2018 DISTRIBUTED SYSTEM IMPLEMENTATION PLAN

July 31, 2018

NYSEG RG&E

CONTENTS

ACRONYMS

ADMS—Advanced Distribution Management System
AMI—Advanced Metering Infrastructure
ANM—Active Network Management
BCA—Benefit-Cost Analysis
CCA—Community Choice Aggregation
CRM&B—Customer Relationship Management & Billing System
CVR—Conservation Voltage Reduction
DC—Direct Current
DER—Distributed Energy Resource(s)
DER MMS—Distributed Energy Resource Market Management System
DERMS—Distributed Energy Resource Management System
DG—Distributed Generation
DOE—U.S. Department of Energy
DOE-OE—Department of Energy Office of Electriicty Delivery and Energy Reliability
DR—Demand Response
DSA—Data Security Agreement
DSIP—Distributed System Implementation Plan
DSP—Distributed System Platform
ECC—Energy Control Center
EDI—Electronic Data Interchange
EPRI—Electric Power Research Institute
ESC—Energy Smart Community
ESCO—Energy Services Company
EV—Electric Vehicle
EVSE—Electric Vehicle Supply Equipment
FICS—Flexible Interconnect Capacity Solution
FLISR—Fault Location, Isolation and Service Restoration
GBC—Green Button Connect
GIS—Geographic Information System
GMEP—Grid Model Enhancement Project
IOAP—Interconnection Online Application Portal
IT—Information Technology
ITWG—Interconnection Technical Working Group
kW—kilowatt
LMI—Low- and Moderate-Income
M&C—Monitoring and Control
M&V—Measurement and Verification
MCOS—Marginal Cost of Service
MGMS—Microgrids Management System
MM&C—Measurement, Monitoring & Control
NWA—Non-Wires Alternative(s)
NYISO—New York Independent System Operator
NYSEG—New York State Electric & Gas Corporation
NYSERDA—New York State Energy Research and Development Authority
OMS—Outage Management System
PII—Personally Identifiable Information
REV—Reforming the Energy Vision
RFP—Request for Proposal
RG&E—Rochester Gas and Electric Corporation
SCADA—Supervisory Control and Data Acquisition
SI-SM—Smart Interter-Smrat Meter
SIR—Standardized Interconnection Requirements
T&D—Transmission and Distribution
VDER—Value of DER
VRA—Vendor Risk Assessment
VVO—Volt/VAR Optimization
ZEV—Zero Emissions Vehicle

DEFINED TERMS

Commission: *New York Public Service Commission*
Companies: *NYSEG and RG&E, collectively*
DSPx: *Next Generation Distribution System Platform initiative sponsored by DOE-OE*
EE New York: *NYSERDA's April 2018 white paper*
Joint Utilities: *New York's investor-owned electric utilities, collectively*
Staff: *Staff of the New York Department of Public Service*
Staff 2018 Guidance: *Staff Whitepaper Guidance for 2018 DSIP Updates*
Supplemental DSIP: *Joint Utilities' Supplemental Distributed System Implementation Plan*
YES Store: *Energy-related e-commerce site launched by RG&E*

I. EXECUTIVE SUMMARY

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New York State Electric & Gas Corporation (NYSEG) and Rochester Gas and Electric Corporation (RG&E) (collectively, the "Companies")[1] present our 2018 Distributed System Implementation Plan (DSIP) to continue to transform our business to integrate clean energy resources, provide our customers with greater control over their energy usage and total energy bills, and provide market participants with information to make informed investment decisions.

The electric industry is experiencing unprecedented change, enabled by innovation and advances in clean energy, power delivery, and information technologies. Our vision is to be a leader in the energy sector, providing reliable service to our customers with a commitment to the communities we serve.

Our customers are interested in clean energy, new products and services, and reliable, affordable electricity. Under our plan, our customers will benefit, our grid will be more efficient, and we will help New York realize its goal to reduce greenhouse gas emissions by 40 percent by 2030 and 80 percent by 2050.

What is a DSIP and what does it mean for our customers?

The DSIP is our current plan to leverage technology to meet the needs of our customers, our communities and contribute to New York State's environmental and energy policy goals.

It is our plan to provide our customers with online access to their own energy usage by time of day, and solutions in the form of programs and innovative products and services that will give them greater control over their energy usage.[2] Our customers will be able to participate in NYSEG and RG&E service options that improve the efficiency of the grid and reduce carbon emissions by reducing energy usage during periods of high demand. They will be able to use our online products and services marketplace to sign up for NYSEG, RG&E, and New York State Energy Research and Development Authority (NYSERDA) energy efficiency and other programs. Most significantly, customers will be able to transact directly with products and services offered by distributed energy resource (DER) developers, competitive suppliers, and aggregators.[3]

We describe the progress we've made over the past two years to serve as the Distributed System Platform (DSP) provider, and the investments we will be making over the next five years that will allow us to integrate unprecedented amounts of renewable and distributed energy resources.[4] Our ability to integrate DER depends on a smart, automated distribution grid that will allow us to maintain power quality and reliability for every customer while enhancing the resiliency of the grid. We are building technologies to capture real-time customer and grid performance data, systems that can leverage this data to plan and operate the grid, and analytical capabilities that can convert granular data into insights for our customers and other market participants to make informed decisions. These investments complement system hardening and other resiliency investments recently announced by the Companies. The resiliency plan includes measures that will harden the power grid to better withstand and recover from storms while also utilizing technology that will help customers better manage their energy consumption.[5]

1 *NYSEG and RG&E are the New York-based utility subsidiaries of AVANGRID, the United States based diversified energy company that is majority owned by Iberdrola Group. Iberdrola Group has a goal of being carbon-neutral by 2050.*

2 *Our 2018 DSIP was prepared to comply with the Department of Public Service Staff Whitepaper, Guidance for 2018 DSIP Updates, April 26, 2018 ("Staff 2018 Guidance"), and preceding orders including the Order Adopting Regulatory Policy Framework and Implementation Plan issued February 26, 2015)("Track One Order") and the Order on Distribution System Implementation Plan Filings issued March 9, 2017.*

3 *A competitive supplier offers a product or service to our customers that helps them manage their energy or take advantage of a new energy-related technology. This excludes the Companies or a government entity such as NYSERDA. An aggregator is a community or private entity that serves as an intermediary between a group of customers and the DSP or a wholesale supplier.*

4 *This is NYSEG's and RG&E's second five-year DSIP filing. Our initial DSIP was filed on June 30, 2016.*

5 *See our June 27, 2018 press release, available on AVANGRID's website. The DSIP contributes to enhanced resiliency in several respects including our investment in Advanced Metering Infrastructure and automation of our distribution system, as well as batteries that can provide backup power when a customer is disconnected from the grid.*

What are DER and how do they impact the grid?

DER include solar and other distributed generation (DG) technologies, energy storage, energy efficiency measures, and demand response, which may be installed either on our customers' premises or connected to our distribution system.[6] DER matter because the electricity grid was originally designed and built to deliver power in one direction from large power plants that are connected to regional transmission networks to our distribution systems for delivery to residential and business customers. DER inject power *(or reduce demand)* at thousands of points on the grid and change power flow direction and dynamics on the grid.

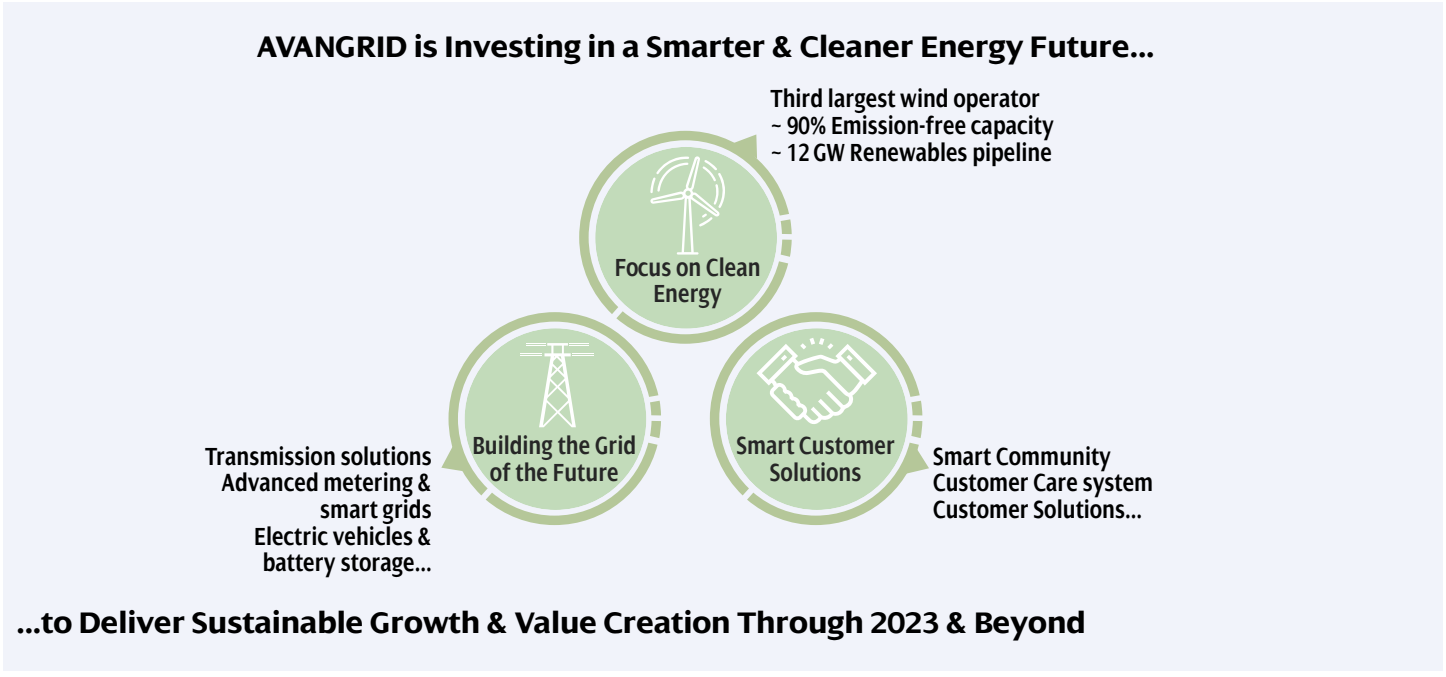
In order to connect and integrate large quantities of DER and accommodate the bi-directional power flows that will result, we must change the way we plan and operate the grid.

