more locational-specific sub-feeder level information to better inform developers.

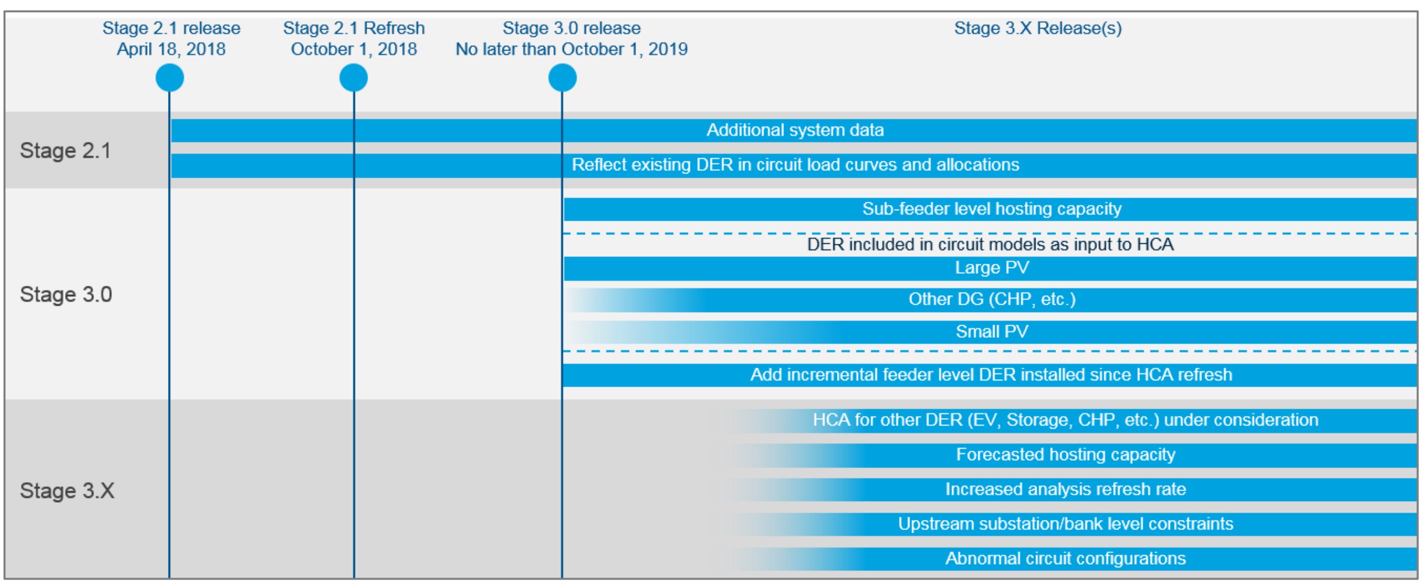
Subsequent Stage 3.X releases will further enhance the information provided on the hosting capacity portal. The Joint Utilities are evaluating options to further improve the analysis and will continue to solicit input from stakeholders on the continued development of the hosting capacity roadmap. Possible enhancements in Stage 3.X releases identified thus far include:

- Forecasted hosting capacity.
- Increased analysis refresh frequency.
- Circuit reconfiguration assessments and operation flexibility.
- Incorporation of use cases for energy storage.

Consistent with the 2018 DSIP Guidance, the Joint Utilities will evaluate options for forecasting hosting capacity that take into account the accuracy of such an analysis given the uncertainty in the location, timing, and configuration of DER adoption forecasts; projected changes to individual customer loads; and any upgrades or changes to the utility system. The roadmap for forecasting hosting capacity must incorporate models of future utility system configurations, gross load forecasts, and DER forecasts. Each of these items has its own roadmap and consideration of scenario based planning, probabilistic, and deterministic approaches. These concepts must be integrated to produce a forecast, and it must be decided what level of granularity is appropriate before the level of uncertainty rises significantly.

The Joint Utilities are actively coordinating with EPRI and other utilities in North America on the DRIVE tool roadmap in order to evaluate options for including aspects such as upstream constraints and operational flexibility in future Stage 3.X releases. The draft roadmap for Stages 2.1, 3.0, and 3.X is presented in Figure 50.

Figure 50: Joint Utilities Roadmap for Stages 2.1, 3.0 and 3.X



Risks and Mitigation

The software and calculation tools used for hosting capacity analysis are evolving. The timeline for the development of tools necessary for Stage 3 analysis and their integration with utility systems could impact the timeline for Stage 3. Con

Edison is continuing to engage with EPRI on the refinement of its DRIVE tool in the continued development of the roadmap.

Stakeholder Interface

The Joint Utilities worked with stakeholders to familiarize them with the hosting capacity maps and solicit input on desired features. For example, in November 2017, the Joint Utilities hosted a stakeholder engagement session to offer a live demonstration of the Central Hudson Gas & Electric Corporation's hosting capacity map and solicit input on future enhancements, including developments as part of Stage 3 hosting capacity analysis. The Joint Utilities also worked collaboratively with stakeholders to identify additional data elements that could further enhance the value of the displays to developers. As noted above, the Joint Utilities added datasets requested by stakeholders to their hosting capacity maps as part of the Stage 2.1 release.

The Joint Utilities will continue to engage stakeholders and solicit input on these approaches to further inform the continued expansion of the hosting capacity roadmap. In the case of hosting capacity analysis for energy storage, input on developer use cases will help inform the appropriate work product that will be most beneficial to stakeholders. This input will be especially important given the broad range of energy storage technologies, applications, and operating characteristics that such analyses could reflect. Similarly, forecasted hosting capacity will likewise benefit from stakeholder input given the level of complexity of the analysis that impacts the accuracy and precision of its results.

Similar to their approach in 2017, the Joint Utilities plan to hold stakeholder engagement sessions corresponding with the release of each stage to provide an update to stakeholders on progress to date and solicit input on future stages. The Joint Utilities plan to continue facilitating open discussions with stakeholders via the engagement group sessions beyond the Stage 3.0 release. As described in the Supplemental DSIP, completion of Stages 3 and 4 of the hosting capacity roadmap is intended to be a long-term focus for utilities based on lessons learned from previous stages and the availability of enhanced analytical tools to conduct this degree of analysis.[204] The longer-term focus on Stages 3 and 4 complements the Joint Utilities' interest in engaging stakeholders to provide the highest value results for users.

Additional Detail

This section responds to the questions specific to hosting capacity.

1) **The utility's current efforts to plan, implement, and manage projects related tohosting capacity. Information provided should include:**

   a. **a detailed description of each project, existing and planned, with an explanation of howthe project fits into the utility's long range hosting capacity plans;**

Con Edison has an internal hosting capacity project team that is responsible for translating the Joint Utilities' hosting capacity roadmap into work streams and deliverables. The cross-functional team is made up of subject matter experts familiar with relevant policy goals and standards, distribution planning, and engineering, as well as the mapping and visualization platforms needed to externally present calculated data points. The hosting capacity project team has prioritized the release schedule to align with the DSIP Order, as well as specific stakeholder requests that were gathered during 2017 engagement sessions. As of July 2018, Con Edison has completed Stages 2.0 and 2.1 and released network hosting capacity. The Company's priority, starting in 2018, will be providing a refresh of the Stage 2 analysis results and

[204] REV Proceeding, Supplemental DSIP, p. 56.

the completion of Stage 3 hosting capacity. The Company's plans, in coordination with the Joint Utilities, to make additional enhancements to hosting capacity, including Stage 3, will continue to evolve as tools and priorities change.

Stage 2.0 Radial Hosting Capacity

In October 2017, Con Edison published a full streamlined hosting capacity analysis for overhead circuits operating at a voltage class greater than 12 kV. Due to the number of 4 kV circuits located in the overhead system, Con Edison prioritized the streamlined calculation of these circuits in fall 2017. Since the 4 kV system is not radial in nature (radial circuits only account for approximately 13 percent of the Company's load), the Company needed to perform additional work on these circuits in order to calculate similar results that were derived for the radial system. These results were released in December 2017.

During this time, Con Edison worked with the Joint Utilities and EPRI to validate the calculations provided by the DRIVE tool. Additionally, the team refined load flow models and the methodology to adapt the Company's tools and techniques to facilitate future phases of hosting capacity calculation.

In addition to traditional utility load flow modeling, the Company worked on the mapping and visualization platforms necessary to refine the data elements needed to present hosting capacity in a geospatial environment. This will be an ongoing effort throughout future stages of hosting capacity analysis.

Network Level Hosting Capacity

Because 87 percent of load is served through underground low-voltage networks, the Company worked through 2017 and into 2018 to develop an approach around network level hosting capacity calculation and the data visualization strategy that leveraged the established overhead color and data schemes to improve the customer experience. Con Edison prioritized this process following the delivery of Stage 2.0 in October 2017.

Con Edison's network level map allows the user to navigate different sections of a network by hosting capacity color and view existing and queued DG values. Once users locate a larger geographic area of interest, they have the ability to navigate to the street level and observe values at the various points that would be available for interconnection. A user can also search by prospective project address to view these more detailed values. This network level map was released in June 2018.

Stage 2.1 Hosting Capacity

Throughout the 2017 stakeholder engagement sessions for both hosting capacity and system data, developers requested values for queued and connected DG projects, total DG (i.e., sum of queued and connected DG), historical peak load values, and status of 3VO upgrades (i.e., scheduled and completed) at the substation level.[205] During spring 2018, Con Edison, along with the Joint Utilities, prioritized this work as "Stage 2.1" and Con Edison published its available data to the hosting capacity and system data portal in April 2018.

Stage 3.0 Hosting Capacity

Con Edison has started to evaluate the means and methods to calculate and visualize more granular hosting capacity. The Company plans to continue reviewing lessons learned from Stage 2.0 to refine modeling and visualization

[205] 3VO upgrades are not applicable to Con Edison's network system.

capabilities for future advancements and opportunities for automation. Con Edison will continue to work with the Joint Utilities to develop a common approach to nodal analysis calculation and visualization while seeking ongoing input from the stakeholder engagement process.

Stage 3.X Hosting Capacity

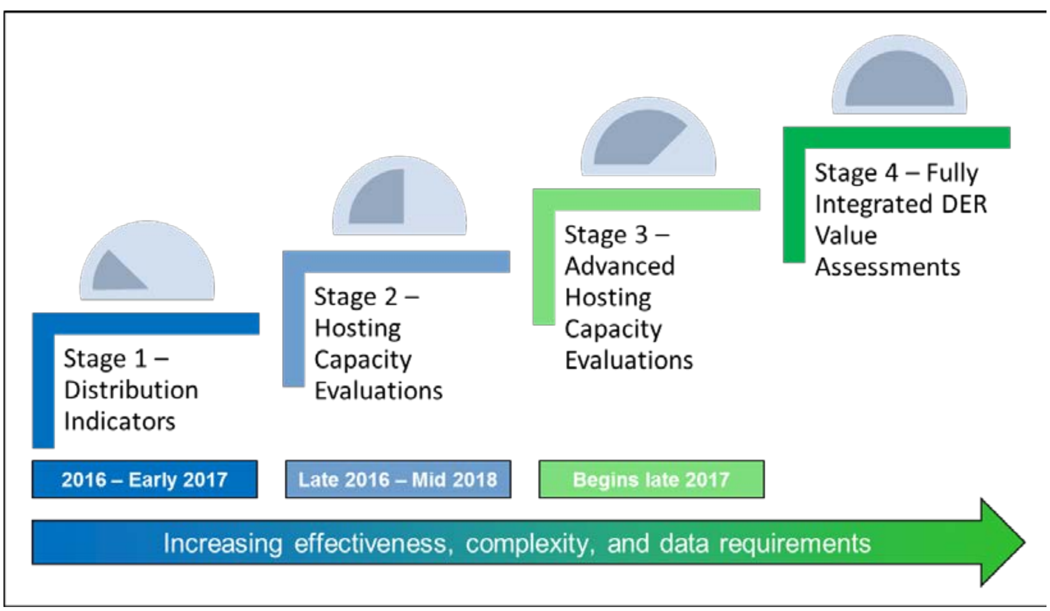
Subsequent Stage 3.X releases will further enhance the information provided on the hosting capacity portal. The Joint Utilities are evaluating options to further improve the analysis and will continue to solicit input from stakeholders on the continued development of the hosting capacity roadmap. Possible enhancements in Stage 3.X releases identified thus far include:

- Forecasted hosting capacity.
- Increased analysis refresh frequency.
- Circuit reconfiguration assessments and operation flexibility.
- Upstream constraints such as 3V0.[206]
- Incorporation of use cases for energy storage.

b. the original project schedule;

The Joint Utilities adopted a multi-phased approach for developing hosting capacity analysis capabilities that is paced with the evolution of hosting capacity tools, models, and processes. Figure 51 details the original project schedule as included in the Supplemental DSIP.

Figure 51: Original Joint Utilities Hosting Capacity Roadmap from Supplemental DSIP[207]



[206] 3VO upgrades are not applicable to Con Edison's network system.
[207] DSIP Proceeding, Supplemental DSIP, p. 48.

c. the current project status;

Con Edison has completed Stages 2.0 and 2.1, and released a network level hosting capacity map. The Company, along with the Joint Utilities, has begun work on the calculation methodology and visualization requirements necessary to complete Stage 3.

d. lessons learned to-date;

Con Edison will be able to use lessons learned from Stage 2 for future hosting capacity development. The Company has made significant strides in modeling and visualization efforts that will directly inform the way Stage 3 hosting capacity is developed. The hosting capacity work streams have created numerous processes for not only the refinement of data, but also the ways in which it is exchanged between systems and utilized for calculations and visualization. In addition, a large portion of the work that has gone into network level hosting capacity can be repurposed and leveraged toward future hosting capacity deliverables, specifically the way in which more granular calculations can be accomplished and visually segmented.

The consistent use across the Joint Utilities of Esri's ArcGIS tool for displaying hosting capacity has also facilitated additional knowledge sharing on best practices and implementation challenges. [208] Con Edison continues to coordinate with the other utilities on a consistent coloring scheme for each utility's hosting capacity map, making it easier for developers to interpret information for each utility.

Additionally, by engaging directly with stakeholders and monitoring activity within the hosting capacity map, Con Edison learned that while some developers leverage the hosting capacity map to inform business development activities, others rely primarily on the interconnection process to meet business needs. Given the Company's simultaneous efforts to enhance the interconnection process, Con Edison learned that in many cases the timely results achievable through the interconnection process obviate the need for developers to utilize the hosting capacity map.

e. project adjustments and improvement opportunities identified to-date; and,

In addition to lessons learned through internal work, Con Edison learned a great deal from the various stakeholder engagement sessions held throughout 2017 and 2018. One recurring element from the development community related to the value of data visualization. Providing a more complete system picture, inclusive of all value streams, can produce more complete project models for developers. To this end, the Company incorporated NWS, LSRV areas, and various system data elements into the hosting capacity and system data mapping environment. The ability of third parties to view these elements, in addition to hosting capacity values, offers a more complete representation of areas where projects can fully capitalize on both monetary and system benefits.

Another improvement opportunity identified through the stakeholder process is providing additional granularity in the hosting capacity results. In response to stakeholder feedback, Con Edison and the Joint Utilities will continue to prioritize the development of sub-feeder level hosting capacity as part of Stage 3.