One of the benefits of DER is the contribution to a cleaner environment. For example, customers can reduce energy usage by participating in energy efficiency opportunities and other programs. Participation in Demand Response (DR) programs will also improve the environment as the reductions in energy demand occur when the region is producing power from power plants that operate on fossil fuels. The environmental contribution of DER such as solar energy is well understood and awareness of the potential environmental contribution of electric vehicles is growing rapidly.

Is the DSIP endorsed by NYSEG and RG&E's corporate parent?

Yes. As shown in Figure I-1 the vision and strategy of our parent corporate entity, AVANGRID, Inc., and the global Iberdrola Group, majority investor in AVANGRID, are aligned with the DSIP. Our vision is also aligned with clean energy goals and policy direction that is being set by New York State and the New York Public Service Commission ("Commission") in concert with the Governor's Reforming the Energy Vision (REV) strategy.[7]

FIGURE I-1: AVANGRID'S VISION



6 *FN reads: REV Track One Order, Footnote 3, p. 3*

7 *The Commission's activities to execute the REV strategy are being addressed in Case No. 14-M-0101 and related proceedings.*

What role will NYSEG and RG&E serve?

The Companies will serve as the DSP provider and "Smart Integrator," by interconnecting and integrating DER in response to decisions made by our customers. We will provide information to DER developers to signal where and when DER can provide the greatest value to the grid. We will provide an online platform for customers, DER developers and other competitive suppliers to transact with the DSP and with each other. We will leverage granular data and employ smart technologies to empower our customers to manage their energy usage, improve the efficiency of the grid, and contribute to a cleaner environment. Our customers will be able to use our online products and services platform to choose among time-of-use and other pricing options offered by us, participate in energy efficiency or demand response programs, and purchase products and services from other suppliers. We will provide Advanced Metering Infrastructure (AMI) data and insights to customers that will allow them to take actions that create value for them.

THE SMART INTEGRATOR

- Serves as a platform for customers and third-party service providers, enabling the growth, integration, and optimization of DER.
- Enables new value-added products and services that benefit customers directly and the overall efficiency of New York's energy markets.
- Improves delivery service efficiency while improving the reliability and resiliency of the network.
- Enable the participation of customers and suppliers in evolving distribution markets.

What are we doing to prepare to serve as the DSP?

The DSP is defined by the Commission 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."[8] One of our primary responsibilities as the DSP provider is to support the proliferation of DER where it delivers benefits to our customers, improves the performance of the grid, and contributes to a cleaner environment. In order to meet this responsibility and maintain reliable, resilient and safe service to our customers, our DSP is being designed to deliver three core functions:

1. **INTEGRATED PLANNING** is the DSP function that ensures the reliable, safe, and efficient planning and design of our electric distribution network. We are integrating DER into our long-term planning processes, optimizing the contribution of DER together with our more traditional investments that we make to improve the reliability and resiliency of the grid. DER developers already offer alternatives to traditional grid solutions, called "Non Wires Alternatives" (NWA). To perform our planning studies, we will employ an analytical model that reflects an up-to-date mathematical representation of the physical and electrical attributes of distribution infrastructure that comprise the network, data regarding electrical flows, and the location and operational attributes of connected and forecasted DER.

2. **GRID OPERATIONS** is the DSP function that manages, maintains, and operates the electric power system in order to deliver system stability, power quality, and reliability. We are integrating DER into our daily operation of the grid to improve the reliability and quality of service to all of our customers and we are coordinating our operations with the New York Independent System Operator (NYISO) to ensure the reliability of both our own distribution systems and the New York State high-voltage grid and to compensate DER for the value they contribute to the region. The distribution grid must become significantly more "intelligent" in order to continue to fulfill these obligations while accommodating a substantial increase in DER that is widely dispersed throughout the network. Real-time network and DER performance data is necessary to coordinate and control grid resources, ensure the stability of the network, and maintain the quality of power delivered to our residential and business customers. It is clear that extensive grid (and DER) automation, enabled by real-time telecommunication of network performance data, will be required.

8 REV Track One Order, p. 31.

3. **MARKET SERVICES** connects customers to our pricing options and programs as well as to products and services offered by competitive suppliers. The DSP enables customer transactions through a products and services marketplace. Our DSP will also empower customers to make better decisions by providing customers and their potential suppliers with access to energy usage and other relevant information, consistent with data privacy requirements.

We refer to these three core DSP functions as our "DSP Pillars." They are supported by a fourth DSP function, **INFORMATION SHARING**. Information Sharing provides customer information and insights to customers. Information Sharing also provides system information and insights with DER providers and competitive suppliers regarding where on our grid DER offer the greatest value to help them make informed decisions.

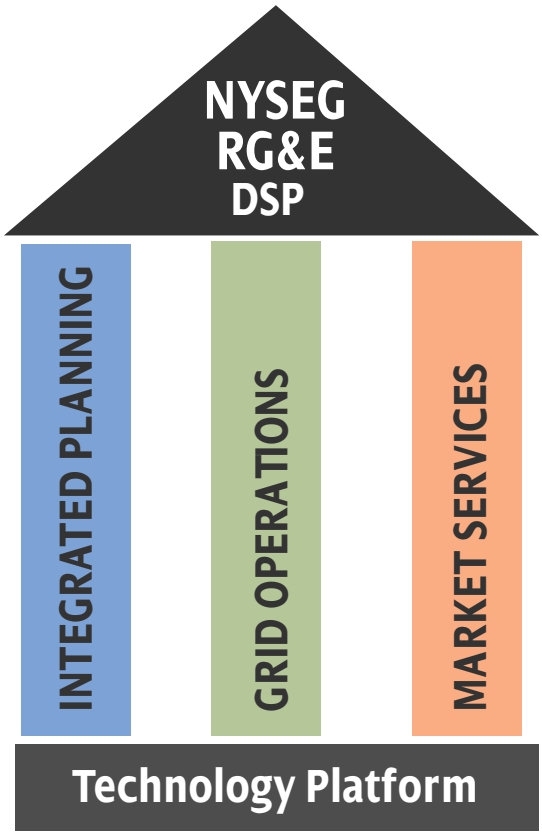
What role is served by technology?

As shown in Figure I-2, the three core DSP pillars are enabled by an integrated set of technologies that include existing NYSEG and RG&E technologies, investments to modernize our grid, and investments that enable our performance as the DSP provider.

FIGURE I-2: DSP TECHNOLOGY PLATFORM

Our technology platform includes several foundation technologies that support the three DSP Pillars

- Investments in physical grid assests
- Telecommunications/IT
- Advanced Metering Infrastructure
- Grid Automation
- Enhanced Grid Model
- Enhanced DER Monitoring & Control: (M&C)
- Enterprise Analytics
- Advanced Forcasting



The way we plan and operate the grid is changing since DER are being dispersed throughout the grid *(e.g., next to a substation in an urban area or at the end of a line in a sparsely populated region).* In addition, some DER may provide an intermittent source of energy making their supply difficult to predict. With experience, we will improve our DER forecasting accuracy.

We need real-time granular information about the location and operating characteristics of DER, the performance of DER, and the performance of our grid.

Our technology platform will provide more granular information that will help us manage our distribution system and control DER when necessary to maintain voltage and power quality delivered to every one of our customer's premises, including that customer at the end of a distribution line.

How are we developing the DSP and delivering on our vision?

First, and foremost, we are collaborating with the other New York investor-owned utilities to discuss the challenges we all face, potential solutions, and how best to go about making these changes while continuing to provide reliable, resilient, and safe service to New York's electricity customers.[9] We are also working closely with the staff of the New York Department of Public Service ("Staff") and many other stakeholders to address the large number of details that need to be resolved to make sure that we are able to deliver on our vision. We began four years ago by refining our vision and building the capabilities necessary to perform as the DSP provider. Progress is being made and customers are starting to see the benefits.

Second, we have actively engaged with our stakeholders, participating with the Joint Utilities to address many technical issues over the past two years and meeting more recently with a broad group of our key stakeholders to provide an overview of our 2018 DSIP, request their feedback, and respond to their questions.[10] Our stakeholders asked questions and offered feedback on a wide range of issues including our support for electric vehicles, how we partner and coordinate with DER providers before and after DER are installed, when customers and DER providers should expect to see benefits from our DSIP, and how our DSIP will contribute to New York's clean energy goals.

Third,we are engaged in a comprehensive effort to test new technologies and ways of doing business by executing a portfolio of innovation projects. The centerpiece of our innovation portfolio is the Energy Smart Community (ESC), located in Ithaca, New York where we have installed approximately 12,300 smart electric meters and are testing as many of the technologies, business model concepts, and products and services marketplace functions as possible before we apply lessons learned on a system-wide scale throughout our NYSEG and RG&E service areas.

Fourth, we are designing an integrated technology platform that will provide data and operational capability that we need to plan and operate the grid, integrate and deploy DER, share customer and system data, and provide an online products and services marketplace.

Fifth, we are enhancing existing capabilities and building new capabilities throughout our organization to perform successfully as the DSP provider, consistent with AVANGRID's vision to operate as a technology and innovation company that is investing in a cleaner and smarter energy future.

In summary, our DSP will be . . .

INTEGRATED: Although we present the DSP by focusing on its individual components, the DSP is being planned, and will be built and operated, as an integrated whole. Our technology platform is designed to support the Integrated Planning, Grid Operations, Market Services, and Information Sharing functions.

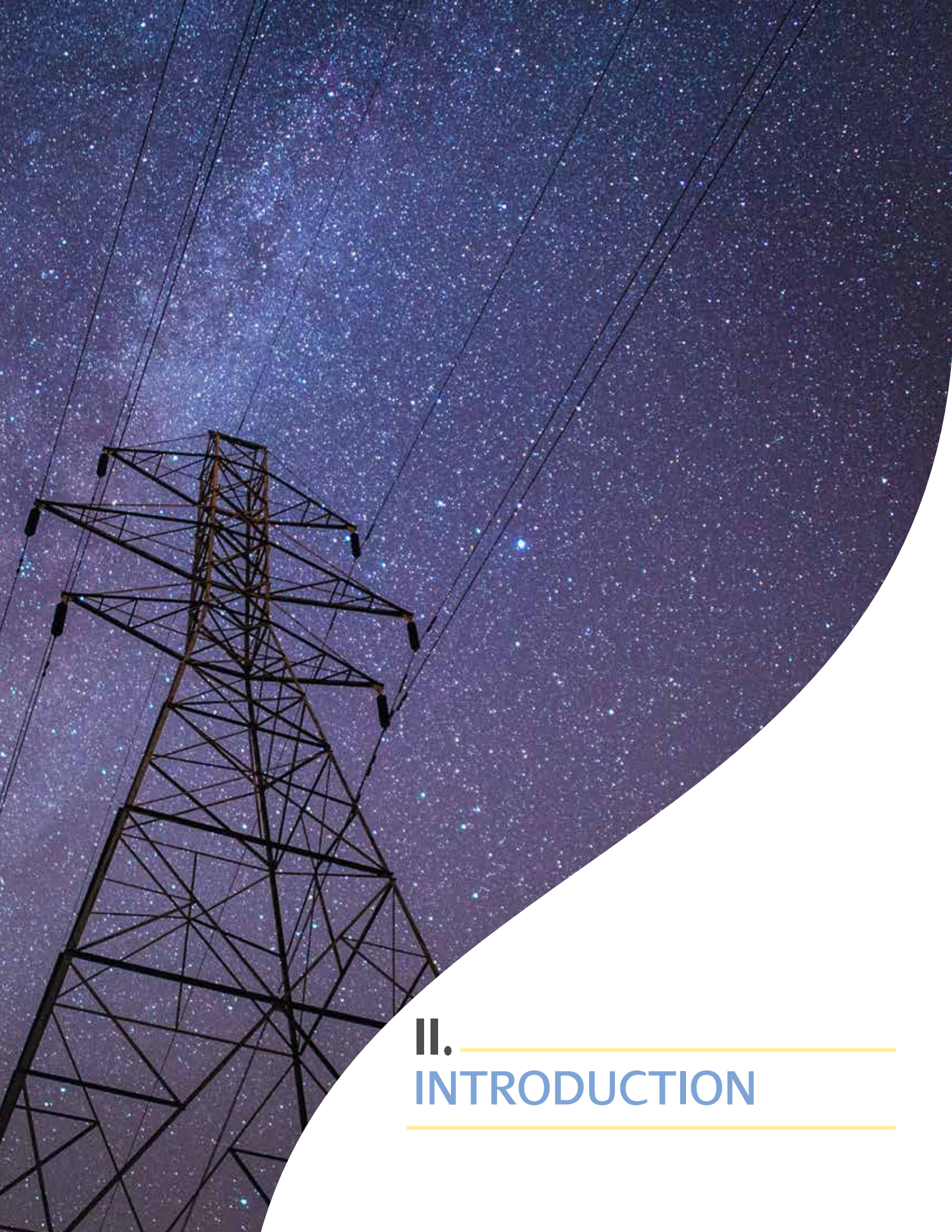
CUSTOMER-CENTRIC: The Smart Integrator places customers in the center. Customers make the decisions to engage with DER that not only helps them meet their energy needs, but helps other customers and the environment. Our role is to empower customers, provide them with a products and services marketplace to securely transact, and to provide them with the information they need to make sound decisions.

9 *For purposes of participating in the REV Proceeding and our ongoing collaboration with stakeholders, and at the request of the NY Public Service Commission, the New York investor-owned utilities are referred to as the "Joint Utilities of New York" ("Joint Utilities") and include Consolidated Edison Company of New York, Inc., Orange and Rockland Utilities, Inc., Central Hudson Gas & Electric Corporation, Niagara Mohawk Power Corporation d/b/a National Grid, New York State Electric & Gas Corporation, and Rochester Gas and Electric Corporation. The Joint Utilities' website http://jointutilitiesofny.org/home/*

10 *Our DSIP and this filing are improved as the result of our stakeholder outreach, including a meeting held in our service area on June 20, 2018 with more than 70 participants including elected officials and representatives from a county planning department, sustainability coalitions, academic institutions, clean energy companies, solar organizations, NYPA, advocacy groups, engineering firms, innovation companies, and vendors.*

SMART: We are compiling and managing a common set of granular data that support each of the Smart Integrator functions. We have historically been able to plan and operate the grid by geographic area. Now, we must plan and operate the grid and share information that is differentiated by geographic location and by time. Our ongoing investments in AMI, DER database, grid automation, and Measurement, Monitoring and Control (MM&C) will provide us with the granular data we need.

CLEAN: We are actively engaged in delivering value to our customers and enabling New York State's policy objectives. We serve a proactive role in the proliferation of energy efficiency, clean distributed generation, energy storage, and electric vehicles where and when they provide the most value.



II. INTRODUCTION

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This is NYSEG's and RG&E's second five-year (2019-2023) DSIP which builds upon the progress we have made since our initial 2016 DSIP filing to serve as the DSP provider and Smart Integrator. The Companies filed our first DSIP in June 2016, followed four months later by the Joint Utilities' Supplemental Distributed System Implementation Plan ("Supplemental DSIP") filing.

This document consists of two primary components. The body of the report provides an overview of our efforts to continue to build the DSP and addresses the same topics as presented in reports being filed by the other New York utilities. The second part, Appendix A, presents our detailed responses to the 14 specific topics identified in the Staff 2018 Guidance.

In addition to topical consistency, we have collaborated with the Joint Utilities to prepare a shared long-term vision and approach to how customers, DER developers, and other stakeholders will engage with DSPs throughout New York. This is presented in Chapter III.

We present our initiatives over the 2018-2023 period to continue building the DSP in Chapters IV-VIII. We describe the capabilities we are building to execute DSP functions, including efforts to incorporate DER into grid planning and operations, and enable market transactions. We include a brief discussion of our market-related activities, including our marketplace in the ESC, and will work with the Joint Utilities to prepare a DSP Market Design and Integration Report in accordance with the Staff 2018 Guidance. Our technology platform is being designed and built to support the collection of DSP functions, including Market Services.

Appendices B, C, and D provide links to NYSEG and RG&E data portals, our Benefit Cost Analysis Handbook, and our most recent Marginal Cost of Service Study. Appendix E presents a diagram of technologies that enable the DSP. In addition to the list of acronyms and defined terms at the beginning of this document, we have included a glossary of industry terms used in this Report as Appendix F.

III.

JOINT UTILITIES OF NEW YORK LONG-TERM VISION FOR THE DSP

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Over the next decade, New York's electricity system will become significantly cleaner, more efficient, more flexible, more reliable, and more resilient, contributing significantly to the decarbonization of the State's economy.[11]

A. INTRODUCTION

DER, defined by the Commission to include end-use energy efficiency, demand response, distributed storage, and distributed generation, will play a central role in this transformation. To facilitate adoption and grid integration of these resources, 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, we have made substantial progress in laying a foundation for the DSP. Building upon this early progress requires having 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 its vision of a sustainable, low-carbon future. Quantitative targets for this vision were established in the State Energy Plan[12] and reinforced and supplemented by the Governor's 2018 State of the State address[13]. These targets include efforts to significantly expand renewable energy, energy storage, and energy efficiency (Figure III-1). Additionally, the state has established goals for zero emission vehicles (ZEV)[14] and is actively promoting electric vehicle (EV) adoption and a build-out of EV charging infrastructure.[15] More recently, on June 21 2018, NYSERDA published a comprehensive Energy Storage Roadmap that includes recommended actions that will accelerate the deployment of energy storage projects in New York State.

FIGURE III-1: NEW YORK STATE ENERGY POLICY GOALS

CLEAN ENERGY
- 50% of electricity consumption generated with renewable energy resources by 2030

ENERGY EFFICIENCY
- 185 tillion 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
- 843,000 Zero-emission vehicles in New York by 2025

11 *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 Plan (issued February 26, 2016) (REV Track One Order), p. 3.*
12 *New York State Energy Planning Board, 2015, 2015 New York State Energy Plan.*
13 *"Governor Cuomo Unveils 20th Proposal of 2018 State of the State: New York's Clean Energy Jobs and Climate Agenda."*
14 *Multi-State ZEV Task Force, State Zero-Emission Vehicle Programs: Memorandum of Understanding (October 24, 2013).*
15 *New York State Energy Research and Development Authority website, "Electric Vehicle Programs."*

These targets imply a transformation of the state's energy sector, from independent energy end-uses heavily 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, smarter 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 more qualitative REV goals: affordability, clean energy innovation, greenhouse gas emission reductions, choice empowerment, infrastructure improvement, job creation, natural resource protection, energy system resiliency, cleaner transportation, and energy efficiency.[16] 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.[17]

Meeting the 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 energy efficiency. The transition to this future electricity system is being enabled by improvements in energy, information, communications, and grid control technologies.