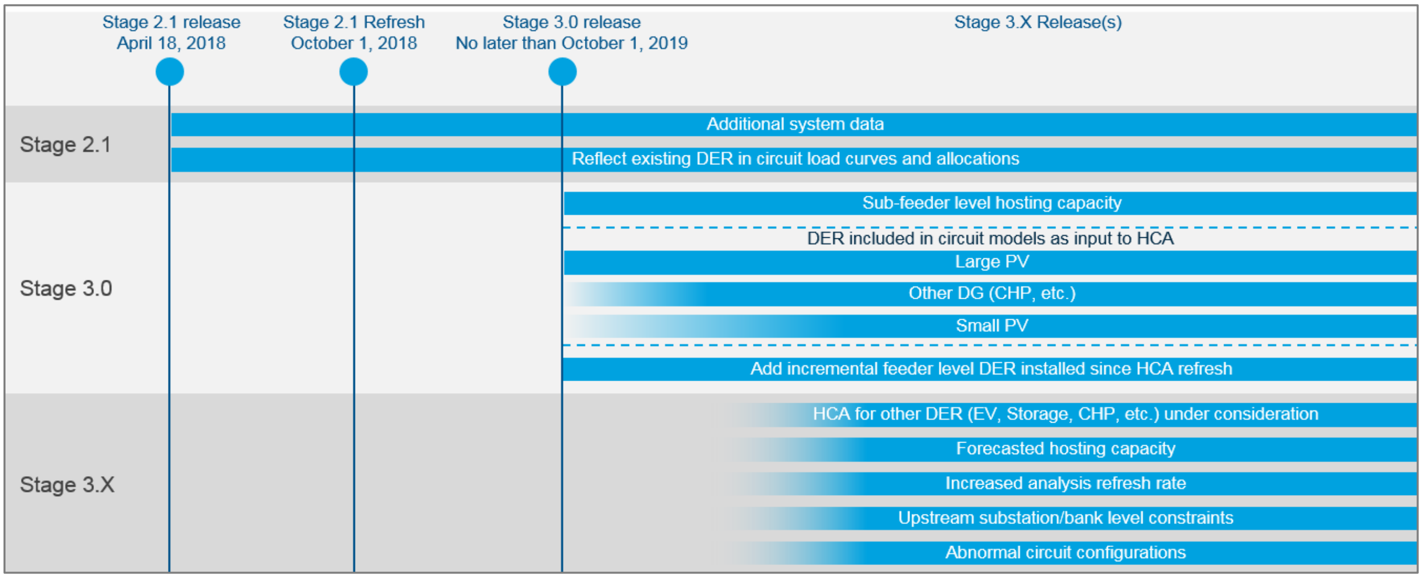
f. next steps with clear timelines and deliverables

Con Edison will refresh its hosting capacity analysis and Stage 2.1 data by October 1, 2018. The Company is working toward Stage 3 hosting capacity and expects to have the capability to display more granular values across circuit segments by October 2019. Additionally, Con Edison, in coordination with the Joint Utilities, will review options for

[208] https://www.esri.com/en-us/arcgis/about-arcgis/overview

calculating forecasted hosting capacity and seek to understand its potential use cases. Figure 52 illustrates the current timeline and deliverables.

Figure 52: Joint Utilities Roadmap for Stages 2.1, 3.0 and 3.X



2) Where and how DER developers/operators and other third parties can readily access the utility's hosting capacity information.

Information regarding hosting capacity and access to the hosting capacity and system data portal can be found at https://www.coned.com/en/business-partners/hosting-capacity.

3) How and when the existing hosting capacity assessment information provided to DER developers/operators and other third parties will increase and improve as work progresses.

Responding to requests from the developer community, Con Edison has begun work on Stage 3 and expects to deliver a more granular view of hosting capacity when segmented across a circuit. Con Edison also anticipates that, as work progresses to meet these objectives, continued model and data refinement will further clarify existing values.

4) The means and methods used for determining the hosting capacity currently available at each location in the distribution system.

Con Edison, along with the Joint Utilities, employed a streamlined approach to hosting capacity calculations that focused on the siting of larger commercial PV installations. This decision was made to guide developers toward areas on the distribution system that would be more accommodating to commercial-scale projects. The values produced on a circuit-by-circuit basis can also be valuable to site smaller rooftop solar projects as well.

The Joint Utilities validated and utilized the DRIVE tool to facilitate the calculation of the overhead and radial portions of the service territory. Con Edison created and refined minimum load flow cases based on historically observed values at the area substations and distribution transformers, where applicable. The minimum daytime load is used to most accurately simulate a low-load condition when PV generation is generating at a significant portion of its nameplate capacity in order to determine the hosting capacity limit during "worst case" conditions. These minimum load cases were coincident with peak PV output times between 11:00 a.m. and 2:00 p.m. The resulting datasets from these load flow simulations were exported to the DRIVE tool, where centralized DER was applied until the circuits reached excursion thresholds for voltage, loading, and protection concerns. To support consistency in approach, the Joint Utilities adopted a common set of specifications to inform the analysis.

Con Edison validated the results of the DRIVE tool during the overhead calculation process and worked to incorporate the specification and threshold elements of the tool into the Company's network level hosting capacity analysis. The DRIVE tool is not built to evaluate secondary mesh distribution systems. However, Con Edison was able to incorporate the same thresholds and methodologies into the utility load flow program to produce results consistent with the overhead analysis. The load flow tool builds the same minimum load case (11:00 a.m. to 2:00 p.m.) based on historical interval data that is observed at the distribution transformers. For structures in the network that would accommodate an interconnection application, nearby distribution transformer loads are analyzed and algorithmically distributed to the various sites for analysis against potential PV. The program compares the load flows to the same EPRI values or voltage, load, and protection excursions to determine a maximum hosting capacity value.

5) The means and methods used for forecasting the future hosting capacity available at each location in the distribution system.

Consistent with the 2018 DSIP Guidance, the Joint Utilities will evaluate options for forecasting hosting capacity that take into account the accuracy of such an analysis given the uncertainty in the location, timing, and configuration of DER adoption forecasts; projected changes to individual customer loads; and any upgrades or changes to the utility system. When trying to forecast hosting capacity, the addition of generation at various points on a feeder can significantly impact the circuit-level hosting capacity. Additionally, it is more complex to forecast hosting capacity down to the individual property level as hosting capacity analysis can be sensitive to changes in a single customer's load.

The roadmap for forecasting hosting capacity must incorporate models of future utility system configurations, gross load forecasts, and DER forecasts. Each model has its own roadmap and consideration of scenario based planning, probabilistic, and deterministic approaches. These concepts must be integrated to produce a hosting capacity forecast, and it must be decided what level of granularity is appropriate before the level of uncertainty rises significantly. Going beyond the initial hosting capacity analysis to forecast these values will require an even greater level of complexity on top of a process that already entails high levels of variability in results.

6) How and when the future hosting capacity forecast information provided to DER developers/operators and other third parties will begin, increase, and improve as work progresses.

The Joint Utilities plan to hold a stakeholder engagement session in late 2018 to solicit input from developers on additional enhancements to the hosting capacity portal, including increasing the frequency of updates to the analysis and providing additional information such as forecasted hosting capacity evaluations. The stakeholder engagement sessions in 2018 and 2019 will influence the information provided on hosting capacity forecasts and the timing of its release. Con Edison expects forecasted hosting capacity and other additional enhancements to be included as discussed with stakeholders in subsequent releases of the portals after Stage 3 in October 2019.

7) The utility's specific objectives and methods to:

a. identify and characterize the locations in the utility's service area where limited hosting capacity is a barrier to productive DER development; and,

Con Edison's experience indicates that the dense urban nature of its load area is a primary factor in considering the capacity to host DG. Given the load density, Con Edison can host a significant amount of DG without hitting system constraints. That said, the urban environment limits the land and structures available to cost-effectively site larger DG systems. While land and roof space may be more available in Con Edison's outlying suburbs, these areas are often characterized by a distribution design using 4 kV feeder circuits, which can limit hosting capacity. The planned VVO program will help increase hosting capacity in these areas by effectively managing system voltages to accept higher levels of PV without hitting high voltage constraints.

Con Edison's low-voltage meshed grid in its dense urban areas requires separate review given the different constraints involved with limiting hosting capacity. In these areas, the primary constraint involves tripping a local breaker when reverse power flow occurs in a distribution transformer. Con Edison has taken innovative steps in research and design to accommodate this reverse power flow due to PV systems and thus has significantly increased hosting capacity.

b. timely increase hosting capacity to enable productive DER development at those locations.

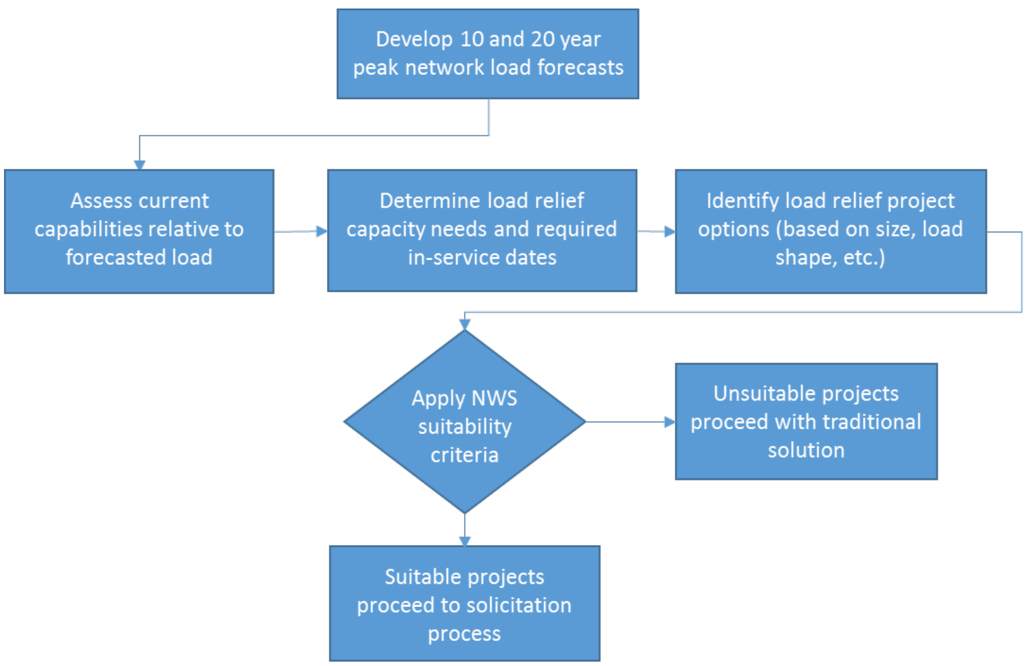
As noted above, VVO is expected to provide advanced voltage management, which will allow for increased hosting capacity in Con Edison's non-network design areas. Additionally, as discussed above, the Company has introduced new design standards in low-voltage meshed designs to allow for bi-directional power flow in these systems typical of dense urban areas. This innovative design change to the network protector relay standards will result in an increase to hosting capacity. The Company has an active program to upgrade protective relays in support of its grid modernization program.

2.13. BENEFICIAL LOCATIONS FOR DER AND NWS

Context and Background

Beneficial locations are locations where there is a potential for localized DER deployment to address projected system needs, particularly load relief, and defer or avoid traditional utility infrastructure investments.[209] Beneficial locations are generally identified through the Company's capital budgeting process. Company planners use load flow modeling, network reliability modeling, and modeling of system performance to assess the current capability of existing distribution and substation assets to meet the forecasted load, based on the design criteria, type of asset, thermal ratings, and local power factors. For assets that are determined to be at risk of becoming overloaded during system peak conditions and under various contingencies, multiple load relief project options are identified to mitigate the overload.[210] Figure 53 provides a simplified diagram of the capital planning process, highlighting the role of NWS identification.

Figure 53: Overview of Capital Planning Process



Concurrent to this filing, the Company is also submitting a revised MCOS study, which identifies marginal cost by Load Area. The study clusters Load Areas and costs into six general geographic regions of the system and also provides a system average cost. This more granular study will form the basis of future distribution system values in the Value Stack tariff, which, in addition to NWS solicitations, is a vehicle for guiding developers to beneficial locations.

[209] DSIP Proceeding, Supplemental DSIP, p. 40.
[210] Other areas of system need identified through distribution modeling include risk reduction programs, new business projects to interconnect new customers, storm hardening or resiliency projects, emergency response and replacement, IT solutions to meet strategic business needs, and public works projects to re-route Company equipment due to municipal right-of-way.

Implementation Plan, Schedule, and Investments

Current Progress

Summary of Achievements

- Identified beneficial locations through annual capital budgeting process.
- Shared information on beneficial locations by (1) supplying information on past, present, and expected future NWS solicitations on the Company's website, the Joint Utilities website, and REV Connect, and (2) displaying NWS target areas and LSRV zones as part of the Company's hosting capacity maps.

As noted above, the annual capital budgeting process results in the identification of system needs, including projects needed to provide load relief. Con Edison reviews projects in the 10-year load relief program to determine if DER has the potential to defer or avoid the capital project, using the Company's NWS suitability criteria. The suitability criteria assess if the project: (1) is for load relief, (2) has enough lead time to pursue a NWS without foreclosing the opportunity to install a traditional solution if needed, and (3) meets the financial threshold.

HUDSON NETWORK FEEDER RELIEF

The Hudson network feeder relief project was identified prior to the determination of NWS suitability criteria and does not meet the current cost suitability criteria for small projects. The Company proceeded with an RFP to test distribution load relief in networked systems.

Due in part to the dispersion or dilution of load relief in a network distribution system, the solicitation responses proved inadequate to construct a portfolio that met the full load relief, requiring the Company to proceed with the traditional solution in lieu of a NWS.

The suitability criteria are reviewed annually and will be updated as appropriate as experience is gained through procurement and subsequent DER performance. Early experience in the initial phases of NWS solicitations suggest the suitability criteria are generally working well and are effectively directing developers to high potential opportunities. Many of the recent solicitations have provided sufficient options to construct viable portfolios of market solutions for projects satisfying the suitability criteria.

Those solicitations that have not resulted in viable portfolios have also been instructive and helped the Company better understand the real-world challenges of procuring NWS portfolios. For example, the Company's experience with the solicitation for the Hudson network feeder relief project, featured in the text box at left, provides anecdotal evidence that lower-cost traditional projects can challenge the economics of NWS and the ability to assemble a sufficient portfolio of projects.

Similarly, recent experience suggests that longer lead times may be required for developers to implement advanced solutions, which highlights the potential challenges of assembling viable portfolios when the system need is more urgent and the need to manage the portfolio to meet lead-time requirements. In this case, the Company is pursuing alternative options for meeting the earliest system needs and working to build a portfolio that includes advanced solutions in later years.

Based on these early experiences, the Company is comfortable maintaining the current criteria. The Company will continue to assess the criteria in order to uphold the principle of identifying NWS candidates with a reasonable expectation of being economic and resulting in a viable portfolio that meets the system needs.

Future Implementation and Planning

Summary of Future Actions
• Explore opportunities for geo-targeting of demand management and EE programs to more effectively incentivize DR and EE deployment in high-value areas. • Enhance MCOS studies to allow for more granular identification of high-value areas.

The Company will continue to identify beneficial locations through the capital planning process and direct developers to these locations through NWS notifications and the LSRV adder. Additionally, the Company will continue to explore opportunities to leverage its existing utility programs to meet localized system needs. Finally, the Company will continue to refine the MCOS studies to identify high-value areas at a more granular level.

Risks and Mitigation

The identification of beneficial locations and potential NWS candidates is now integrated into the annual planning process, which occurs on a regular schedule. The risks around beneficial locations relate more to the dynamic nature of the grid and changes in system needs, often driven by factors outside of the Company's control. This means that beneficial locations tied to specific system needs, particularly load relief needs, are subject to change as load conditions change, which could result in the scaling back or cancelation of NWS projects.

However, changes to the policies for valuing DER in beneficial locations could impact the Company's processes, necessitating changes in the identification of beneficial locations. To mitigate this risk, the Company will collaborate with key stakeholders to identify any such situation and plan to address any issues or concerns as they arise. In addition, changes to BCA requirements (e.g., impacting calculation methodology/components) could also change the nature of which potential NWS projects are selected and the Company's process for selecting them. To mitigate this risk, Con Edison will work with the Joint Utilities to understand how changing various inputs to the BCA affect the NWS procurement process.

Stakeholder Interface

Con Edison will continue engaging stakeholders through the relevant Joint Utilities working groups, including a focus on DER Sourcing and NWS, Hosting Capacity, Forecasting, and VDER Value Stack. On a more direct level, the Company will continue one-on-one and group communications with NWS bidders to identify opportunities for enhancements in future NWS solicitations. This communication will naturally increase in scale as Con Edison proceeds with additional NWS solicitations.

Additional Details

This section responds to the questions specific to beneficial locations for DER and NWS.

1) **The resources provided to developers and other stakeholders for:**
   a. **accessing up-to-date information about beneficial locations for DERs and/or energy efficiency measures;**

The Company posts potential NWS candidates and past and present NWS solicitations on the Company's website,[211] on the Joint Utilities website, [212] and through REV Connect. [213] Information on beneficial locations can also be accessed through the hosting capacity map available through the Company's system data portal.[214] Figure 54 presents the view of NWS areas and project information on the hosting capacity map.

Figure 54: Screenshot of Hosting Capacity Map with NWS Information

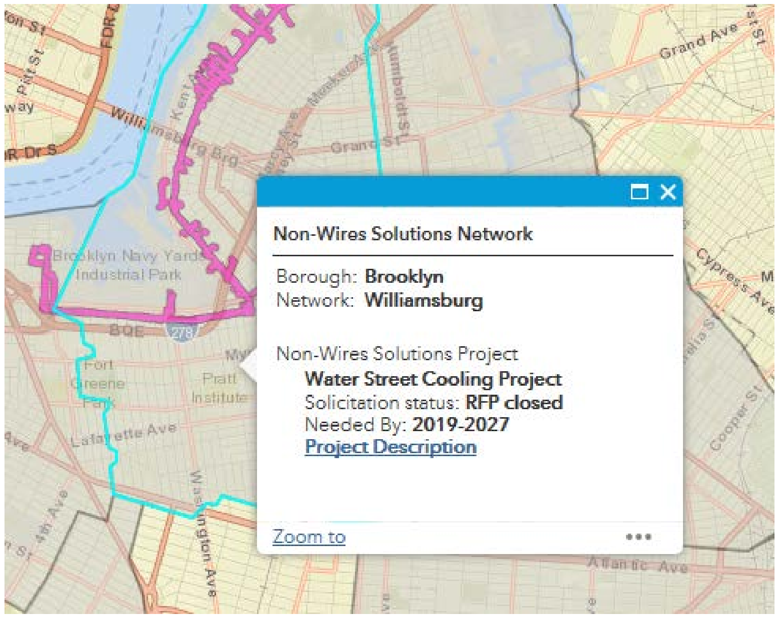
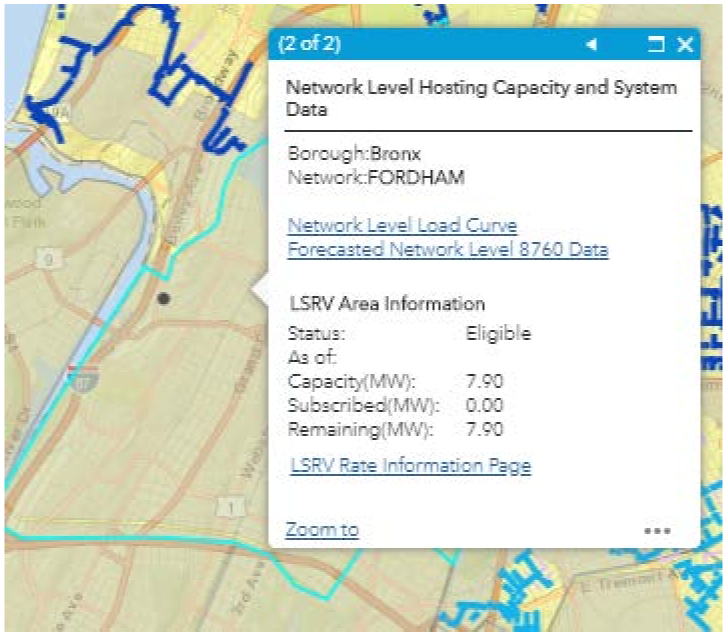


Figure 55 shows how a developer can also search an address in the hosting capacity map and see in the pop-up box if that location is eligible for the LSRV adder.

[211] https://www.coned.com/en/business-partners/business-opportunities/non-wires-solutions
[212] http://jointutilitiesofny.org/utility-specific-pages/
[213] https://nyrevconnect.com/non-wires-alternatives/
[214] https://www.coned.com/en/business-partners/hosting-capacity

Figure 55: Screenshot of Hosting Capacity Map with LSRV Information



Both the NWS and hosting capacity websites are linked from the central Joint Utilities website and easily located through an internet search.

b. efficiently sorting and filtering locations by the type(s) of capability needed, the timing and amount of each needed capability, the type(s) and value of desired benefit, the serving substation, the circuit, and the geographic area.

As noted in response to 1a above, the Company shares information on beneficial locations targeted for NWS through its NWS website and hosting capacity map. The NWS solicitations posted on the Company's website provide extensive detail on the system capability needed, the timing and amount of each needed capability, the serving substation and/or circuit, and the geographic area. The NWS solicitations also provide customer demographic information, including annualized consumption and peak and average billing demand.

Figure 56 provides a screenshot of current NWS opportunities.

Figure 56: Screenshot of Current NWS Opportunities as of July 31, 2018

Current Opportunities

Projects	Current Status	Documents
Newtown Transformer Installation Project	RFP available	RFP Questionnaire
Primary Feeder Relief - Chelsea	RFP in development Project Description available	Project Description
Parkchester No. 1 Cooling Project	RFP in development Project Description available	Project Description

2) The means and methods for identifying and evaluating locations in the distribution system where:

a. a NWA comprising one or more DERs and/or energy efficiency measures could timely reduce, delay, or eliminate the need for upgrading distribution infrastructure and/or materially benefit distribution system reliability, efficiency, and/or operations; and/or,

The Company's capital budgeting approach seeks to identify the investments needed to meet customer expectations for safe and reliable service while moderating impacts to the customer bill. Con Edison initiates its annual planning cycle immediately following the summer operating period with the development of forecasts and identification of load relief needs. Planning continues over the next several months with the identification of risk reduction, new business, and other system investments culminating in a proposed capital work plan for the next five-year period. The proposed capital investment plan, available internally in May, continues to undergo an iterative review and optimization process lasting up to six months, during which time projects may be added or deleted based on evolving system needs and priorities. The plan receives formal corporate approval and becomes the final CIP in November, which is then filed with the Commission the following February.[215] During the capital planning process, Company planners use load flow modeling, network reliability modeling, and modeling of system performance to assess the current capability of existing distribution and substation assets to meet the forecasted load, based on the design criteria, type of asset, thermal ratings, and local power factors. For assets that are determined to be at risk of becoming overloaded during system peak conditions and under various contingencies, multiple load relief project options are identified to mitigate the overload.[216]

[215] Con Edison 2016 Electric Rate Case, Report on 2017 Capital Expenditures and 2018-2022 Electric Capital Forecast (filed February 28, 2018).

[216] Other areas of system need identified through distribution modeling include risk reduction programs, new business projects to interconnect new customers, storm hardening or resiliency projects, emergency response and replacement, IT solutions to meet strategic business needs, and public works projects to re-route Company equipment due to municipal right-of-way.

The Company analyzes load relief needs at an area substation, sub-transmission, and feeder level over a 10-year window. The load relief projects (also referred to as system expansion projects) identified in the capital planning process are assessed against the NWS suitability criteria to determine suitable NWS candidates. Specifically, Area Station Planning reviews the list of projects in the 10-year load relief program and determines if the project meets the NWS suitability criteria, specifically if the project: (1) is for load relief, (2) has enough lead time to pursue a NWS without foreclosing the opportunity to install a traditional solution if needed, and (3) meets the financial threshold. Figure 57 presents Con Edison's NWS suitability criteria. [217]

Figure 57: Con Edison NWS Suitability Criteria

Criteria	Potential Elements Addressed	
Project Type Suitability	Project types include Load Relief or Load Relief in combination with Reliability. Other categories have minimal suitability and will be periodically reviewed for potential modifications due to state policy or technological changes.	
Timeline Suitability	**Large Project** (Projects that are on a major circuit or substation and above)	• 36 to 60 months
	Small Project (Projects that are feeder level and below)	• 18 to 24 months
Cost Suitability	**Large Project** (Projects that are on a major circuit or substation and above)	• No cost floor
	Small Project (Projects that are feeder level and below)	• Greater than or equal to $450k

For projects satisfying the criteria, the Company defines the MW need and the time of day over which the relief is required and then determines the total capacity of NWS needed to replace the traditional project(s) and define the date(s) by which the relief is needed, which is a critical input for the solicitation. If any of the suitability criteria are not met, the Company pursues a traditional solution.

b. one or more DERs and/or energy efficiency measures could reduce, delay, or eliminate the need for upgrading bulk electric system resources and/or materially benefit bulk electric system reliability, efficiency, and/or operations.

[217] On March 1, 2017, the Joint Utilities submitted a compliance filing with individual utility-specific suitability criteria. DSIP Proceeding, Non-Wires Suitability Criteria. Note 60, *supra*.

See response to 2a above. The identification of system needs at the bulk electric level follows the same process. In 2017, no projects at the bulk electric level satisfied the NWS suitability criteria.

3) Locations where energy exported to the system, or load reduction, would be eligible for:

a. compensation under the utility VDER Value Stack tariff;

DER installed in any location are eligible for compensation under the VDER Value Stack tariff. There is a location-based adder known as the LSRV that is available until the allocated MW cap is met. Those locations have been mapped onto the hosting capacity map. Additionally, the Company provides on its website information on the VDER tariff and links to the current and previous tariff sheets, which also list LSRV for eligible locations.[218]

b. utility dynamic load management programs, including the Commercial System Relief Program, Distribution Load Relief Program, and Direct Load Control Program;

The Company's load management programs, including the Commercial System Relief Program ("CSRP"), Distribution Load Relief Program ("DLRP"), and Direct Load Control ("DLC") Program, seek to reduce generation emissions and transmission and distribution capacity costs for all customers. With the exception of the DLRP, which is typically called to address contingencies at the network level, these programs are dispatched to relieve network or system demand during system peak days. Table 20 provides an overview of the Company's DMPs.

Table 20: Con Edison DMPs

Program	Purpose	Secondary purpose	Availability
Non-Wires Solutions (including BQDM)	Network peak	Defers or avoids load relief capital projects in targeted networks	Permanent or Dispatchable
DR – DLRP	Network peak	Operational peak reduction program	Dispatchable
DMP	System peak	Service territory-wide system peak reduction with an emphasis on advanced technology	Permanent
DR - CSRP	System peak	Operational peak reduction program	Dispatchable
SmartCharge New York	System peak	Incentivizes EV charging during system off-peak hours	Permanent

c. and/or, increased value-based customer incentives for energy efficiency measures with load profiles that align with the system needs through utility energy efficiency programs or New York State Energy Research and Development Authority's (NYSERDA) Clean Energy Fund (CEF) programs, while ensuring utility-NYSERDA coordination.

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[218] https://www.coned.com/en/save-money/using-private-generation-energy-sources/private-generation-tariffs

Increased customer incentives based on alignment with location-specific system needs are only considered in areas targeted for NWS. Con Edison and its efficiency vendors engage customers in those areas through direct marketing to make them aware of the additional incentives.

2.14. PROCURING NWS

Context and Background

NWS solicitations are an important mechanism for bringing DER onto the system. They offer opportunities for developers to propose innovative solutions to meet a clearly defined system need, while driving customer benefits. To date, market response has been strong, with many proposals testing novel concepts and incorporating advanced technologies. Con Edison continues to learn from its experiences and the collective experience of the Joint Utilities, and is refining the solicitation process with the goal of making it more standardized and efficient, which is expected to facilitate more NWS opportunities and make it faster and easier for developers to respond.

Implementation Plan, Schedule, and Investments

Current Progress

Summary of Achievements

- Released 4 rounds of solicitations, totaling 160 MW across 8 RFPs.
- Encouraged developers to propose innovative solutions, including advanced technologies.
- Promoted NWS solicitations through multiple channels to raise awareness and help developers learn about solicitations shortly after they are released.
- Engaged stakeholders during the RFP process to share information and answer questions.
- Improved the RFP process in coordination with the Joint Utilities and in response to stakeholder feedback, including adopting a similar structure for RFPs and extending response times.

Con Edison has taken a number of steps to increase NWS opportunities and improve the solicitation process. As discussed below, the Company issued solicitations for qualifying NWS candidates and used the experience from those solicitations to create an efficient, user-friendly experience for developers and further define internal operating procedures.

NWS Market Opportunities

Con Edison made a significant push in 2017 and released seven NWS solicitations in three rounds. During the annual planning process in fall 2017, the Company actively sought additional candidate projects for 2018 RFPs, resulting in one RFP released to date in 2018 and two additional RFPs expected by the end of 2018.

Table 21 summarizes the RFPs Con Edison released in 2017 and 2018 and plans to release by the end of the year.

Table 21: 2017-2018 NWS Solicitations

2017-18 NWS Projects	Total 10-yr Load Relief Need (MW)	Need Period*	Date Solicitation Issued	Proposals Due
Hudson Primary Feeder Relief	7.1	2021	4/24/2017	6/23/2017
Columbus Circle Primary Feeder Relief	4	2021	4/24/2017	6/23/2017
Water Street Cooling Project	43	2019-2027	10/31/2017	1/12/2018
Plymouth Street Cooling Project	30	2021-2027	10/31/2017	1/12/2018
Williamsburg Feeder Project	2.5	2020	10/31/2017	1/12/2018
W. 42nd St Load Transfer	42	2021-2027	12/18/2017	3/16/2018
Flushing Cable Crossing	7.3	2019	12/18/2017	3/16/2018
Newtown Transformer Installation	24	2022-2027[219]	7/6/18	8/31/18
Parkchester No. 1 Cooling	9	2021	*TBD*	*TBD*
	6	2027	*TBD*	*TBD*
Chelsea Network Feeder Overloads	3.2	2021	*TBD*	*TBD*

* For projects showing need over multiple years, the incremental load relief need varies by year.

The Company continues to innovate within its NWS program. For example, the Company sought both customer-sited and utility-sited solutions for the Plymouth Street cooling project. For the first time, the Company offered nearby property owned by Con Edison to developers for energy storage projects.

The Company also sought and received approval in 2017 for the extension of the BQDM program, which will enable the deferral of one of the traditional solutions included in the BQDM program—the Glendale Project.[220] The Company still has funds available to achieve demand reduction in the BQDM area and will continue to engage the market to procure solutions. The Company recently conducted a closed-bid auction to procure additional load relief and is developing other methods to procure further load relief.

[219] 4 MW load relief is needed in 2022.

[220] BQDM Proceeding, BQDM Extension Order.

Best Practices and Process Improvements

To create a more predictable and repeatable pathway for developers to access the market via NWS, Con Edison is working with the Joint Utilities and stakeholders as part of the DER Sourcing Working Group to establish best practices for developing more uniform and consistent solicitations. Stakeholder engagement sessions in April 2017 and November 2017 provided opportunities for stakeholders to gain greater visibility into the current NWS sourcing process, ask questions, and suggest potential improvements.[221] For example, the group discussed the time frame for developers to respond to RFPs and generally agreed that additional time would result in higher quality proposals, recognizing that the appropriate response time depends on the type, size, and location of the project. In response, Con Edison extended its RFP response times from the 6 weeks initially allotted in Round 1 to 10 weeks in Rounds 2 and 3. Going forward, Con Edison is open to extending response times when feasible given the timing of the need.

Other steps taken in 2017 and 2018 to improve the RFP process include standardizing the format of provided information, allowing bidders to submit clarification questions during a specified window, and hosting webinars for interested parties prior to or following RFP release to provide a detailed overview of the NWS opportunities and answer questions from potential bidders. Further, because some RFP responses to previous Con Edison solicitations were disqualified due to a lack of specified costs and kW reductions, current RFPs aimed to clearly communicate that projects may be disqualified if detailed information is not provided, and clearly specified the key information that is important for analysis.

To improve efficiency in evaluating NWS proposals, the Joint Utilities offered suggestions to developers for data to be provided to utilities as part of NWS proposals and other projects. For example, data that would be useful for developers to provide include clear definition of all communication and IT interfaces with the utility; clear, consistent, and detailed one-line diagrams (as necessary); and well-specified geographical location for the proposed solution.