B. THE DISTRIBUTED SYSTEM PLATFORM VISION

1. Defining DSPs

The REV Track One Order 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 monetizes system and social values, by enabling active customer and third party engagement that is aligned with the wholesale market and bulk power system."* [18]

Taken further, DSPs are the set of people, processes, and systems that allow utilities to provide three core, interrelated services: DER integration, information sharing, and market services (Figure III-2).

FIGURE III-2: THREE CORE DSP SERVICES

16 *REV Proceeding, REV Track One Order, p. 4; New York State, "Reforming the Energy Vision: REV 2030 Goals."*
17 *REV Proceeding, REV Track One Order, pp. 10-14.*
18 *REV Proceeding, Track One Order, p. 31.*

- **DER INTEGRATION SERVICES** refer to planning and operational enhancements that promote streamlined interconnection and efficient integration of DER, while maintaining safety and reliability.

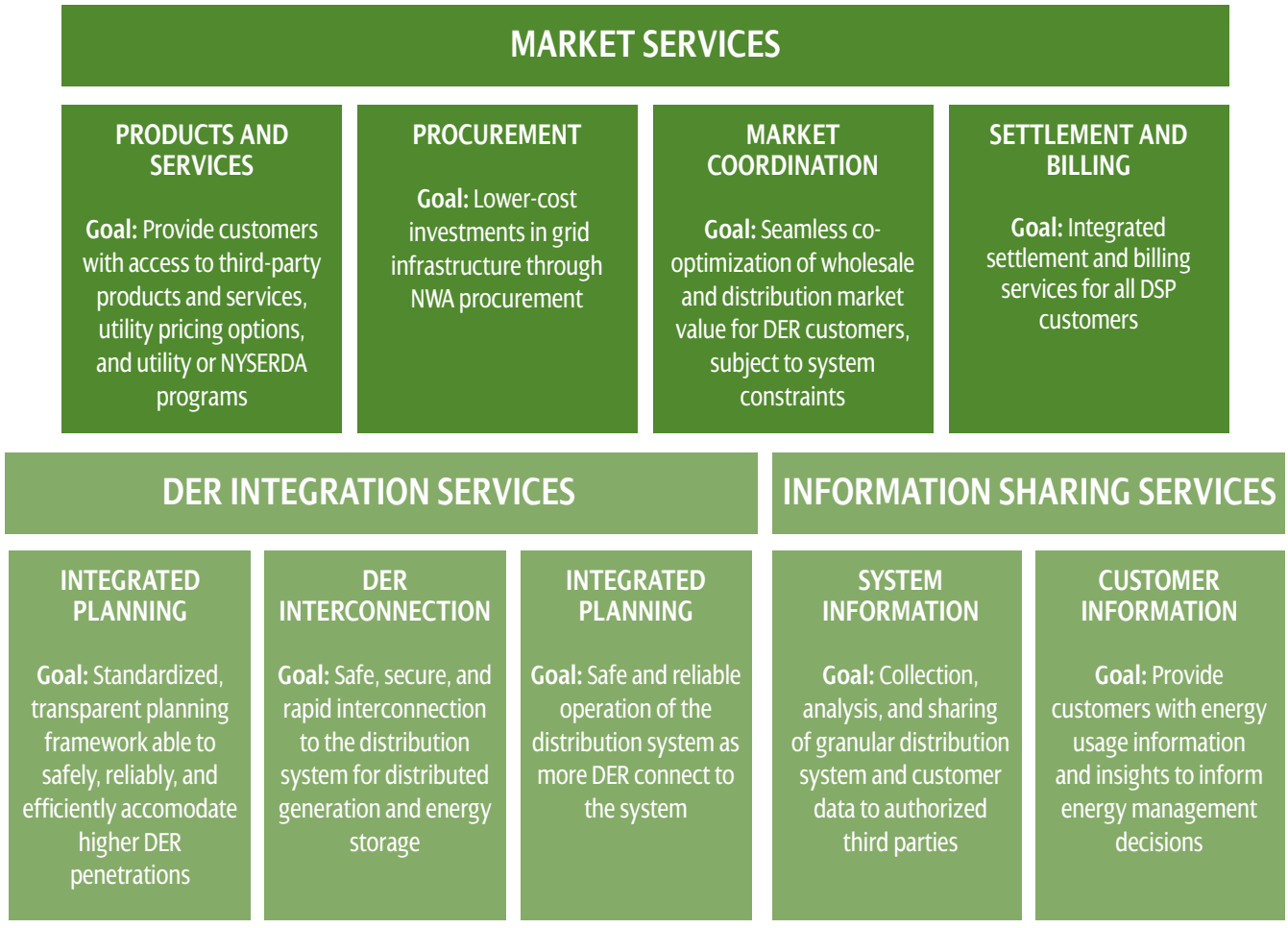
- **INFORMATION SHARING SERVICES** refer to information and communications systems that collect, manage, and share granular customer and system data applying industry standards, enabling customer choice and expanding participation of third-party vendors and aggregators in markets for DER.

- **MARKET SERVICES** refer to the role of the DSP as (a) a provider of information and insights to customers and third parties, (b) a products and services marketplace that connects customers with utility service options and programs, products and services offered by third parties, and (c) enables customers and third parties to share in value that they provide to the distribution grid and wholesale market.

2. DSP Function and Value

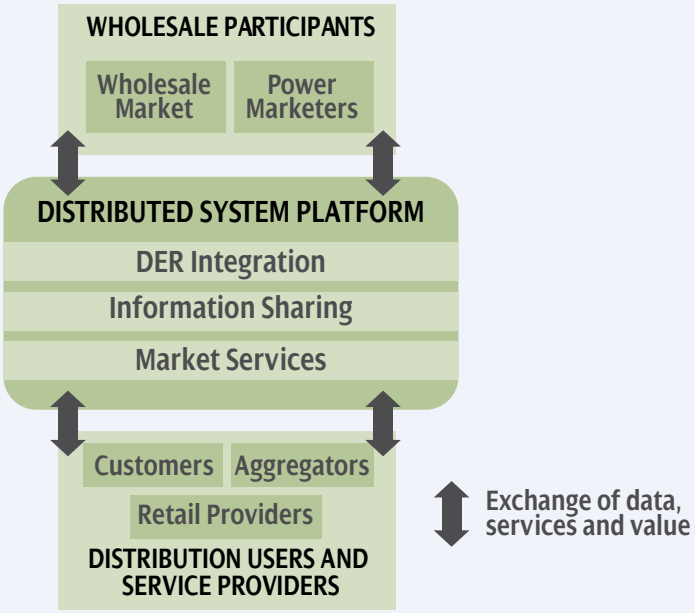
As DSP providers, the Joint utilities are developing the capabilities, processes, and systems that will enable key DSP functions: integrated planning, DER interconnection, and distribution system management (DER integration); information delivery and customer engagement (information sharing); and procurement, market coordination, wholesale tariff, and settlement and billing (market services). Figure III-3 describes long-term goals for each DSP function. These DSP services and functions all support customer engagement and empowerment.

FIGURE III-3: LONG-TERM GOALS FOR DSP FUNCTIONS



As they evolve, DSPs will increasingly bring together suppliers and buyers of electricity services, becoming more populated with information and transactions over time. DSPs will become a platform for third-party aggregators and technology vendors to gather data and offer their products and services (Figure III-4)

FIGURE III-4. ILLUSTRATION OF THE DSP AS AN ENERGY PLATFORM



DSPs will open up 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 (Table III-1).

TABLE III-1: DSP VALUE TO CUSTOMERS AND MARKET PARTICIPANTS IN THE LONGER TERM

CUSTOMERS
• Ability to identify products and services that lower costs, emissions, and improve reliability
• New 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
• Realization of both wholesale and distribution market value
• Procurement for non-wires and other distribution services
• Billing and settlement services for wholesale and distribution markets
• Access to granular customer information with customer consent

The Joint Utilities anticipate that the DSP vision will continue to advance as key drivers and markets evolve.

C. DSP EVOLUTION

DSP functions and capabilities will progress through different phases, as described in the Joint Utilities' 2016 Supplemental DSIP filing.[19] A phased approach aligns the pace of DSP investment with the speed of DER adoption and technological advancement. Additionally, a phased approach provides an opportunity to learn from demonstration projects in New York and from experiences in other states and countries.

As discussed below, 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 chapter focuses on DSP 1.0 and the transition to DSP 2.0, describing three key aspects of DSP evolution: (1) function and capability, (2) customer value, and (3) enabling investments and conditions.