The stakeholder sessions also provided an opportunity for the Joint Utilities to discuss some of the challenges that surfaced during current solicitations, such as treatment of interconnection costs and potential use of utility property for siting DER solutions, and the means to address these challenges to improve the RFP process. Con Edison also shared challenges particular to its system, including the dispersion of load relief in a network system and the resulting impact on the amount of load relief sought through solicitations.

Developing and managing these solicitations has provided valuable experience that is being leveraged to refine the Company's internal operating procedures and improve the solicitation process for developers and third parties. While it is possible to standardize many of the procedures, Con Edison has observed that each NWS is unique in terms of size, nature of the need, and the types of technology solutions to be evaluated, which is driving continued learning. For example, the Company is creating internal processes to help develop and analyze portfolios quicker, such as customer impact analysis for more complex localized needs.

Going forward, the Company may choose to undertake specific research and analytics efforts as it identifies customer-sited projects in order to have more detailed information concerning procurement strategies, nature of load in the targeted areas, and cost-effective opportunities for partnerships with market participants and stakeholders in the area.

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[221] A summary of the questions and responses captured during the webinar is posted on the Joint Utilities website. http://jointutilitiesofny.org/joint-utilities-of-new-york-engagement-groups/

Summary of Future Actions

- Refine the solicitation process to improve efficiency and create a more uniform, consistent, and predictable market mechanism.
- Enhance communication on the selection and portfolio development process.
- Collaborate with the Joint Utilities, as part of the DER Sourcing Working Group, to exchange lessons learned and discuss ongoing and emerging issues.
- Explore evolving operational and performance requirements to allow bidders to more readily pursue other revenue streams for DER.

With continued stakeholder dialogue, sharing experiences within the Joint Utilities, and ongoing experience through present and future rounds of NWS solicitations, the Company expects to further refine and improve the efficiency of its solicitation process. The Joint Utilities continue to share experiences and lessons learned to achieve a consistent set of best practices and improve the solicitation processes to be more efficient and user-friendly. This includes reviewing the NWS suitability criteria as part of the annual planning process, reviewing how system needs are identified, and evolving how NWS can address those needs. The Joint Utilities DER Sourcing/NWS Suitability Criteria Working Group will also continue discussions around developing and adopting similar implementation approaches to BCA methodology, the solicitation and procurement of storage solutions, the availability and potential use of utility land for project siting, and how bidder pre-qualification may make the process more efficient. The ongoing Joint Utilities discussions will also include developing utility-specific operational and performance requirements that inform bidders of the specific expectations and services required to meet the system need and allow bidders to explore other revenue streams for the DER, where applicable.

Risks and Mitigation

The identification of potential NWS candidates is now integrated into the annual planning process, which occurs on a regular schedule. However, the load can decrease as a result of external factors, which mitigates the need for load relief and can result in the cancellation of the solicitation. As described above, the Company continues to refine its solicitation process to meet evolving stakeholder needs and become more efficient at building portfolios and proceeding with selected vendors.

Another potential risk relates third parties' pursuit of LSRV compensation in lieu of NWS opportunities, which may limit DER participation in NWS solicitations designed around specific performance requirements. To mitigate this risk, Con Edison will continue to engage with the VDER Value Stack Working Group to advocate for mechanisms that more appropriately incentivize NWS participation (over LSRV) to receive compensation for providing locational value.

Similarly, misalignment in wholesale market and distribution-level service rules and performance obligations may limit additional revenue streams available to support NWS projects. The Company will continue to coordinate with the NYISO to explore opportunities to facilitate dual participation between wholesale markets and distribution-level services.

Stakeholder Interface

As discussed above, stakeholder engagement sessions in April 2017 and November 2017 provided opportunities for stakeholders to gain greater visibility into the current NWS sourcing process, ask questions, and suggest potential improvements. Con Edison took steps to address stakeholder requests, including extending response times and increasing and improving the information included in solicitations. Con Edison will continue stakeholder engagement through related working groups (e.g., DER Sourcing, Hosting Capacity, Forecasting, and VDER Value Stack).

Additional Detail

This section responds to the questions specific to procuring NWS.

1) **How the NWA procurement process works within utility time constraints while enabling DER developers to properly prepare and propose NWA solutions which can be implemented in time to serve the system need.**

During stakeholder engagement sessions in April 2017 and November 2017, stakeholders discussed the time frame for developers to respond to RFPs and generally agreed that additional time would result in higher quality proposals, recognizing that the appropriate response time depends on the type, size and location of the project. In response, Con Edison extended its RFP response times from the 6 weeks initially allotted in Round 1 to 10 weeks in Rounds 2 and 3. In recent one-on-one discussions with various RFP respondents, the respondents generally agreed they are given sufficient time to prepare responses. Con Edison remains open to extending response times when feasible given the timing of the need.

2) **The NWA procurement means and methods; including:**
    a. **how the utility and DER developers time and expense associated with each procurement transaction are minimized;**

Con Edison has taken a number of steps to increase NWS opportunities and improve the solicitation process. The Company is using its experience from past solicitations to create an efficient, user-friendly experience for developers and further define internal operating procedures. To create a more predictable and repeatable pathway for developers to access the market via NWS, Con Edison is working with the Joint Utilities and stakeholders as part of the DER Sourcing Working Group to establish best practices for developing more uniform and consistent solicitations.

For example, solicitations now provide the detail necessary to develop solutions and craft a response in a standard format, including a detailed project overview complete with description of the specific need, area of need, and customer demographic information, including annualized consumption and peak and average billing demand. Con Edison also allows bidders to submit clarification questions during a specified window, which Con Edison answers and posts online. Additionally, Con Edison hosted webinars for interested parties prior to or following RFP release to provide a detailed overview of the NWS opportunities and answer questions from potential bidders. Further, because some RFP responses to previous Con Edison solicitations were disqualified because of a lack of specified costs and kW reductions, current RFPs aimed to clearly communicate that projects may be disqualified if detailed information is not provided, and clearly specified the key information that is important for analysis.

The response from stakeholders has been generally positive. Stakeholders shared that they find the bidder conferences and regular communication during the solicitation process valuable. Similarly, they appreciate receipt of clear and specific information about the system need including supporting data, as well as clarity about the award process, such as whether the utility is seeking to build a portfolio or pursue single-vendor solutions.

b. the use of standardized contracts and procurement methods across the utilities.

The Joint Utilities continue to share lessons learned from developing and implementing specific NWS RFPs (including the supporting data) and resultant contract terms and conditions to work toward a more similar approach to procurement within the Company and across the Joint Utilities. Con Edison plans to use a standard program agreement, which can be customized for specific solutions, as needed. For example, an NWS contract will clearly state available incentives, approved solutions, and expectations for the intended use of the resource by the utility, as well as operational and commercial requirements including expected performance and corresponding payment terms.

In terms of payment guidelines, the utility must clearly outline payment duration and schedule and include language that holds DER vendors accountable for commercial payment and require bids to include the cost of any necessary security instruments. Through the information sharing across the utilities, the Joint Utilities have agreed that contracts should also include clear and consistent use of key terms and descriptions regarding the NWS DER vendor's market participation, regardless of payment cadence. Draft NWS contracts are available on the Company's website.

The Joint Utilities are working through initial NWS solicitations and contract negotiations. At this time, the Joint Utilities agree that developing and using a standardized contract across the Joint Utilities is premature, as solicitation and contracting lessons are still being learned, but will continue to share best practices for issuing contracts and implementing procurement methods.

3) Where, how, and when the utility will provide a resource to DER developers and other stakeholders for accessing up-to-date information about current NWA project opportunities. For each opportunity, the resource should describe the location, type, size, and timing of the system need to be addressed by the project.

Current NWS project opportunities are widely publicized to promote broad awareness and advanced notice of upcoming market opportunities. NWS solicitations are available at the following online resources:

- Con Edison website (https://www.coned.com/nonwires)
- Con Edison hosting capacity map (https://www.coned.com/en/business-partners/hosting-capacity)
- Joint Utilities of New York central data portal (http://jointutilitiesofny.org/utility-specific-pages/nwa-opportunities/)
- REV Connect (https://nyrevconnect.com/non-wires-alternatives/)
- Filed with the Commission under the generic REV proceeding (Case No. 14-M-0101) and Con Edison's latest rate case proceeding (Case No. 16-E-0060)

4) How the utility considers all aspects of operational criteria and public policy goals when selecting which DERs to procure as part of a NWA solution.

One of the key priorities in building a portfolio of NWS is meeting the system need. NWS portfolios that are expected to meet the system need are then evaluated using the BCA Handbook. The technology solutions considered are informed by what the market provides. However, the Company has encouraged innovative solutions in recent solicitations. The Company defines innovative solutions as solutions that: (1) target customers and uses technologies that are currently not part of Con Edison's existing programs, (2) target generally underserved customer segments, and/or (3) are based on the use of advanced technology that helps foster new DER markets and provides potential future lessons learned. In practice, the Company is receiving proposals and building balanced portfolios that incorporate EE, energy storage, and other DM solutions, thus helping to meet public policy goals. If the proposals received are insufficient to meet the need, the Company may work directly with customers and vendors to determine if there is additional potential for meeting system needs.

5) **Where, how, and when the utility will provide DER developers and other stakeholders with a resource for accessing up-to-date information about all completed and in-progress NWA projects. The information provided for each project should:**

   a. **describe the location, type, size, and timing of the system need addressed by the project;**

The Company's NWS website contains the solicitation documents for completed and in-progress NWS projects. Additionally, the Company files quarterly reports and an annual report in Case Nos. 16-E-0060 (latest rate case) and 14-E-0302 (BQDM) that provide up-to-date information about completed and in-progress NWS projects.[222]

   b. **describe the location, type, size, and provider of the selected alternative solution;**

Currently, the Company provides updates on the location, type, and size of solutions in its quarterly and annual reports. Solution providers are not publicly identified at this time.

   c. **provide the amount of traditional solution cost which was/will be avoided;**

Con Edison does not provide the cost of the traditional solution. Revealing the traditional solution cost could result in suboptimal results to the detriment of utility customers.

   d. **explain how the selected alternative solution enables the savings; and,**

Con Edison provides information on the expected load reduction for each solution in the annual implementation plans.

   e. **describe the structure and functional characteristics of the procurement transaction between the utility and the solution provider(s).**

The Company interprets this question to refer to information about the procurement mechanism, such as RFP or auction. This information is available in the solicitation documents available on the Company's NWS website and quarterly and annual reports.

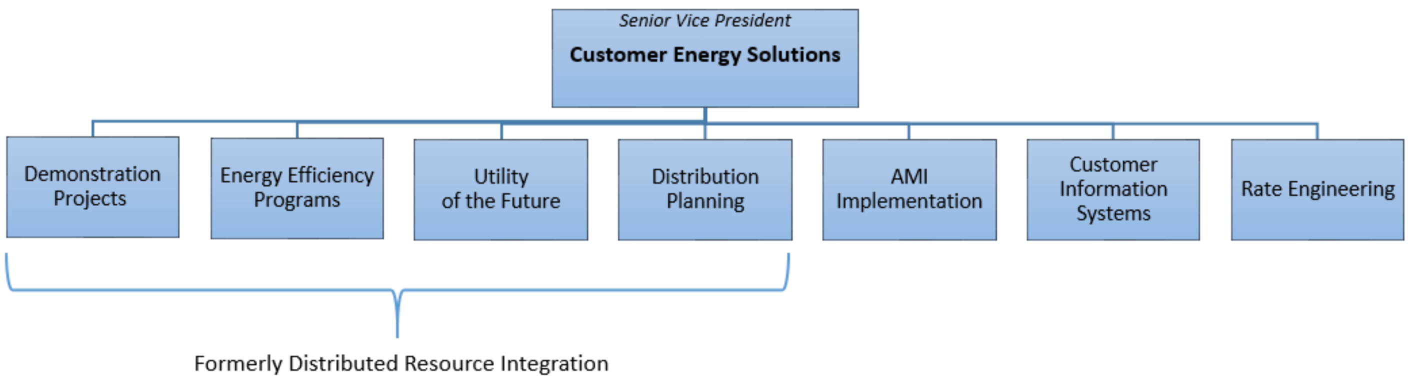
[222] This is the latest quarterly report: http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7bCBEAFEDD-2EBD-482A-82CC-A73D33704B11%7d

3. OTHER DSIP-RELATED INFORMATION

3.1. DSIP GOVERNANCE

Con Edison's organizational structure brings together policy, business, and technical experts to support more holistic approaches to REV implementation and improve the customer experience. Effective November 1, 2017, realignments in Con Edison's organizational structure resulted in the formation of the CES organization, which is focused on facilitating key REV objectives, such as integrating DER and supporting markets for new customer products and services. CES expands on the previous Distributed Resource Integration organization discussed in the Initial DSIP to unite a broader set of functions that influence the customer experience, including AMI implementation, CIS, and rate engineering. Figure 58 shows how these functions report to the Senior Vice President of CES, who directly reports to the President of Consolidated Edison Company of New York, Inc. ("CECONY").

Figure 58: CES Organizational Structure



Executive committees provide strategic direction on Company initiatives, including DSP development and grid modernization, and the necessary approvals to proceed. Executives from the relevant business areas participate to exchange information and represent a variety of perspectives to inform decision-making.

This organization and committee structure aligns the people, processes, and technologies to facilitate DSP development and provides the appropriate oversight and management of DSP-related work streams and functions. Core DSP work streams, such as hosting capacity, DERMS, modernizing protective relays, and SCADA and metering upgrades, are managed by dedicated project managers, who coordinate with the DSP Project Team within Distribution Planning. Key responsibilities of the DSP Project Team include leading cross-functional efforts to manage the DSP budget and appropriate funds, track project progress, and report on DSP achievements and challenges. The DSP Project Team also coordinates with other teams outside of CES, such as Legal and Government Affairs, through regular REV update meetings. Currently, Distribution Planning has primary responsibility for developing the DSIP, with input from other groups internal and external to CES.

The DSIP filing serves as a core planning document for the Company, outlining its plans across DER integration, information sharing, and market services over the course of the next five years based on current Company and New York State priorities and objectives. While the Company's DSIP filing is separate and distinct from its rate case filing, the DSIP will ultimately serve to inform the subsequent rate case filings. The Company's rate case filing builds from the five-year plan within the DSIP and incorporates additional inputs from other regulatory, policy, and litigation processes to prioritize investments for which the Company will seek cost recovery.

Joint Utilities Collaboration

The Joint Utilities are working together to foster common and consistent approaches, tools, and methodologies that will support statewide markets for DER products and services and help reduce transaction costs for third-party providers. The Joint Utilities strive for standardization where possible, recognizing that the utilities are diverse in their service territories, grid configurations, data availability, and the degree of development of existing capabilities. The Joint Utilities also regularly share lessons learned from demonstration projects and ongoing efforts implementing REV.

In 2014, each utility appointed leaders to serve on the REV Leadership Team ("RLT"), which meets weekly to raise awareness of emerging issues, collaborate on shared initiatives, and work toward alignment on the way the Joint Utilities plan for and transition to their new roles as DSP operators. The RLT established two committees—the Regulatory Policy Committee ("RPC") and DSP Steering Committee. The RPC coordinates the Joint Utilities' efforts in policy and rate-related proceedings that fall under the larger REV framework. The DSP Steering Committee discusses strategic issues affecting the Joint Utilities and makes collective decisions on behalf of the Joint Utilities. The Steering Committee typically meets twice per month, alternating between in-person meetings and conference calls.

For example, to support consistency across the Joint Utilities, the DSP Steering Committee aligned around a common definition of the DSP and a common outline for the 2018 DSIP filings to make it easier for stakeholders to navigate the DSIP filings. The steering committee also oversees ten topic-specific implementation Working Groups, which Table 22 lists below. These Working Groups, staffed by utility subject matter experts, were formed to discuss specific technical details and reach common recommendations on how to implement DSP functions. To support these collaborative processes across the six companies, the Joint Utilities retained a consultant to provide project management office functions and technical expertise, as well as coordination of the implementation Working Groups and related stakeholder engagement efforts.