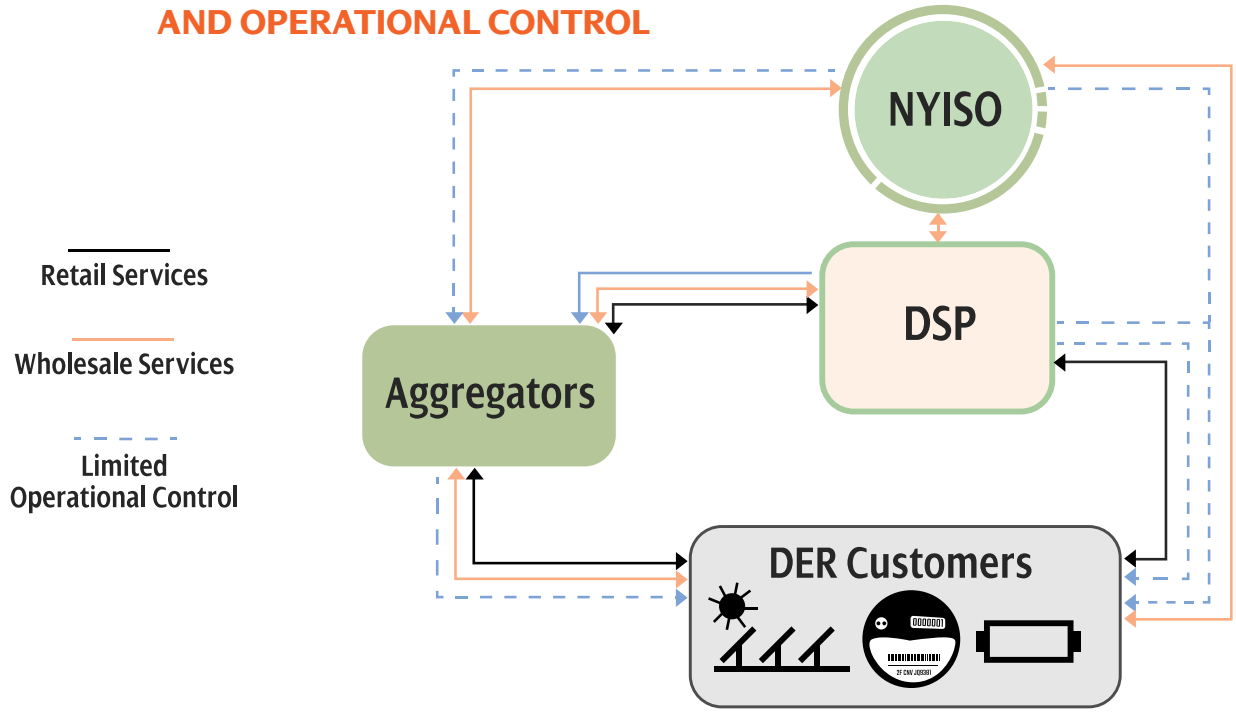
1. DSP 1.0

In DSP 1.0, utilities create foundations for the platform, enabling:

- More streamlined interconnection and enhanced distribution system MM&C capabilities;
- Safe and reliable operation of the grid with increasingly higher levels of DERs;
- More accessible, granular information on customer use and closer engagement with customers and aggregators through Green Button Connect (GBC)[20]; and
- Regular non-wires alternative procurement and incorporation of wholesale value through tariffs.

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 (Figure III-5). DER aggregators and customers can also access wholesale settlement and billing services through the NYISO.

FIGURE III-5: DSP 1.0 WHOLESALE SERVICES, RETAIL SERVICES, AND OPERATIONAL CONTROL



19 *Case 16-M-0411, In the Matter of Distributed System Implementation Plans, Joint Utilities Supplemental Distributed System Implementation Plan (filed November 1, 2016).*

20 *Green Button Connect initiative provides utility customers with easy and secure access to their energy usage information in a consumer-friendly and computer-friendly format. Customers are able to securely download their own detailed energy usage with a simple click of a literal "Green Button" on electric utilities' websites and securely share it with competitive suppliers with authorization.*

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. Operational coordination with the NYISO is based on pre-determined rules for joint participation in NWA procurement and the NYISO markets.

We have made substantial progress in developing the systems, processes, and capabilities that enable DSP 1.0. Continued progress in DSP 1.0 will be facilitated by investments in:

- **DER INTEGRATION CAPABILITIES:** integrated planning; operational communications; measurement, monitoring, and control capabilities; grid automation; and distribution management systems;
- **INFORMATION SHARING CAPABILITIES:** data management and analysis software; customer and aggregator interfaces;
- **MARKET SERVICES CAPABILITIES:** NWA planning and procurement; NYISO coordination: VDER tariff improvements.

Chapter VIII this filing describes these investments and the respective grid functionality provided in greater detail.

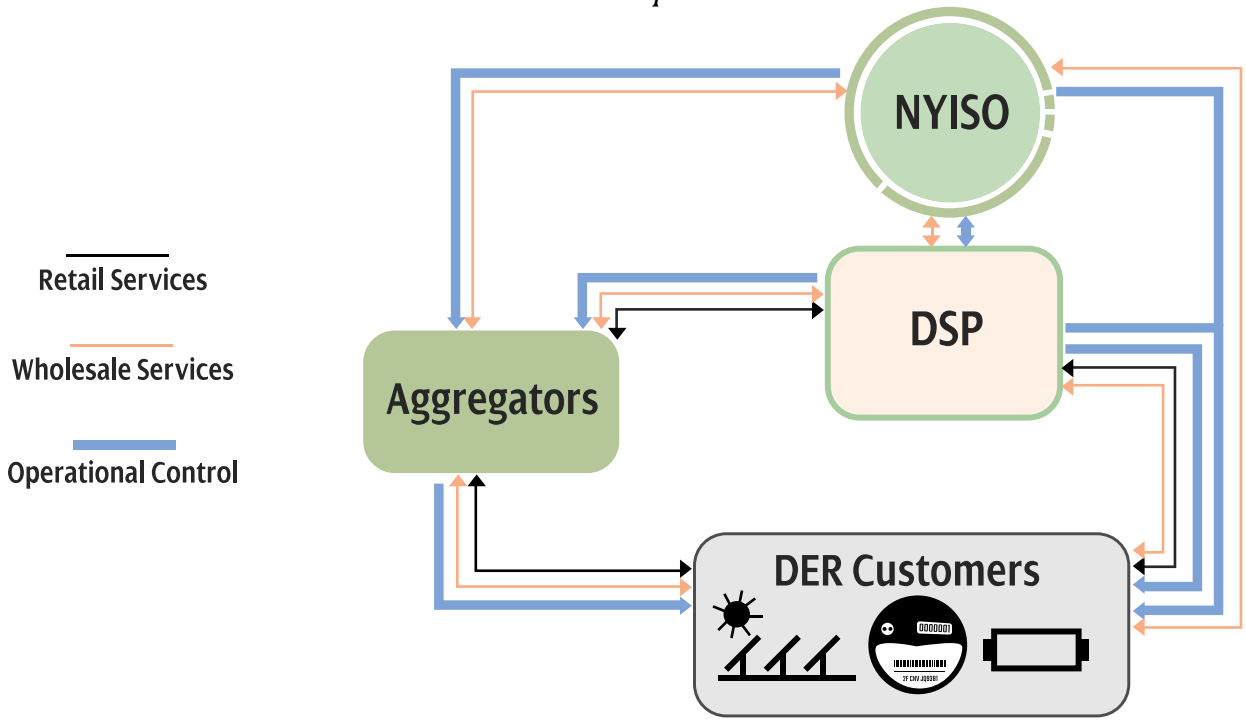
2. DSP 2.0

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

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. Aggregators and customers can still access wholesale markets directly through the NYISO (Figure III-6). The DSP and NYISO have enhanced capabilities to monitor and control DER.

FIGURE III-6: DSP 2.0 WHOLESALE SERVICES, RETAIL SERVICES, AND OPERATIONAL CONTROL

DSP 2.0 adds provision of wholesale services from the DSP to DER customers and enhanced operational control



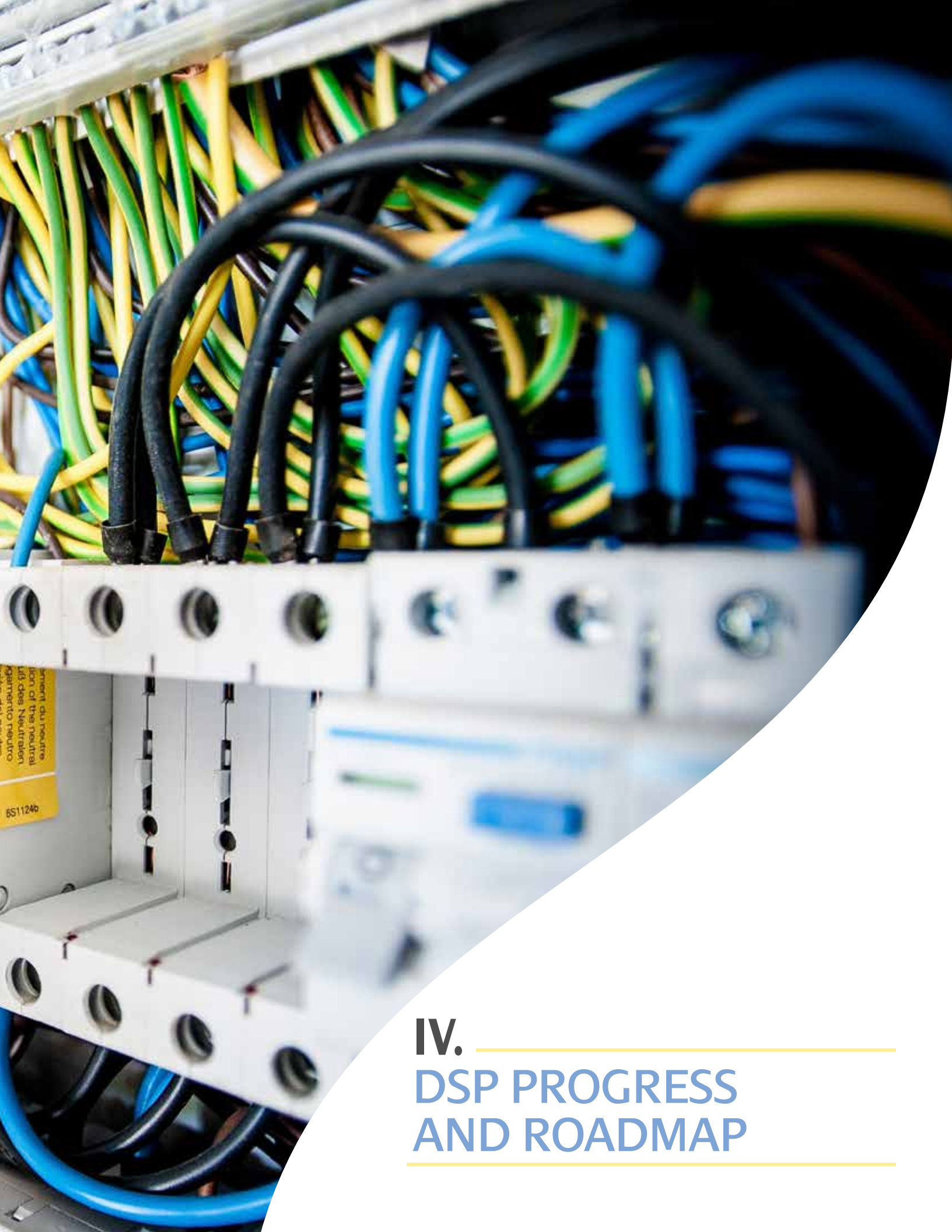
DSP 2.0 provides an additional wholesale services route for DER customers to deliver their services to markets — illustrated by the solid blue line connecting DER Customers and the DSP. These market platforms will be defined in the DSP Market Design and Integration Report.

Several functions and capabilities in DSP 2.0 require innovations in software, systems, and processes. 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.

The transition from DSP 1.0 to 2.0 will evolve and develop over multiple years, with variation among 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 retail transactions are feasible on a larger scale.

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



IV.
DSP PROGRESS AND ROADMAP

IV. DSP PROGRESS AND ROADMAP

This chapter summarizes progress that has been made by the Joint Utilities and by the Companies since 2016 in building DSP functions and capabilities. We will then present our high-level roadmap for the next five years, through 2023.

A. JOINT UTILITIES' PROGRESS

The Joint Utilities have focused DSP implementation efforts in three core aspects of the platform: DER Integration, Information Sharing, and Market Services. This progress will benefit customers and market participants by providing granular information that helps them make informed market choices.

The result of this current DSP 1.0 version of the DSP will be more DER both on our system and across New York, providing better resiliency and efficiency, more resource diversity, lower emissions of greenhouse gases, and the animation of more market services. DER will have better access to market value through multiple market mechanisms, and in turn, the system will benefit from an enhanced ability of DER to provide grid support.

1. DER Integration

DER Integration encompasses three functions:

1. **INTEGRATED PLANNING:** studying what type and where DER should be located to provide the greatest value to customers and the grid and how DER can be combined with investments in distribution infrastructure to build a more efficient and resilient grid;
2. **INTERCONNECTION:** safely and expediently connecting DER equipment to the grid; and
3. **GRID OPERATIONS:** monitoring the real-time impact of connected DER on power flows and managing the grid to maintain reliability and power quality.

As shown in the following table, the Joint Utilities have made progress in defining each of these functions.

TABLE IV-1: DER INTEGRATION - ACTIONS AND RESULTS

ACTIONS	RESULTS
Incorporated DER into forecasting in a more robust and granular fashion	DER forecasting as a standard part of the planning process; NWA opportunities, locational pricing zones
Provided access to circuit-level hosting capacity data	Developers able to target less costly locations for DER interconnection

ACTIONS	RESULTS
Created online application portal	Streamlined DER interconnection process
Identified potential low-cost M&C solutions while implementing interconnection advancements	Reduced barriers to entry for DER and greater cost predict-ability for interconnecting developers
Began deployment or demon-stration of foundational investments: (Chapter VIII)	Foundational communications and operations infrastructure facilitates DER integration and market participation
Established common interim monitoring and control standards for DER	Maintains system reliability/ safety under current DER pen-etration and will enable more advanced market functions
	Support for expansion of the EV market and charging infrastructure
Procured and formed energy storage safety agreements with local authorities	Greater opportunities for energy storage deployment

The Joint Utilities worked with our stakeholders to develop a common set of NWA Suitability Criteria[21], and tailored them to meet specific circumstances of each utility. The Joint Utilities submitted a filing in May 2017 describing how utility planning procedures would apply the proposed NWA Suitability Criteria and identifying projects in each utility's 2017 five-year capital plan that meet these criteria.[22]

The Joint Utilities' Interconnection Technical Working Group (ITWG) has approved updated monitoring and control requirements to ensure system reliability as DER penetration increases. The Joint Utilities have also achieved a par-tially automated interconnection application process through completion of Phase 1 of the Interconnection Online Application Portal (IOAP), an online submission portal to streamline the process.[23]

21 *In the January 21, 2016 BCA Framework Order, the Commission directed the utilities to use a broader and more flexible set of screening criteria than they had proposed in their comments. In its April 26, 2016 Order Adopting Distributed System Implementation Plan Guidance, the Commission indicated that the utilities "should propose such an improved screening process in their Initial DSIP filings, addressing the concerns expressed by the Commission in its BCA Framework Order" [p. 40]. NWA criteria are currently being referred to as "suitability criteria".*

22 *Joint Utilities filing.*

23 *See Appendix B for links to NYSEG and RG&E portal.*

The Joint Utilities have collaborated with the NYISO to propose operational DSP-NYISO coordination protocols, including approaches for dual participation by DER to support local distribution service and provide value to NYISO's wholesale markets.

2. Information Sharing

Information sharing refers to the DSP (a) sharing usage information and related insights with customers to help them decide on suitable rate options, products, and services; and (b) sharing grid information with developers to help them market their services to our customers. In this manner, the DSP provides information to customers that helps them assess options to manage their energy usage and information to DER developers and other third-party suppliers that help develop new services and target their marketing efforts.

In the past two years, the Joint Utilities, guided by stakeholder engagement including focused outreach to understand developer use cases, have developed and implemented a comprehensive set of information sharing enhancements.[24]

The following table lists some of the progress that has been made in Information Sharing since 2016.

TABLE IV-2: INFORMATION SHARING - ACTIONS AND RESULTS

ACTIONS	RESULTS
Began implementation of Green Button Connect (or similar)	More granular data available for customer or authorized third party
Created central location on Joint Utilities website for utility links to individual NWA RFP opportunities	More transparency and efficiency for developers in NWA solicitations and other market opportunities
Developed individual utility system data portals	Increased access and usability of stakeholder-requested information
Provided various forecast data, including 8760 forecasts	Greater transparency for developers to inform business development; greater insight into system needs
Implemented the Commission's whole building aggregated data policy	Identify issues with privacy standards and opportunities for potential automation when volume dictates

24 *In the context of this DSIP, a developer use case serves to communicate what developers want to gain from a new business process or technology or how they anticipate "using" the business process or technology to deliver products and services to customers. In this way, specification of one or more use cases will help us prepare to support DER developers. Testing of use cases before widespread deployment will help validate whether the use case provides the anticipated value and is worth any investment that may be required by the DSP.*

ACTIONS	RESULTS
Produced statewide anonymity standard	Consistent approach to protecting customer privacy
Agreed to protocol for value-added data services	Begin market for information services and development of platform service revenues

3. Market Services

Market Services pertains to the role of the DSP in providing a platform for customers, DER developers and other third-party product and service providers to transact with the DSP and with each other. The DSP also offers programs that support customer engagement with energy efficiency, demand response and other DER. Market Services also includes the procurement of NWAs to address a grid need or compensation to DER by tariff for locating in a beneficial location. Compensation for locational and other value provided by DER will be provided by the Value of DER (VDER) tariff through a two-phase implementation.[25]

The Joint Utilities have also worked together to develop a common EV Readiness Framework to promote the proliferation of charging stations and address other barriers to widespread adoption of EVs.

TABLE IV-3: MARKET SERVICES - ACTIONS AND RESULTS

ACTIONS	RESULTS
Identified, developed, and implemented NWA, including common datasets and bidder pre-qualification	More opportunities; greater transparency, consistency and efficiency for the entire NWA solicitation process
Implemented advanced utility programs: Energy Efficiency, Demand Response	Programs allow for greater DER participation and customer choice
Applied Phase One VDER Value	Clearer market signal to developers of where DER can capture enhanced locational value