Table 22: Current Joint Utilities Implementation Working Groups

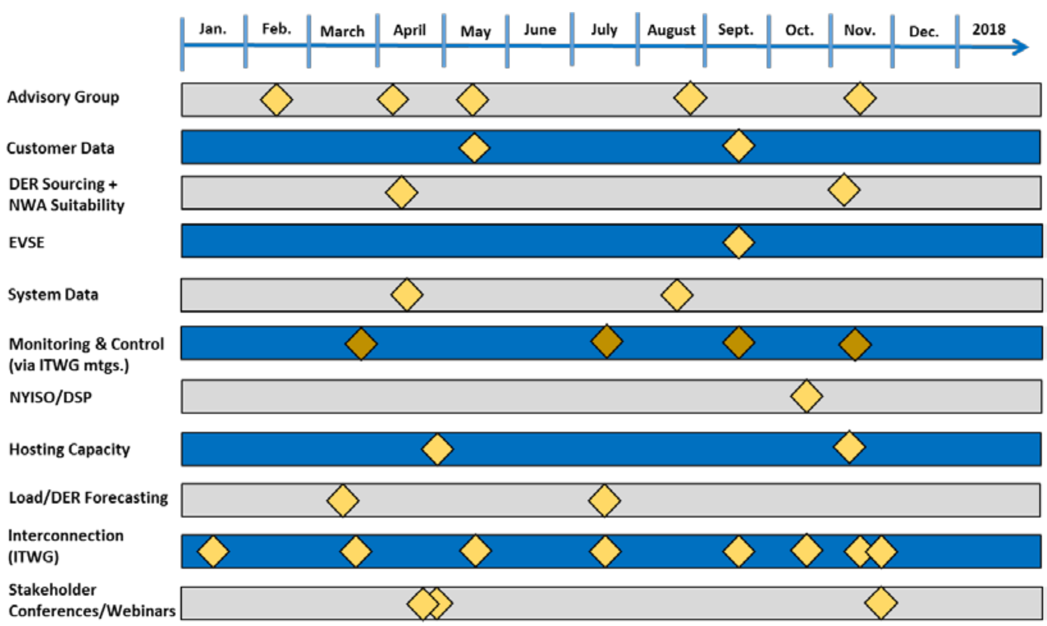
Working Groups	
1	Load and DER Forecasting
2	Hosting Capacity
3	Interconnection
4	M&C
5	ISO-DSP Coordination
6	DER Sourcing/ NWS Suitability Criteria
7	EVSE
8	Energy Storage
9	Customer Data
10	System Data

To improve transparency and facilitate information sharing, the Joint Utilities collectively maintain and regularly update their website (www.jointutilitiesofny.org) with valuable resources for interested parties. For example, the utilities post a summary of current Joint Utilities DSP enablement activities to the website homepage each month to keep third parties informed of efforts to advance DSP implementation. The Joint Utilities enhanced their website by compiling utility-specific links for hosting capacity, system data, and NWS opportunities. The website also serves as a valuable repository for stakeholder information, providing key policy and regulatory documents, detailing past stakeholder meetings, summarizing inputs that stakeholders have previously provided and next steps for addressing them, and providing links to other resources such as REV Connect. The Joint Utilities welcome suggestions to enrich the website through their email address at: info@jointutilitiesofny.org.

Stakeholder Engagement

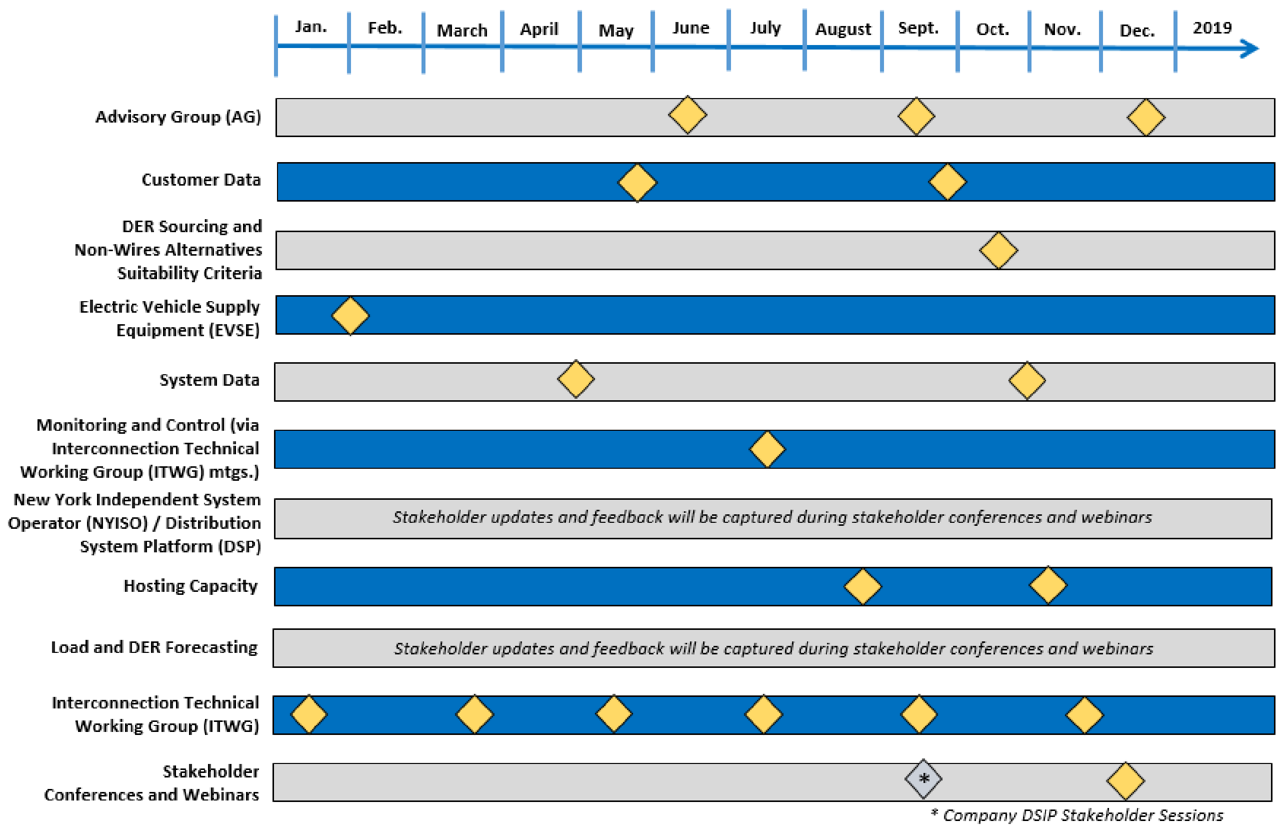
Building on the structure established in 2016 in preparing the Initial DSIPs and the Supplemental DSIP, the Joint Utilities continued to collaborate on stakeholder engagement, both through the stakeholder Advisory Group, as well as through meetings organized around specific topics across the nine Working Groups. Figure 59 summarizes the 2017 Working Groups and stakeholder engagement meeting schedule.

Figure 59: 2017 Stakeholder Engagement Efforts



Stakeholder outreach continued in 2018 and will be augmented with a meeting specific to Con Edison's and O&R's DSIPs, as well as a broader Joint Utilities' stakeholder conference to discuss implementation efforts since the DSIP filings and preview plans for 2019.

Figure 60: Anticipated 2018 Stakeholder Engagements Efforts



3.2. MCOS STUDY

The 2018 DSIP Guidance requires utilities to include a publicly accessible web link to the latest version of the utility's MCOS study. Con Edison's latest MCOS study is being filed concurrent with the DSIP in the DSIP proceeding, as well as in the Con Edison 2016 Electric Rate Case and VDER Proceeding and will be available by searching for Cases 16-M-0411, 16-E-0060, or 15-E-0751 on the DPS website found here:
http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx

3.3. BENEFIT COST ANALYSIS

The 2018 DSIP Guidance requires utilities to include a publicly accessible web link to the latest version of the utility's BCA Handbook. Con Edison's BCA is being filed concurrent with the DSIP in the DSIP proceeding and will be available by searching for Case 16-M-0411 on the DPS website. This is the direct link: http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=16-M-0411&submit=Search

APPENDIX A: LOAD AND DER FORECASTS

The forecast data is organized in the sections below as follows:

- System-level forecasts:
  - 5-year peak demand forecast
  - 10-year peak demand forecast
  - 5-year energy forecast
- Network area forecasts:
  - 10-year independent peak demand forecast
- DER forecasts
  - DSM (including EE and DR)
  - DG (including solar PV, CHP, other generation, and energy storage)

SYSTEM FORECASTS

Forecast of System Peak Demand Growth

Every year, following the summer peak season, the Company produces a series of forecasts to guide the next planning cycle, including 5- and 10-year electric system peak demand forecasts and a 5-year system energy forecast. The single electric system peak hour (system-wide and by network load area) developed as part of the peak demand forecast sets the design point for maintaining system reliability.

These forecasts are developed using a hybrid of top-down and bottom-up methodologies, which improves forecasting accuracy by allowing for cross-referencing of meter data and queued projects with overall macro-economic trends. Additionally, by comparing the top-down system-wide peak load analysis to the bottom-up network peak load analyses, the Company can verify the allocations of load in its annual peak load forecast.

The electric peak demand forecast is produced by adding incremental MW demand growth of key customer sectors: residential, commercial, and governmental. Along with sector demand growth, non-sector-specific technology-driven load growth is also added, such as EVs or conversions from steam to electric air-conditioning ("A/C").

To determine residential sector growth, the residential top-down econometric model considers number of households, saturation of A/C, coincident use of A/C, household occupancy, and hourly use per A/C unit. To determine commercial sector demand growth, the commercial top-down econometric model considers the number of customers by service classification, the price of electricity, and other macroeconomic measures. Governmental sector demand growth is calculated by aggregating announced projects for the initial years of the system forecast (bottom-up methodology), before switching to a top-down approach.

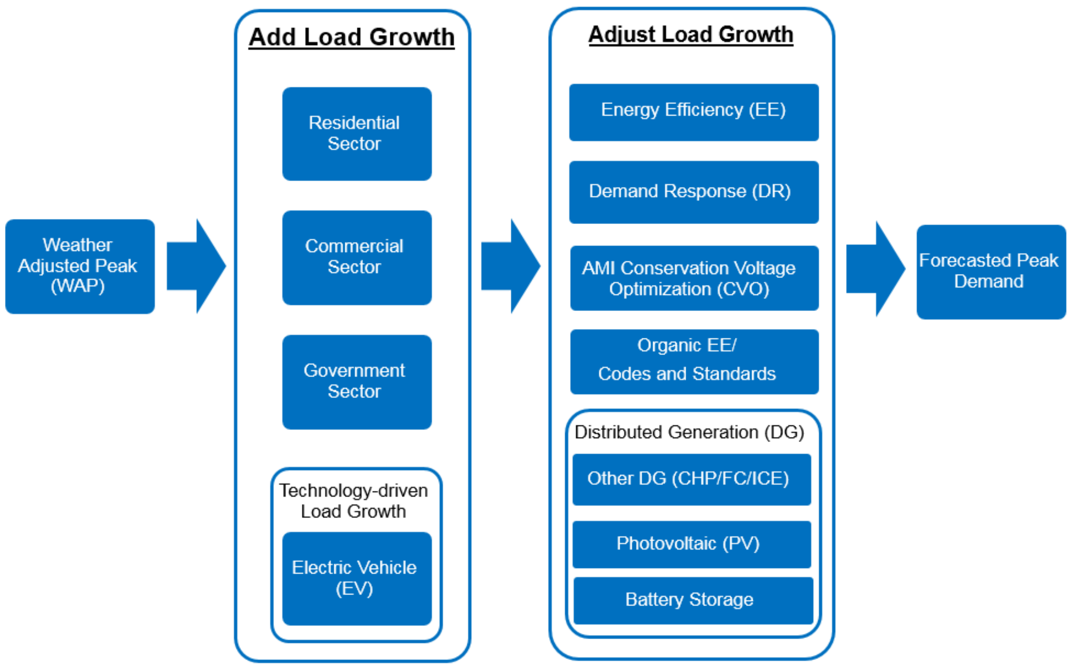
There are various DER measures that offset demand, such as EE, DR, DG, PV, energy storage, and targeted load relief programs, collectively referred to as negative load modifiers. Organic EE and CVO were added as load modifiers in the fall 2017 forecast. DER are forecasted using primarily bottom-up methodologies by counting projects or program totals for both system and network forecasts. EE and DR forecasts are based on program-level projections based on historic and expected future performance. DG, including all solar, CHP, and energy storage, are forecasted using cumulative historical penetration, known queued projects, and extrapolated future growth rates. The details and underlying assumptions regarding the forecasting of DER will be described in greater detail below in the DER Forecasts section.

The positive load modifiers, EVs and steam to electric A/C, are also forecasted using a bottom-up methodology. EV forecasting is based on current registration data from the Department of Motor Vehicles, expected growth rates based on state goals and consultant studies,[223] and the assumed average kW per vehicle. Steam to A/C conversions are driven by steam chillers reaching the end of their useful lives and being replaced by electric chillers. Incremental load growth from steam to electric A/C is based on the aggregation of all customer conversions and is provided by the Steam Operations team.

As noted above, the sector forecasts generally use a top-down methodology, which takes a holistic view of macro-economic conditions that influence electric demand. Bottom-up methodologies are generally used when there is sufficient data available to build a forecast. The combination of top-down and bottom-up works well for forecasting demand growth, as it allows cross-referencing of the meter data and queued projects with the overall macro-economic trends.

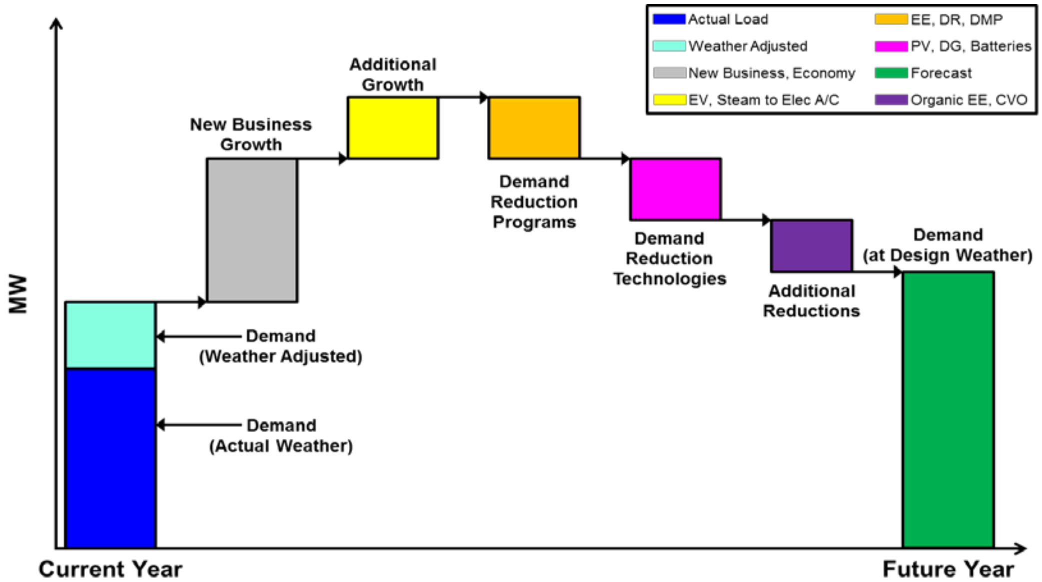
Figure 61 and Figure 62 below show the basic process of producing a system peak forecast.

Figure 61: System Peak Forecasting Process



[223] M.J. Bradley & Associates, *Plug-in Electric Vehicle Cost-Benefit Analysis: New York* (December 2016), https://www.mjbradley.com/sites/default/files/NY_PEV_CB_Analysis_FINAL.pdf.