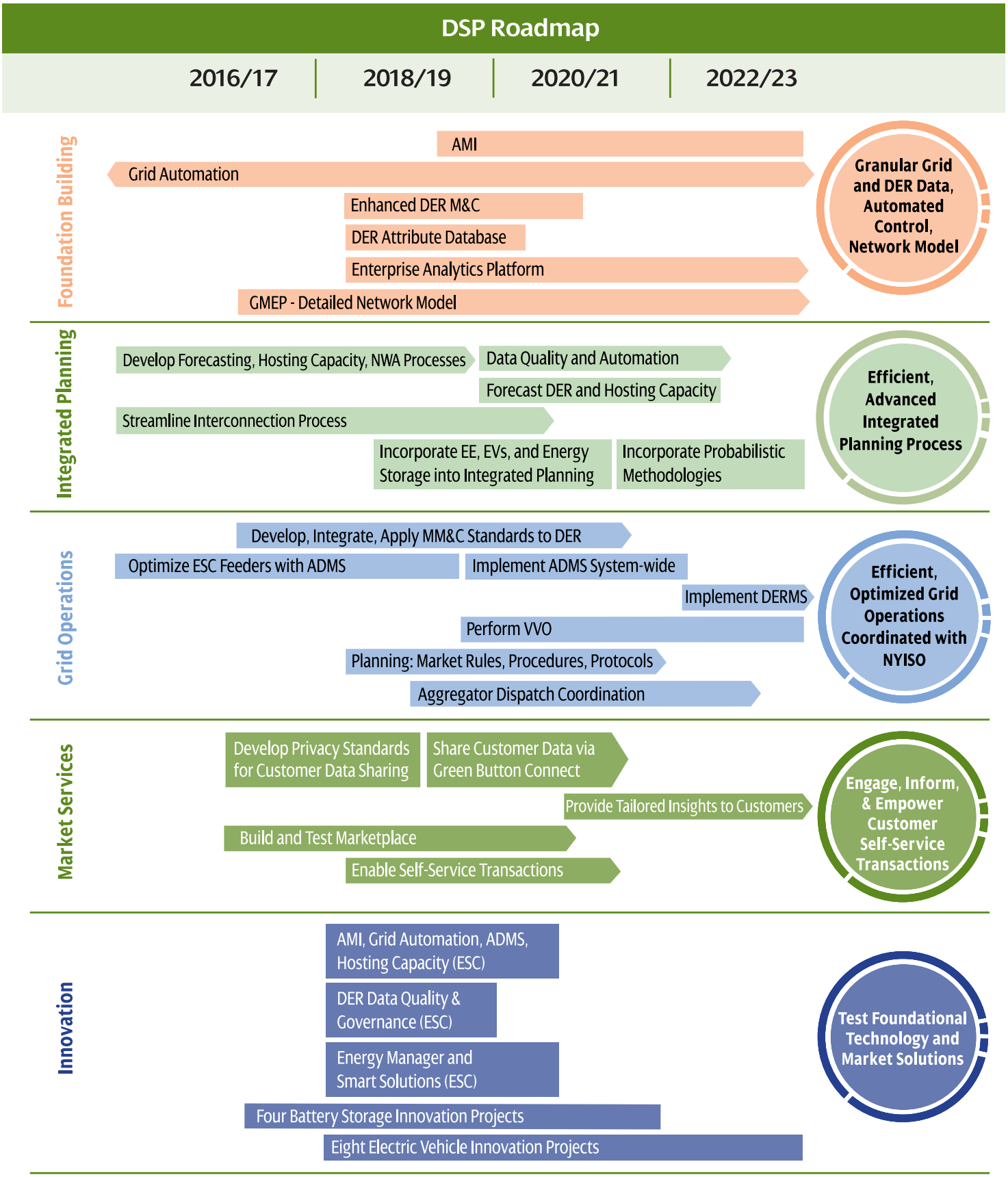
25 *Order on Net Energy Metering Transition, Phase One of Value of Distributed Energy Resources, and Related Matters, March 9, 2017 in Case 15-E-0751.*

ACTIONS	RESULTS
Aligned dispatch and communication protocols, and formalized roles and functions among the DSP provider, NYISO, DER aggregators, and DER owners	Allow DER to access more value through wholesale markets, while maintaining distribution and bulk power system safety and reliability
Enabled dual participation by DER in wholesale and retail markets	Opportunity for DER to realize increased value
Developed improved marginal cost studies	Increased transparency into and ability to estimate high-cost/value areas of the distribution system

B. NYSEG AND RG&E PROGRESS AND ROADMAP

As described in these three tables, NYSEG and RG&E have made substantial progress building these three functions, leveraging the collaborative work done by the Joint Utilities. Additional progress is described in each of the remaining chapters of the Report and in Appendix A where we present our detailed responses to the 14 specific topics identified in the Staff 2018 Guidance. In the guidance, the Staff requests a report on progress that has been made since 2016 and the current status of our capabilities in each of these areas. These are summarized in Figure IV-4 below, and discussed in further detail in Appendix A.

FIGURE IV-4: NYSEG-RG&E DSIP ROADMAP



V.
REV INNOVATION PORTFOLIO

V. REV INNOVATION PORTFOLIO

AVANGRID's Innovation Policy states that innovation is a core corporate value that is critical to a sustainable energy future and to provide reliable, valuable, and affordable services to our customers.[26] As expressed in this policy, AVANGRID seeks to be a leader in innovation within the energy sector, using innovation to improve reliability, reduce environmental impacts, and increase efficiency. This policy is directly applicable to our efforts to serve as the DSP and Smart Integrator and to the development of our REV Innovation Portfolio.

A. INTRODUCTION

Lessons learned are shared among AVANGRID's distribution utilities in New York, Connecticut, Maine, and Massachusetts. NYSEG's and RG&E's innovation efforts focus on serving as the DSP provider and fulfilling the needs of our customers, DER providers, and other stakeholders. There is also a sharing of information and learning from innovation projects that are either under development or in progress among the Joint Utilities and between the Joint Utilities as a group and New York stakeholders.

B. REV INNOVATION PORTFOLIO PROCESS

Our innovation portfolio objectives align with the AVANGRID vision:

- Support REV objectives;
- Test foundational elements of the DSP;
- Enhance our ability to deliver reliable service;
- Contribute to the wellbeing of communities;
- Provide clean energy through innovation, technology, and sustainable sources;
- Reduce AVANGRID's carbon footprint; and
- Efficiently connect customers with energy solutions in support of AVANGRID's role as the Smart Integrator.

The Companies have developed a portfolio of innovation projects based upon "priority action lines" which represent the highest priority DSP development focus areas.[27] Our innovation cycle process, shown in Figure V-1, identifies our current innovation priorities. Innovation projects test integrated technologies, new processes, business models, and customer engagement concepts at a manageable scale before applying them across our service areas where the value is realized by all of our customers, the communities we serve, DER providers, and other stakeholders.

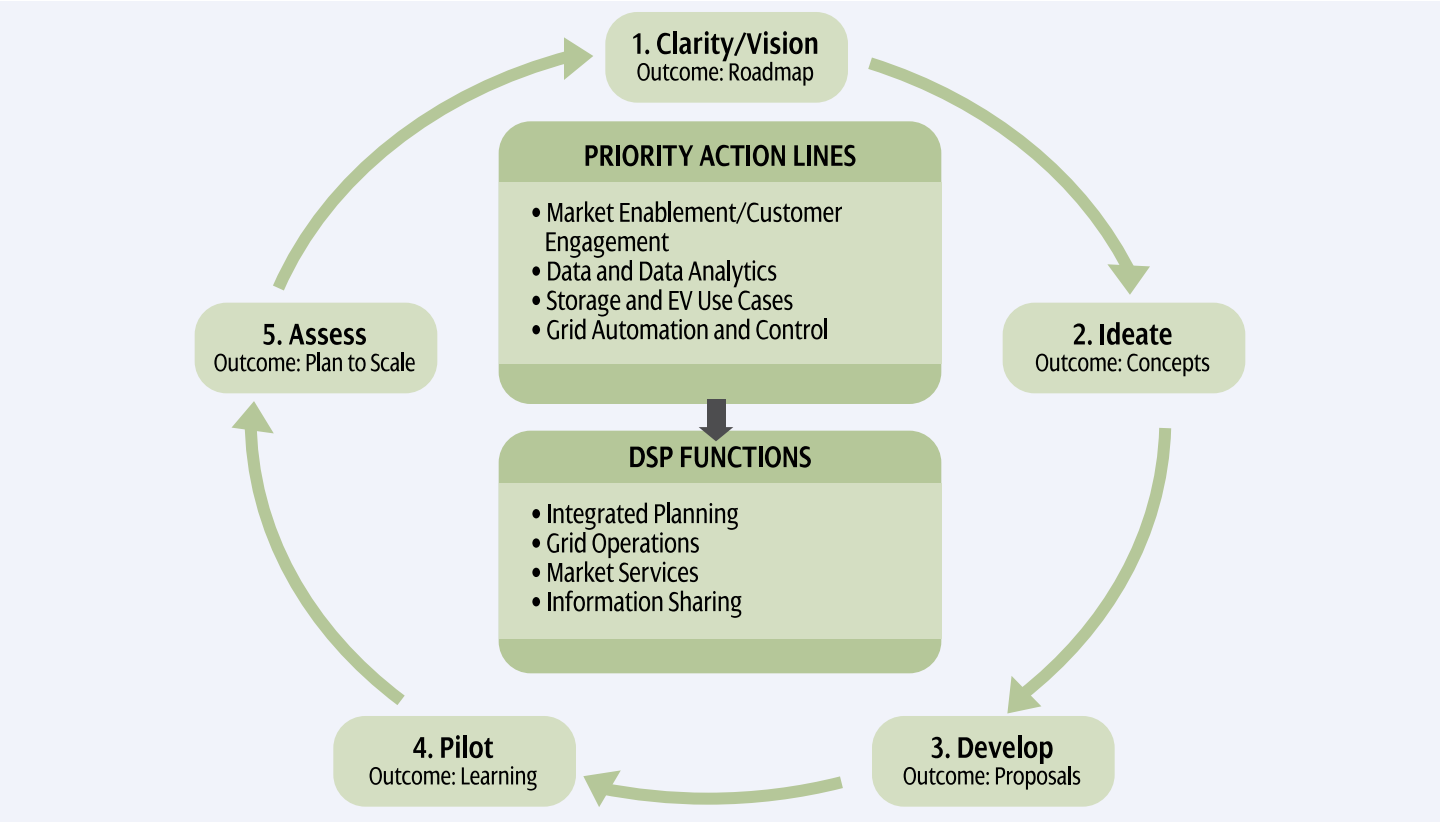
Our innovation cycle process provides opportunities for internal and external stakeholders to contribute throughout the innovation project development process. Engagement provides transparency and helps to establish and maintain realistic expectations for innovation project outcomes and potential for success. Our innovation process assures that we approach learning opportunities holistically, and that solutions are viable, likely to meet evolving needs, and are aligned with our long-term DSP vision. The Companies will continue to leverage REV Connect and other forums to identify innovation opportunities.[28]

26 *AVANGRID's Innovation Policy was approved by its Board of Directors on October 19, 2017.*

27 *Our innovation portfolio includes REV Demonstration Projects that are formally reviewed and approved by the Commission, projects that we are pursuing as part of our Energy Smart Community, and individual pilot projects that are identified as part of our innovation cycle process.*

28 *REV Connect is an initiative launched by NYSERDA that encourages partnerships between New York's utilities and companies to accelerate innovation and the development of new business models.*

FIGURE V-1: INNOVATION CYCLE PROCESS



Lessons learned in each of our four priority action line areas will contribute to our ability to perform as the DSP provider by providing lessons learned that will inform the design of our technology platform and one or more of our three core DSP functions or pillars: Integrated Planning, Grid Operations, and Market Services.