Figure 62: Illustrative Process of Adjusting Forecasting (not to scale)



The Company continues to improve the accuracy of its forecasts, with only minor deviations between forecasts and actuals. For example, over the past three years, the difference between the WAP and the forecasted peak for the given year has been below 1.5 percent for the system and below 3 percent for the independent networks. The variance is expected to decrease as more experience with DER is gained, all else being equal.

Five-Year System Peak Demand Forecast

The following five-year system peak demand forecast was issued in October 2017 and covers the years 2018 to 2022. Table 23 shows the overall electric system load growth is forecasted to be nearly flat, with a CAGR of 0.1 percent over the 5-year period, though load growth in many individual load areas is projected to be higher, driven by the resurgence of certain residential neighborhoods in Brooklyn, Queens, and Manhattan. For example, the Company is forecasting 11.5 percent annual growth for 5 years for the Pennsylvania Network due to the redevelopment of the west side of midtown Manhattan. This localized load growth includes one of the largest private real estate developments in the history of the United States, which has led to the creation of a new network, named Midtown West, to alleviate overloads at a substation in the area. Contributing to the development of these mixed-use areas is growth in the hospitality, tourism, health care, and technology sectors.

Table 23: 2017 Electric Five-Year System Peak Demand Forecast (MW)

		2017	2018	2019	2020	2021	2022
1	**WAP/ Load Growth Forecast**	**13,270**	**13,480**	**13,659**	**13,815**	**13,929**	**14,019**
2	MW Growth:		210	179	156	114	91
3	% Growth:		1.6%	1.3%	1.1%	0.8%	0.7%
4	**Additional MW Growth (Rolling Incremental)**						
5	EV		2	5	10	17	28
6	Steam A/C Conversion		7	14	21	28	35
7	**Load Modifiers (Rolling Incremental)**						
8	PV		-19	-44	-73	-106	-144
9	DG		-4	-27	-41	-47	-53
10	Battery Storage		-0.7	-3	-4	-7	-9
11	AMI CVO		0	-7	-7	-25	-25
12	Organic EE/ Codes and Standards		-5	-10	-15	-20	-25
13	**Coincident DSM (Incremental)**						
14	Con Edison EE		-40	-32	-32	-32	-32
15	NYSERDA EE		-8	-7	-6	-7	-8
16	NYPA		-18	-9	-3	0	0
17	BQDM		-33	6[224]	0	0	0
18	DMP (1+2)		-40	-31	-29	0	0
19	Rate Case		-18	-37	-25	0	0
20	DR		-5	-5	-4	-4	-4
21	Total Incremental DSM:		-161	-115	-99	-44	-44
22	Rolling Incremental DSM:		-161	-276	-375	-419	-463
23	**System Forecast net of both positive and negative modifiers**		13,299	13,311	13,330	13,350	13,362
24	MW Growth:		29	12	19	20	12
25	**Rounded System Forecast net of both positive and negative modifiers**		**13,300**	**13,310**	**13,330**	**13,350**	**13,360**
26	MW Growth (Rounded):		30	10	20	20	10
27	% Growth:		*0.23%*	*0.08%*	*0.15%*	*0.15%*	*0.07%*

Note: 2017 Demand is Weather-Adjusted

[224] The positive load modifier for BQDM in 2019 is the result of no longer contracting and calling upon certain non-permanent DER resources, as was done for years (2016-2018) of the BQDM program.

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<u>System forecast line item descriptions</u>:

Line 1: Weather adjusted peak (WAP)/Load Growth Forecast: WAP in 2017 and new business load growth forecasts in 2018 and beyond

Line 2: MW Growth: Cumulative growth of residential, commercial, and governmental sectors

Line 3: Percentage Growth: Growth as a percentage of the base

Line 5: EV – The incremental load growth associated with EV charging

Line 6: Steam A/C Conversion – The incremental load growth associated with customers converting steam chillers to electric air-conditioning

Line 8: Photovoltaic (PV) – The cumulative effect of the solar units (PV) coincident with peak hour demand

Line 9: DG – The peak load reduction associated with non-solar generators (*e.g.*, CHP, gas turbines, *etc*.)

Line 10: Energy Storage – The peak load reduction associated with appropriately rated batteries

Line 11: AMI CVO – The peak load reduction associated with appropriately estimated CVO impacts

Line 12: Organic EE/ Codes and Standards – The peak load reduction associated with appropriately estimated Organic EE/ Codes and Standards

Line 13: Coincident DSM (Incremental): Category heading for the below seven lines

Line 14: Con Edison EE: Annual incremental forecasted system coincident demand reductions from Con Edison's EE programs

Line 15: NYSERDA EE: Annual incremental forecasted system coincident demand reductions from NYSERDA's EE programs

Line 16: NYPA: Annual incremental forecasted system coincident demand reductions from NYPA EE/DM projects

Line 17: BQDM: Annual incremental forecasted system coincident demand reductions from the BQDM program

Line 18: DMP (1+2): Annual incremental forecasted system coincident demand reductions from the Con Edison/NYSERDA DMP

Line 19: Rate Case: Annual incremental forecasted system coincident demand reductions from Con Edison's Rate Case portfolio of programs

Line 20: DR: Annual incremental forecasted system coincident demand reductions from Con Edison's commercial and residential DR programs. It does not include NYISO DR.

Line 21: Total Demand Side Management (DSM) - Annual sum of peak reduction programs

Line 22: Rolling Incremental DSM – Total sum of new (*i.e.,* not baked into the previous year's WAP) peak reduction programs, including the previous year's

Line 23: System Forecast less DSM, less DG, PV, Battery Storage, and AMI CVO + EVs + Steam A/C – System forecast including all incremental growth and load modifiers

Line 24: MW Growth – Net growth; sector growth plus technology driven growth less DER load modifiers

Line 25: Rounded System Forecast net of positive and negative load modifiers. System Forecast rounded to the nearest 10 MW

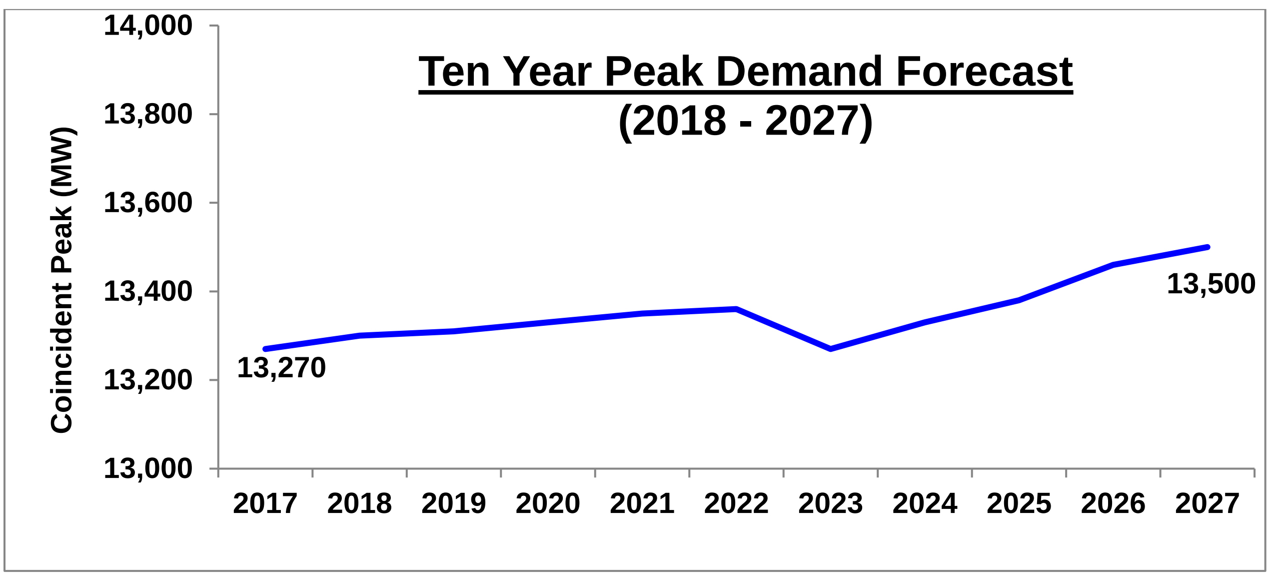
Line 26: MW Growth (Rounded): Net growth rounded to the nearest 10 MW; sector growth plus technology driven growth less DER load modifiers

Line 27: Percentage Growth – Rounded MW Growth as a percentage of the rounded system forecast

10-Year System Peak Demand Forecast

The following 10-year system peak demand forecast was issued in October 2017 and covers the years 2018 to 2027. Figure 63 shows the 10-year CAGR is 0.2 percent, resulting in a 2027 system coincident peak of 13,500 MW. This is a 360 MW reduction compared to the 2016 forecast. While EVs and new business growth are contributing to an increase in load, this increase is more than offset by forecasted load reductions from DSM, PV, DG, and energy storage and the addition of organic EE/Codes and Standards and CVO as negative load modifiers. The impact of CVO implementation is estimated using a 1.0 percent reduction of the forecast for the affected borough. This is done both for the system and network forecasts.

Figure 63: 10-Year System Coincident Peak Demand Forecast



5-Year CAGR (2018 – 2022)	0.1%
10-Year CAGR (2018 – 2027)	0.2%

Five-Year System Energy Forecast

The current delivery volume forecast for Con Edison's service classes reflects an approximate three percent decline in sales over the five-year period. The primary driver of the decline is EE, particularly the Company's EE programs. Other factors contributing to the decline include continued growth of residential solar and other DG and decreases in average use per customer, driven by change in customer behavior and the effects of more stringent codes and standards.

The forecasts of delivery volumes for major service classifications[225] are based on econometric models, whereas the forecasts of delivery volumes for the other service classifications are performed on a deterministic or individual service class basis. The delivery volume forecast for Con Edison customers includes the following adjustments, described in greater detail in the DER Forecasts section:

- Solar Generation – To account for the projected delivery volumes associated with the installation of solar panels by customers who will then generate a portion or all of their energy requirements.
- Standby Service – To reflect the projected delivery volumes from customers who plan to convert a portion, or all, of their existing load to onsite generation and will become standby service customers.
- DSM Programs – To account for expected energy reductions resulting from EE and DMPs.

Figure 64: Five-Year System Energy Forecast (GWh)

	2017	2018	2019	2020	2021
Con Edison	44,592	44,886	44,465	43,987	43,216
NYPA	10,028	9,833	9,762	9,707	9,589
Recharge New York	770	783	783	783	783
Total	**55,390**	**55,502**	**55,010**	**54,477**	**53,588**

NETWORK LOAD AREA PEAK DEMAND FORECASTS

Con Edison also prepares network load area level peak demand forecasts, which roll up to the substation level. Networks are forecasted both for their independent peaks (termed "Independent Network Peak Forecast"), which may differ from the system peak hour and can vary among networks, and for their coincidence with the system peak (termed "Coincident Network Peak Forecast"). Similar to the system demand forecast, the loads are modified to account for any applicable reductions for DER-related programs and other load growth (EVs and steam A/C to electric A/C). The Network Forecasts are developed in parallel with the System Forecast during the early fall to incorporate the most recent summer experience. However, the Coincident Network Peak Forecast uses the System Forecast as an input and cannot be finalized until the System Forecast is complete.

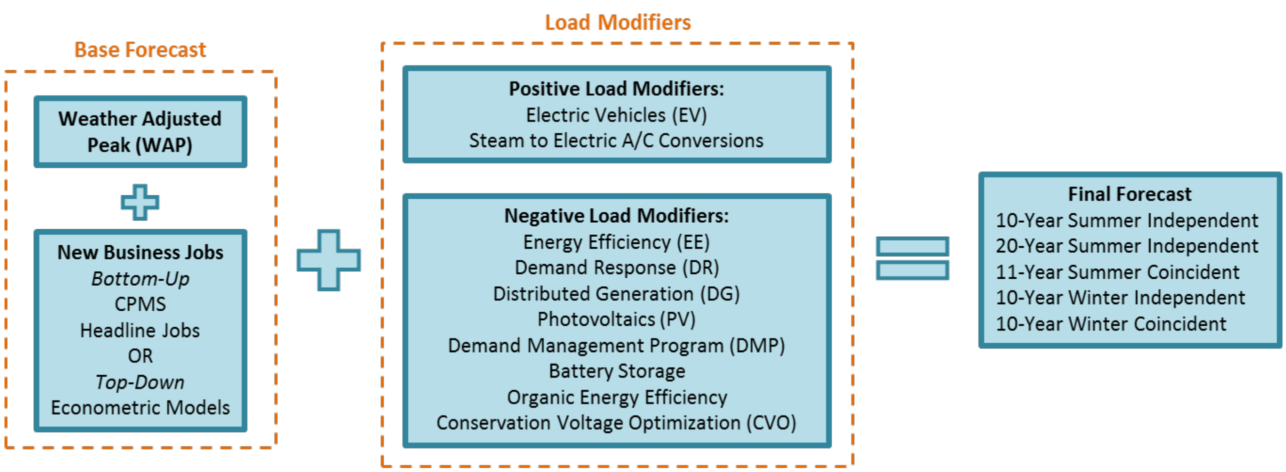
For the Independent Network Peak Forecast, the new business growth for the first five years are developed using a bottom-up approach where the Company has insight on upcoming new business jobs for each sector. This results in a more accurate forecast because the macroeconomic factors used to determine top-down growth cannot be finely parsed across the network and radial areas. Each individual job greater than 100 kVA within the electric service territory is evaluated to determine the total load, the network location, and when it will come online. In addition, the Company maintains a separate list for non-Energy Service jobs that are initiated outside the typical process. Beyond the fifth year, the top-down approach is applied, with the system level growth allocated to each network based on the network's contribution to the first five years of growth. There are some exceptions in which the bottom-up methodology is still used beyond the fifth year if it results in a higher estimated growth than the top-down methodology.

[225] SC 1 (Residential), SC 2 (Small Commercial), SC 5 (Rail Road Platform and Stations Lightings), SC 6 (New York City Private Street Lighting), SC 8 (Master Metered Apartments), SC 9 (Large Commercial), and SC 12 (Multiple Dwelling Space Heating). NYPA Service Classes are also included in the energy forecast by service class: SC 62 (General Small); SC 66 (Westchester Street Lighting); SC 80 (New York City Street Lighting); SC 91 (NYC Public Buildings); and KIAC (Kennedy International Airport Cogeneration).

The base load for the network forecast is developed by adding the estimated growth to the WAP. The final Independent Network Peak Forecast is developed by adding the net of the load modifiers to the base forecast. Each network's peak hour will inform localized infrastructure investment decisions.

The Coincident Network Peak Forecast, which uses the Independent Network Peak Forecast as a starting point, evaluates the networks' expected load during the system peak hour. Therefore, the Coincident Network Peak Forecast must add up to the System Forecast, minus any transmission losses. The annual coincident growth (or base load) is developed using the annual growth of each network (derived from the Independent Network Peak Forecast), the total system growth minus transmission losses, and the ratio of the independent growth of each network to the sum of all independent growth. Once the base load for the network coincident forecast is developed, it must be verified that the independent forecast is higher than or equal to the coincident forecast. Once verified, the base load will be added to the WAP and load modifiers to develop the final Coincident Network Peak Forecast. Figure 65 provides an overview of the network forecasting process.

Figure 65: Electric Network Peak Demand Forecast Process



As discussed above, system average load growth is near zero; however, there are pockets of higher growth, largely driven by revitalization of certain residential neighborhoods in Brooklyn, Queens, and Manhattan. In total, as Table 24 shows below, there are 38 electric network areas that have compounded annual load growth rates of 1.0 percent or higher per year for the next 5 years, per the Independent Network Peak Demand Forecast, with some networks projecting much higher growth.

Table 24: 2018-2027 Network Area Forecasted Growth Rates*

Network Area (Excludes Radial Allocated Feeder Loads)	5-Yr CAGR	10-Yr CAGR
Pennsylvania	11.5%	6.2%
Borden	7.0%	4.4%
Roosevelt	5.1%	3.1%
Borough Hall	4.6%	2.7%
Long Island City	4.4%	2.8%
Cortlandt	3.6%	2.5%
Kips Bay	3.5%	2.1%
Williamsburg	3.0%	1.8%
Jackson Heights	2.8%	1.5%

Hudson	2.5%	1.5%
Turtle Bay	2.5%	1.7%
Grasslands	2.5%	1.6%
Grand Central	2.4%	1.4%
Sutton	2.3%	1.5%
Southeast Bronx	2.3%	1.4%
Ridgewood	2.2%	1.5%
Prospect Park	2.2%	1.3%
City Hall	2.2%	1.4%
Brighton Beach	2.1%	1.4%
Fulton	2.0%	1.3%
Fashion	2.0%	1.2%
Fresh Kills	1.8%	1.3%
Sunnyside	1.5%	1.3%
Ossining West	1.4%	1.2%
Cooper Square	1.4%	0.8%
Canal	1.3%	0.8%
Lenox Hill	1.3%	0.8%
West Bronx	1.3%	0.7%
Greenwich	1.1%	0.3%
Chelsea	1.1%	0.7%
Harlem	1.1%	0.7%
Times Square	1.0%	0.6%
Fox Hills	1.0%	0.7%
Plaza	1.0%	0.6%
Lincoln Square	1.0%	0.7%
Rockefeller Center	1.0%	0.7%
Flushing	1.0%	0.7%
Freedom	1.0%	1.8%
Richmond Hill	0.9%	0.7%
Granite Hill	0.9%	0.7%
Madison Square	0.8%	0.5%
Flatbush	0.7%	0.4%
Central Bronx	0.7%	0.4%
Beekman	0.7%	0.4%
Herald Square	0.7%	0.4%
Yorkville	0.6%	0.4%
Sheridan Square	0.6%	0.4%
Park Place	0.6%	0.3%
Bay Ridge	0.5%	0.2%
Ocean Parkway	0.5%	0.3%
Bowling Green	0.5%	0.3%
Randalls Island	0.4%	1.3%
Elmsford No. 2	0.4%	0.5%
Jamaica	0.4%	0.2%
Crown Heights	0.4%	0.2%
Fordham	0.4%	0.0%
Maspeth	0.4%	0.2%
Washington Heights	0.3%	0.1%
Rockview	0.2%	0.6%

Central Park	0.2%	0.1%
Greeley Square	0.2%	-0.2%
Washington Street	0.1%	0.3%
Midtown West	0.1%	0.0%
Columbus Circle	0.1%	0.0%
Northeast Bronx	0.1%	0.0%
Hunter	0.0%	0.0%
Rego Park	0.0%	0.0%
Millwood West	0.0%	1.0%
Empire	0.0%	0.0%
Riverdale	0.0%	-0.1%
Buchanan	-0.1%	0.2%
Sheepshead Bay	-0.1%	-0.1%
White Plains	-0.1%	0.3%
Park Slope	-0.1%	-0.1%
Cedar Street	-0.2%	0.3%
Battery Park City	-0.3%	-0.4%
Woodrow	-0.5%	-0.3%
Harrison	-0.5%	-0.2%
Willowbrook	-0.6%	-0.3%
Wainwright	-0.8%	-0.4%
Triboro	-0.9%	-0.2%
Pleasantville	-1.2%	-0.6%
Mohansic	-3.9%	-3.1%

The Company also prepares forecasted network-level 24-hour peak load duration curves and network level 24-hour minimum load duration curves, which are available through the Company's hosting capacity maps. Additionally, the Company provides historical 8,760 hour load data for each network as part of the system data pop-ups in its online hosting capacity map.

DER FORECASTS

Increased adoption of DER will introduce new challenges for maintaining forecasting accuracy due to uncertainties associated with the variability of DER output, its evolving correlation with net load, and the impact of geographic diversity on aggregate DER output. These new DER will have locational-specific impacts determined in part by the ways in which penetration rates evolve in each part of the distribution system. As a result, increasing levels of DER will drive the need for forecasting of future net load levels at more granular levels. For example, pairing top-down econometric forecasting approaches with more granular forecasts will enable planners to more accurately evaluate distribution system needs as DER penetration increases. These more granular load forecasts consider economic indicators and analyze load shapes based on the characteristics of individual loads or local areas. The development of these approaches for forecasting both load and DER output will enable more accurate representation of the system at varying load levels to help planners understand when and where constraints may emerge.

Within internal planning processes, DER are organized into one of two sub groups: DSM or DG. DSM includes both EE programs, DM, and DR. The DG group includes subset types of DG, namely PV, CHP or other spinning generators, and energy storage.

DSM Programs

Expected energy savings from EE and DM programs are distributed across the electric networks in the forecast using planned program growth, historical consumption data, and customer demographic information. These energy savings are then converted to peak demand savings using annual hourly load curves, which vary with the measures and specific customer segment related to each program. A geographic uncertainty factor is applied to the expected demand reductions to reflect the uncertainty of where the future savings from system-wide programs will be realized.

Incremental EE program savings are projected annually into the future as far out as the programs are funded or highly likely to be funded. Excluded from the forecast are impacts of codes and standards or naturally occurring EE implemented outside of programs, although these effects are captured in a separate load modifier ("Organic EE/Codes and Standards").

For DM and DR programs, forecast data come from internal program managers who gather information from their implementation contractors and market participants. Future volume and demand reductions are tied to filed and approved program goals and budgets adjusted by historic performance and future performance expectations. For DR programs, discount factors are applied to enrolled MW for network forecasts based on the size and diversity of enrollments in each individual network. DR programs are not included in the volume forecast because the energy savings are both uncertain (programs may or may not be called) and de minimis (even if events are called).

Table 25: 2017 Electric System Peak Demand Forecast - DSM Programs (MW)

line	Program	2018	2019	2020	2021	2022
14	Con Edison EE	-40	-32	-32	-32	-32
15	NYSERDA EE	-8	-7	-6	-7	-8
16	NYPA	-18	-9	-3	0	0
17	BQDM	-33	6[226]	0	0	0
18	DMP (1+2)	-40	-31	-29	0	0
19	Rate Case	-18	-37	-25	0	0
20	DR	-5	-5	-4	-4	-4
21	Total Incremental DSM:	-161	-115	-99	-44	-44
22	Rolling Incremental DSM:	-161	-276	-375	-419	-463

[226] The positive load modifier for BQDM in 2019 is the result of the Company's no longer contracting and calling upon certain non-permanent DER resources, as was done for years (2016-2018) of the BQDM program.

Table 26: Delivery Volume Adjustments by Service Class - DSM Programs (GWh)

Delivery Volume Adjustments (GWh) – DSM Programs		2018	2019	2020	2021	2022
Con Edison	Total	-691	-1,100	-1,509	-1,917	-2,324
NYPA	Total	-16	-16	-16	-16	-16
System	Total	-707	-1,116	-1,525	-1,933	-2,340

Table 27 lists the specific programs the forecasts include.

Table 27: DSM Programs Included in the Forecast

EE	DM	DR[227]
Con Edison Electric Programs • Small Business Direct Install • Multifamily • Commercial & Industrial Equipment Rebate • Commercial & Industrial Custom Efficiency • Residential Electric **NYSERDA Clean Energy Fund**[228] • Residential Sector • Multifamily Sector • Commercial Sector **NYPA Programs** • BuildSmart NY	**Con Edison Electric Programs** • DMP • BQDM • Targeted Demand Management Projects	**Con Edison Electric Programs** • CSRP –Reservation Payment Option • DLC Program

Note: Only the Electric System Forecast includes a forecast for the BQDM program. The Independent and Coincident Network Forecasts only include installed projects (implicit in the Weather Adjusted Peak), but not future impacts from BQDM (additions and subtractions for expiring temporary measures).

[227] Excluded DR programs include DLRP and CSRP Voluntary Participation Options, DLRP Reservation Payment Option, and NYISO DR Programs (SCR).
[228] Case 14-M-0094, *Proceeding on Motion of the Commission to Consider a Clean Energy Fund*, Order Commencing Proceeding (issued May 8, 2014).

DG

DG is included in demand and energy forecasts. For purposes of forecasting, DG is defined as DER capable of operating in parallel with the grid and exporting power back, including solar PV, CHP, and other rotating generation, fuel cells, and energy storage, which represent the overwhelming majority of DG in the Con Edison service territory.

Solar PV

The forecasting of solar PV, as with other DER, involves determining both the impact of the DER and the future growth rate. To assess the impact of currently deployed solar PV, the Company collects AC nameplate kW capacity and application of PV jobs in the interconnection queue from the interconnection processing system. The Company also analyzes available solar output per hour data and the location of the PV projects. The solar output for each hour is determined by reviewing interval data and is representative of four summer months of data (June 1 – September 30) across a sample set of large PV sites with SCADA data. Figure 66 shows the output curve.

Figure 66: Measured Solar Output Curve Using Sampled Interval Meter Data

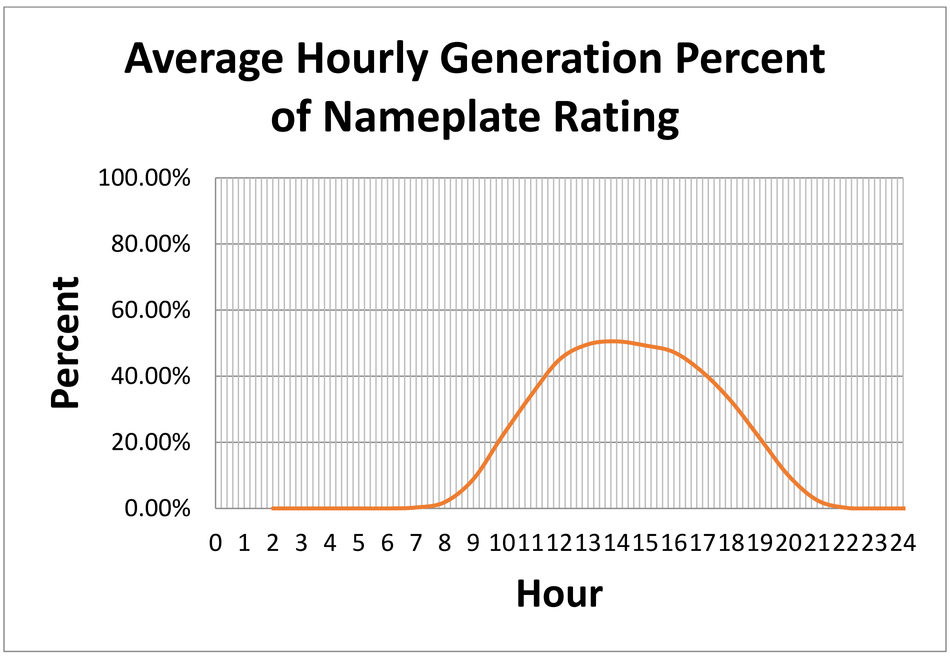


Table 28: Average Summer Solar Output as a Percentage of Nameplate Capacity (AC)

Hourly Solar Generation as a Percent of Nameplate (AC)			
Hour Ending	Average	Hour Ending	Average
0:00:00	0.0%	12:00:00	50.1%
1:00:00	0.0%	13:00:00	49.9%
2:00:00	0.0%	14:00:00	48.3%
3:00:00	0.0%	15:00:00	44.2%

4:00:00	0.0%	16:00:00	36.8%
5:00:00	0.1%	17:00:00	26.8%
6:00:00	1.1%	18:00:00	15.6%
7:00:00	5.4%	19:00:00	6.2%
8:00:00	15.3%	20:00:00	1.3%
9:00:00	27.9%	21:00:00	0.1%
10:00:00	39.5%	22:00:00	0.0%
11:00:00	47.3%	23:00:00	0.0%

The Company identifies where each PV job in the queue is located. Without network information for each PV, it is impossible to determine where PV is most prevalent, and where it has the greatest impact on the grid.

To assess the growth rate of solar PV installations, the initial two years of growth is based on the interconnection queue. For the years beyond the queue, the Company uses a probabilistic approach, including historical growth, cancellation, and decaying rates. For the PV forecast, the Company defined the following assumptions to build the 2017 PV forecast model for Con Edison's service territory:

- Residential customers include any account under 25 kW and commercial customers; include any account over 25 kW.
- Residential jobs go-live an average of 129 days after application date.
- Commercials jobs go-live an average of 321 days after application date.
- The peak occurs after June 1 of each summer.[229]

Twenty-five kW was selected as an approximate divider between residential and commercial projects in order to apply the lead times of large and small PV projects to the forecast. The lead-time assumptions for residential and commercial PV jobs are based on an analysis of average completion cycles of projects past projects. The analysis indicates residential PV goes live approximately 130 days after the application date and commercial PV goes live approximately 320 days after the application date. These lead times are expected to decrease as the interconnection process is further streamlined. As additional data is tracked and made available, the assumptions regarding go-live time will be updated and enhanced accordingly.

June 1 was assumed as a representative peak day for purposes of creating the model, which allows PV jobs that are in the queue to be parsed into groups that will go-live that summer or the following summer.

[229] The PV output curve analysis includes the summer months between June and September. By selecting all summer months, it captures uncertainties of weather conditions and pending projects in the queue after June 1 of each summer.

Based on the lead times and interconnection queue, there is sufficient detail to estimate which PV jobs will go-live the next summer. The queue does not contain enough information when the current year forecast is created to estimate how many PV jobs will go-live two summers into the future. Therefore, the number of PV installations for two summers into the future must be extrapolated based on a combination of the interconnection queue used to forecast the current year and long-term growth assumptions.

As shown in line 8 of the System Peak Demand Forecast (and included below for reference), PV is expected to contribute a rolling incremental 19 MW of load reduction in 2018, ramping to a rolling incremental 144 MW by 2022. This is based on the nameplate capacity of the PV, converting to AC, de-rating it to account for coincidence with Con Edison's system peak. The PV forecast is represented as rolling incremental where 2018 is the incremental decrease to system load, and each year thereafter is the reduction of that year and all years dating back to 2018. Over the 10-year period (2018-2027), the forecasted cumulative coincident solar PV MW is 310 MW (843 MW_{AC} nameplate).

Table 29: Electric Five-Year System Peak Demand Forecast – Solar PV (MW)

		2018	2019	2020	2021	2022
8	Photovoltaic (PV) (rolling incremental)	-19	-44	-73	-106	-144
	Coincident PV MW in AC (Cumulative)	-82	-107	-135	-168	-206
	% MW Growth	31%	31%	27%	25%	23%

Table 30 shows that solar generation at the system level is expected to contribute 127 GWh of energy reduction in 2018, ramping up to 555 GWh of reduction in 2022.

Table 30: Delivery Volume Adjustments by Service Class – Solar PV (GWh)

Delivery Volume Adjustments (GWh) – Solar Generation		2018	2019	2020	2021	2022
Con Edison	Total	-107	-183	-271	-366	-469
NYPA	Total	-20	-34	-51	-68	-86
System	Total	-127	-217	-322	-434	-555

CHP and Other Generation

CHP and other forms of rotating generation preceded the wide scale adoption of solar and energy storage. As such they are referred to within Company processes and forecasts as DG, even though they are a subset of DG. All references to DG in this section refer only to CHP and other rotating generations. This includes traditional DG like gas turbines and reciprocating engines, as well as newer technologies such as fuel cells and microturbines.

DG inputs are collected from developers prior to and throughout the interconnection process. The nameplate capacity and details of the go-live timing (looking three years out) are provided through the interconnection process and verified by the Company. Furthermore, for large DG units (and some units below 1 MW), operational performance data may be collected through interval meters or other mechanisms. Long-term growth of DG is extrapolated based on the historical penetration and currently queued projects.

Because non-solar DG units are generally larger than PV projects and are normally dispatched at times of peak load, their impacts on the local grid are greater and depend on several factors. These factors include the size of the DG unit, the redundancy of the local area station, the expected time of go-live, and engineering knowledge of the substation reliability and other local conditions. For the DG forecast, the Company defined the following assumptions to build the forecast model:

- Large DG is defined as having a capacity greater than or equal to 1 MW and small DG as having a capacity less than 1 MW.
- All small DG units are assumed to be on at all times. Therefore, full credit will be taken to reduce load at their stations (and associated networks).
- Large DG units with N-2 redundancy or N-1 redundancy with a spare bank will take full load credit to reduce load at stations (and their associated networks).
- Large DG units with N-1 redundancy without a spare bank will take half of the load to reduce load at their stations (and associated networks).
- All DG jobs in the queue will be assigned with one-year lag of the DG completed/install year (e.g., if the completed year is 2016, credit will be taken in 2017).
- Each DG project had a performance factor applied (69% for large DG and 84% for small DG). The DG system forecast in outer years will be divided into networks based on the network's contribution to the DG queue.

Table 31 characterizes the non-solar DG assumptions that determine load reduction credit. DG for each network is rolled up for the system DG forecast.

Table 31: Determination of Non-Solar DG Demand Reduction Credit

			Station Redundancy	
			N-2 & N-1 with a spare bank	N-1
Size and Quantity of DG	Small (<1 MW)	Small DG	Nameplate capacity with performance factor and one year lag from the job completion date	Nameplate capacity with performance factor and one year lag from the job completion date
	Large (>=1 MW)	Large DG	Nameplate capacity with performance factor and one year lag from the job completion date	50% of nameplate capacity with performance factor and one year lag from the job completion date

Once the DG forecast is determined, the inputs are analyzed so that the system forecast displays the rolling incremental growth (in MW). DG growth from energy storage projects is tracked separately.

In determining the energy forecast load modifier for DG, the Company evaluates only the large (greater than 2 MW) DG units owned by customers taking standby service. The scope prioritizes the standby service rates because of the laborious manual methods to determine the revenues associated with these customers and, as the largest DG units, they have the greatest impact on the energy forecast. The energy forecasting process requires an investigation of the past performance of each unit. For each of the Company's existing standby service accounts, the prior year's usage is reviewed to identify monthly consumption anomalies. For new customers, if available, their past consumption is analyzed to determine the difference between usage and planned on-site generation. In each case, the potential kW generation of the new DG is provided, and applied to historical energy/kW ratio to determine the account-specific monthly energy reduction to be applied to the forecast. These account-specific energy reductions are summed by existing service class to determine the energy forecast modifier.

As shown in line 9 of the system forecast (and included below for reference), non-solar DG is expected to contribute an additional 4 MW of load reduction in 2018, ramping to an additional 53 MW of reduction in 2022. The non-solar DG forecast is represented as rolling incremental, where 2018 is an incremental decrease to the system load and each year thereafter is the reduction of that year and all years prior through 2018. Over the 10-year period, the forecasted cumulative coincident DG MW is 186 MW (293 MW nameplate).

Table 32: Electric System Peak Demand Forecast – Non-Solar DG (MW)

		2018	2019	2020	2021	2022
9	DG (incremental rolling)	-4	-24	-14	-6	-6
	Coincident DG MW (Cumulative)	-100	-124	-138	-144	-150
	% MW Growth	4%	23%	11%	4%	5%

Table 33 shows that DG is expected to contribute 300 GWh of energy reduction in 2018, ramping up to 315 GWh of reduction in 2022.

Table 33: Delivery Volume Adjustments by Service Class – Non-Solar DG (GWh)

Delivery Volume Adjustments (GWh) - Standby Service (DG)		2018	2019	2020	2021	2022
Con Edison	Impact	-275	-275	-275	-275	-275
NYPA	Impact	-25	-25	-25	-40	-40
System	Impact	-300	-300	-300	-315	-315

Energy Storage

Energy Storage is a separate line item in the DG forecast. While storage is still a small component of the forecast, advances in technology will result in many more installed storage devices, particularly batteries, throughout Con Edison territory over time. Energy storage penetration and growth information are derived from the Company's interconnection queue, which provides a near-term view of proposed and under-construction projects. For the 2017 forecast, the Company reviewed existing and queued energy storage projects. Given the early development of energy storage technology in the service territory, the Company used conservative assumptions on energy storage growth. The 2018 forecast will update growth assumptions based on the outcomes of the Energy Storage Roadmap initiative.

The Company recognizes that distributed energy storage is a relatively new technology with limited but growing data on technical and market potential in the Company's service territory. The Company has identified factors for adoption that it believes will indicate the future pace of distributed energy storage. These signposts include energy storage pricing (by technology type), installed cost, policy treatment (e.g., NEM/value stack, tax credits), and FDNY and NYC DOB permitting will be used to inform the forecasting process going forward. The Company is evolving toward a probabilistic approach that incorporates historical growth rates of DER technologies with similar characteristics, such as space requirements, as indicative of storage growth patterns. In the future, as more actual energy storage installation data and clearer guidance on the policies surrounding energy storage become available, the Company plans to revise and refine its forecasting model for energy storage projects.

Energy storage systems are a flexible resource in terms of the value they can provide. For example, a 10 MW, four-hour (or 40 MWh) battery can discharge in several ways: 10 MW discharged for 4 hours, 5 MW discharged for 8 hours, or different levels of discharge for varying durations. Battery systems could also target a use case that provides more consistent output of intermittent renewable sources or flattening the peaks of load curves of customers with highly variable loads. These systems are most predictable when they discharge in a manner set by program rules (e.g., the Company's DMP specifies the battery must discharge from 2:00 p.m. to 6:00 p.m.). For planning purposes, the Company will view the load reduction from the battery as the amount of discharge it can provide over four hours, in line with the network peak load. Thus, a 500 kW reduction from peak would be a 2 MWh battery discharged over 4 hours. The Company understands that a battery system could discharge in a variety of ways and if an incentive mechanism (e.g., DR or program rules) caused the battery discharge pattern to vary from this standard, then the Company could adjust the amount of reduction the forecast includes.

Due to the limited visibility of installed storage as of 2017, the Company lacks adequate data to model the effect on peak load. The Company recognizes that several factors require further study, including storage use and charging method. In general, an energy storage resource serves as a load to the utility when it charges from the grid, and serves as a resource to the utility when it discharges. Charging at off-peak times and discharging at peak times generally leads to less carbon-intensive supply sources being utilized and serves to flatten the peak and fill in the troughs for the utility, leading to a better overall load factor and better system efficiency. Energy storage would not serve as a load to the utility if it charges using BTM generation (i.e., solar and battery both behind a one-way inverter). The charging of the battery would not increase the load seen by the utility.

Storage use, and its impact on peak load, varies by intended purpose (*e.g.,* customer-peak shaving, DR, direct utility-control) and size of resource. Customer-peak shaving is dependent on the time of the customer's peak, and may not be coincident with utility or NYISO peak. Resources used for customer-specific energy needs may be unavailable at other times.

Other storage uses are measurable and able to be influenced or controlled by the utility (through contracts and/or in real-time). Programs that support a higher level of utility visibility include the DMP and REV Demonstration projects (VPP and recently issued RFP for energy storage), discussed elsewhere. These programs are administered by the Company and provide greater visibility and impact to peak demand. BQDM also provides an opportunity for the Company to control an energy storage unit as part of a larger suite of DM projects. Similar RFPs would guarantee coincidence with the Company's greatest need. Depending on storage capacity, technology, and project economics, utility-owned storage projects may also be capable of bidding into NYISO DR and/or ancillary services markets. The

Company expects data from these programs to contribute to peak load and energy use impact studies in the coming years.

As shown in line 10 of the system forecast (and included below for reference), batteries are expected to contribute an additional 0.7 MW of load reduction in 2018, ramping to 9 MW of reduction in 2022.

Table 34: Electric System Peak Demand Forecast - Battery Storage (MW)

		2018	2019	2020	2021	2022
10	Battery Storage (incremental rolling)	-0.7	-3	-4	-7	-9

The Company currently does not quantify the specific contribution of distributed energy storage to energy reduction due to the limited number of installations and disparate impacts of storage on energy use based on how the storage is charged. For example, charging from the grid would have a positive (additive) impact to delivered energy, while a resource charging from BTM generation would have no impact on delivered energy. Other factors which could affect energy usage are the load curve of customers who adopt distributed energy storage, as well as their charging cycle and frequency, and capacity utilization of the storage resource.

APPENDIX B: TOOLS AND INFORMATION SOURCES

Tools and Information Sources by Organization

Resource Name and Link	Topic(s) Covered
Con Edison Utilities Links	
Con Edison: Hosting Capacity	• Advanced Forecasting • Distribution System Data • Beneficial Locations for DERs and NWS
Con Edison: Non-Wires Solutions	• Procurement of NWS
Con Edison: Private Generation Energy Sources	• DER Interconnections
Con Edison: Customer Energy Data	• Customer Data
Con Edison: Electric Vehicles	• Electric Vehicle Integration
Con Edison: Smart Meters	• Advanced Metering Infrastructure
Con Edison: Energy Storage	• Energy Storage
Con Edison: Cyber Security Policy	• Cybersecurity
Con Edison: Private Generation	• Beneficial Locations for DERs and NWS
Con Edison: Energy Star	• Energy Efficiency, Integration and Innovation
Con Edison: PowerClerk	• Applying for Interconnection
NY REV and Assorted NY Government Links	
REV Connect: Non-Wires Alternatives portal	• Electric Vehicle Integration
Assembly Bill 288 residential tariff for recharging EVs	• Electrical Vehicle Integration
Case 14-M-0101, Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision	• DER Integration
Case 16-M-0411, In the Matter of Distributed System Implementation Plans	• DER Integration
Case 16-M-0412, Benefit Cost Analysis Handbook	• Procurement of NWS
Joint Utilities of NY Links	

Joint Utilities: Utility-Specific NWA Opportunities	• Procurement of NWS
Joint Utilities: Cyber and Privacy Framework	• Cybersecurity
Joint Utilities: Overview of Currently Accessible System Data	• Advanced Forecasting • Distribution System Data
Joint Utilities: EV Readiness Framework	• Electric Vehicle Integration
Joint Utilities: Overview of Currently Accessible System Data	• Advanced Forecasting • Distribution System Data
Joint Utilities: DSP Communications and Coordination Manual	• Grid Operations
Joint Utilities: Draft DSP-Aggregator Agreement for NYISO Pilot Program	• Grid Operations
Other Links	
NERC CIP Reliability Standards	• Cybersecurity
National Institute of Standards and Technology (“NIST”) Special Publication (SP) 800-53 revision 4	• Cybersecurity
EPRI: Defining a Roadmap for Successful Implementation of a Hosting Capacity Method for NY State	• Hosting Capacity

List of Related Ongoing Proceedings

- In the Matter of Distributed System Implementation Plans (Case 16-M-0411)
- In the Matter of the Value of Distributed Energy Resources (Case 15-E-0751)
- VDER Working Group Regarding Value Stack (Matter 17-01276)
- VDER Working Group Regarding Rate Design (Matter 17-01277)
- VDER Low Income Working Group Regarding Low and Moderate Income Customers (Matter 17-01278)
- Proceeding on Motion of the Commission Regarding Electric Vehicle Supply Equipment and Infrastructure (Case 18-E-0138)
- In the Matter of Offshore Wind Energy (Case 18-E-0071)
- In the Matter of Energy Storage Deployment Program (Case 18-E-0130)
- In the Matter of Utility Energy Efficiency Programs (Case 15-M-0252)
- In the Matter of the Utility Energy Registry (Case 17-M-0315)
- Whole Building Energy Data Aggregation Standard (Cases 16-M-0411 and 14-M-0101)

- Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and Clean Energy Standard (Case 15-E-0302)
- In the Matter of the Regulation and Oversight of Distributed Energy Resource Providers and Products (Case 15-M-0180)
- In the Matter of Proposed Amendments to the New York State Standardized Interconnection Requirements for Small Distributed Generators (Case 18-E-0018)
- Dynamic Load Management Programs (Cases 14-E-0423 and 15-E-0189)

APPENDIX C : LIST OF ACRONYMS

- A/C – Air conditioning
- ADMS – Advanced distribution management system
- AMI – Advanced metering infrastructure
- API – Application program interface
- BIR – Business incentive rate
- BQDM – Brooklyn Queens Demand Management
- BTM – Behind-the-meter
- CAGR – Compound annual growth rate
- CCA – Community Choice Aggregator
- CESIR – Coordinated Electric System Interconnection Review
- CHP – Combined heat and power
- COD – Commercial operation date
- C&I – Commercial and Industrial
- CPMS – Customer Project Management System
- CSRP – Commercial System Relief Program
- CES – Customer Energy Solutions
- CVO – Conservation Voltage Optimization
- DCX – Digital Customer Experience
- DEC – Department of Environmental Conservation
- DER – Distributed energy resources
- DERMS – DER management system
- DG – Distributed generation
- DLC – Direct Load Control
- DLRP – Distribution Load Relief Program
- DMAP – Demand management analytics platform
- DMP – Demand management program
- DMTS – Demand management tracking system
- DOE-OE – Department of Energy Office of Electricity Delivery and Energy Reliability
- DOT – Department of Transportation
- DPS – Department of Public Service
- DR – Demand response
- DRIVE – Distribution Resource Integration and Value Estimation
- DRMS – Demand response management system
- DRV – Demand Reduction Value
- DSA – Data Security Agreement
- DSIP – Distributed System Implementation Plan
- DSM – Demand-side management
- DSP – Distributed System Platform
- EDAP – Enterprise data analytics platform
- EDI – Electronic Data Interchange

- EE – Energy efficiency
- EEDM – Energy efficiency and demand management
- EPA – Environmental Protection Agency
- EPRI – Electric Power Research Institute
- ESCO – Energy service company
- ETIP – Energy Efficiency Transition Implementation Plan
- EV – Electric vehicle
- EVSE – Electric vehicle supply equipment
- FDNY – Fire Department of the City of New York
- FERC – Federal Energy Regulatory Commission
- FLISR – Fault location, isolation, and service restoration
- GBC – Green Button Connect
- GE-MARS – General Electric – Multi-Area Reliability Simulation
- GHG – Greenhouse gas
- GIS – Geographic information system
- HAN – Home-Area Network
- HERs – Home Energy Reports
- ICAP – Installed capacity
- IEEE – Institute of Electrical and Electronics Engineers
- IOAP – Interconnection Online Application Portal
- IoT – Internet of Things
- IPWG – Interconnection Policy Working Group
- IT – Information technology
- ITWG – Interconnection Technical Working Group
- LMI – Low- and moderate-income
- LSRV – Locational System Relief Value
- M&C – Monitoring and control
- M&S – Main and service
- MCOS – Marginal cost of service
- MDMS – Meter Data Management System
- MIWG – Market Issues Working Group
- MTA – Metropolitan Transportation Authority
- NDA – Non-Disclosure Agreement
- NEM – Net energy metering
- NERC – North American Electric Reliability Corporation
- NIST – National Institute of Standards and Technology
- NRI – Network reliability index
- NWS – Non-Wires Solution
- NY-BEST – NY Battery and Energy Storage Technology Consortium
- DOB – Department of Buildings
- NYISO – New York Independent System Operator
- NYPA – New York Power Authority

- O&R – Orange and Rockland Utilities, Inc.
- OMS – Outage management system
- OVGIP – Open Vehicle Grid Integration Platform
- P4P – Pay for Performance
- PCS – Power conversion system
- PII – Personally identifiable information
- PVL – Poly-voltage load flow
- REV – Reforming the Energy Vision
- RLT – REV Leadership Team
- RFP – Request for proposals
- RMS – Remote monitoring system
- RPC – Regulatory Policy Committee
- SCADA – Supervisory control and data acquisition
- SEEP – System Energy Efficiency Plan
- SEP – Strategic Energy Partnership
- SHR – Smart Home Rate
- SIR – Standardized Interconnection Requirements
- SP – Special Publication
- TCO – Total cost of ownership
- TESS – Transportable energy storage system
- TOU – Time-of-use
- UBP – Uniform Business Practices
- UER – Utility Energy Registry
- V2G – Vehicle-to-grid
- VDER – Value of DER
- VVO – Volt/VAR optimization
- ZEV – Zero emission vehicle