C. ENERGY SMART COMMUNITY

A unique and differentiating aspect of our REV innovation project portfolio is the Energy Smart Community. As discussed in our 2016 DSIP filing, the ESC serves as an innovation ecosystem platform to test multiple concepts simultaneously and in an integrated way, particularly the application of new grid technologies such as AMI, and how more granular energy usage and system data can create value for customers, the network, and third parties. The ESC's integrated project approach has accelerated our learning process, particularly when we are testing technologies and business models that cut across Integrated Planning, Grid Operations, and Market Services functions.

Since 2016, we have been developing and implementing the Energy Smart Community project located within Tompkins County, which includes Ithaca, New York. The ESC area represents a diverse base of customers that is broadly representative of NYSEG's larger service area. The ESC serves approximately 12,300 NYSEG electric customers that are served by a distribution network comprised of 15 circuits and 4 substations.

The ESC objectives support testing REV concepts and/or advancing the Company's ability to serve as the DSP provider:

1. Test and prove the functionality of foundational platform technologies all working together;
2. Develop new capabilities and processes that support the evolution of the DSP;
3. Create and test new rate designs that support system efficiency;
4. Identify new methods for creating value for customers;
5. Identify new methods for engaging with the market;
6. Create an environment of collaboration; and
7. Support and inform clean energy policy.

1. Community and Stakeholder Engagement

Engagement with the local community and our participating customers is a key success factor for the ESC project. The community includes participants and local stakeholders including representatives from Tompkins County government and Cornell University. The County has established comprehensive energy and sustainability plans that are aligned with statewide energy policy principles. Cornell University, a major research institution, has a strong commitment to energy and sustainability goals, and is a leader in research in this area. Leaders from these institutions and local organizations have engaged with us in the Energy Smart Community.

2. ESC Innovation Projects

Table V-1 presents a list of current ESC innovation projects. These projects contribute to each of our core DSP functions to varying degrees. Table V-1 categorizes them by the function that they are contributing to most directly.

TABLE V-1: ESC INNOVATION PROJECTS

INNOVATION PROJECT	DELIVERABLES
Foundation Technology & Grid Operations	
AMI	• **Install 12,300 electric & 7,600 gas smart meters with telecommunications capabilities on 15 circuits** • **Integrate AMI with:** · Energy Manager Platform · SAP Billing System · Outage Management System (OMS) · Volt/VAR Optimization (VVO) · Conservation Voltage Reduction (CVR)
SYSTEM AUTOMATION	• **Fully automate 4 substations and 15 circuits** • **Provide real-time monitoring and control to improve reliability and capture circuit load and voltage data**
ADVANCED DISTRIBUTION MANAGEMENT SYSTEM (ADMS)	• **Develop the capability to:** · Perform real-time power flow modeling, including optimal power flow analysis · DER Monitoring and Dispatch · Distribution Automation (FLISR) · Improve system efficiency (VVO & CVR)
DISTRIBUTION CIRCUIT BATTERY STORAGE	• **Test the ability to reduce circuit daily and monthly peak demand, while maintaining circuit loading. Also test voltage regulation capabilities, the potential to increase hosting capacity along the circuit, and the ability to participate in NYISO**

INNOVATION PROJECT	DELIVERABLES
Integrated Planning	
DER AND LOAD FORECASTING	• Implement Integral Analytics LoadSEER software to develop 5-year DER and load forecasts for the 15 circuits and 4 substations • Enhance quality of system data to support integrated planning with DERs • Perform customer adoption forecasting for DER based on Clean Power Research' WattPlan[29] and EV.
DER HOSTING CAPACITY	• Indicate beneficial locations to market participants and support distribution planning using Geospatial maps • Implement additional CYME modules to enable hosting capacity calculations
DER DEVELOPER PORTAL	• Enhance our online portal which provides 3rd parties the geospatial heat maps and DER and Load Forecasting data • Provide 3rd parties easy access to value-added data to support increased DER penetration and policy goals
Market Services	
ENERGY MANAGER	• Demonstrate the value of AMI data for our customers • Increase awareness and engagement
NYSEG SMART SOLUTIONS	• Drive value of AMI data and increase DER adoption • Enhance the development of trust with our customers
CUSTOMER SEGMENTATION & ANALYTICS	• Continue market research to measure progress from a customers' perspective and test our platform strategy • Measure how customers are engaged in order to strengthen & enhance the relationship • Better understand customer's attitudes regarding NYSEG and energy • Measure and enhance value to customers
SMART PARTNER PROGRAM	• Partner with community organizations to test engagement strategies for our low and moderate income (LMI) customers
SMART USAGE PLAN	• Introduce time of use price signals to support system efficiency • Provide bundled rates and demand response programs to increase opt-in and optimization of rate
SMART HOME RATE	• Test deadline differentiated pricing to provide discounted T&D rates for EVSE charging, with pricing based on system network benefits from a customer's flexible schedule
AGGREGATED BEHIND THE METER BATTERY STORAGE	• Test aggregated behind-the-meter battery storage to provide value to customers (demand charge management) and provide network benefits (participate in DR, improved system efficiency)

29 *The Companies are in the early stages of collaboration with Clean Power Research, having recently resolved contractual matters.*

We publish a quarterly report that discusses developments related to the ESC.[30]

Three of our ESC projects are already being implemented in other service areas. DER hosting capacity is estimated for our entire NYSEG and RG&E service areas and available to developers on our DER Developer Portal. We are also implementing Distribution Automation in a phased approach to other NYSEG and RG&E service areas, having accelerated the first phase in order to accommodate the ESC project.

3. Progress Report

Progress within the Energy Smart Community project has centered around deploying the required foundational grid optimization technologies, deploying integrated planning tools, offering our customers products and services that enable greater control over their energy use and overall energy bills, and providing market participants with information to make informed investment decisions. We have engaged our community stakeholders and customers throughout the ESC project.

a. Foundational Technology and Grid Operations

As presented in Table V-1, we are testing two foundational technologies (AMI and Distribution Automation) as well as ADMS. These technologies provide granular customer usage and system operating data that provide data and capabilities we need to plan and operate the grid while integrating large numbers of DER. We are gaining valuable experience monitoring and controlling DER on a real-time basis that will allow us to build a more resilient, efficient and reliable grid.

We have installed 98% of the AMI meters in the ESC with the remainder expected to be installed by early 2019. We have also completed installation of 97% of the line and substation automation assets with the remainder to be completed by December 2018. Factory Acceptance Testing of the initial Siemens Spectrum ADMS System functions began in July 2018 and Site Acceptance Testing will begin within a few months. Our distribution circuit battery storage project tests the ability to employ battery storage on our circuits to increase hosting capacity. This project is under development.

b. Integrated Planning

Our three Integrated Planning projects in Table V-1 are designed to help us better understand and manage the integration of clean energy resources and predict and manage future system impacts. These include enhancements to our DER and load forecasting and estimation of hosting capacity within the ESC and throughout our service territories. We have also been improving our DER web portal that provides hosting capacity and other system data that developers can use to make more informed investment and marketing decisions, promoting deployment of DER that contributes to the State's policy goals. As described in Chapter VI, progress has been made on the integrated planning tools with further advances to be made as more granular customer, DER, and system data becomes available. The DER developer portal has been enhanced and further development is being planned as part of the Joint Utility efforts.

c. Market Services

The Companies view our ability to engage customers and local communities as a key success factor in serving as the DSP provider and we have several ESC projects that contribute to this outcome. Customer segmentation and analytics are being used to measure the awareness and engagement in our ESC programs and effectiveness of our ESC communications campaign. Our Energy Manager portal provides options and insights for customers to manage their energy use and derive value from the AMI data that we are collecting within the ESC. Our NYSEG Smart Solutions online marketplace connects customers with suppliers that offer products and services that help them realize their energy goals.

30 *Most recent ESC quarterly report available at: http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={A60CF87F-08B2-48D3-A01C-96AAB2A335BD}*

The ESC Smart Usage Plan, which is a time varying rate, tests customers' willingness and ability to shift energy use to non-peak periods in response to a price signal. The Smart Home Rate, offered to ESC customers with smart meters, tests the interest of EV home charging customers in charging during off-peak hours at a lower rate. Finally, our aggregated behind-the-meter storage project tests the ability of storage aggregation to provide benefits to the participating customers and the grid.

We have made significant progress since our Initial DSIP filing:

- NYSEG Smart Solutions was launched in October 2017;
- enhancements to our customer segmentation model were completed in November, 2017;
- Energy Manager was launched recently with additional functionality to be made available in the next few months; and
- the Smart Usage Plan was recently opened for enrollment.

D. OTHER REV INNOVATION PROJECTS

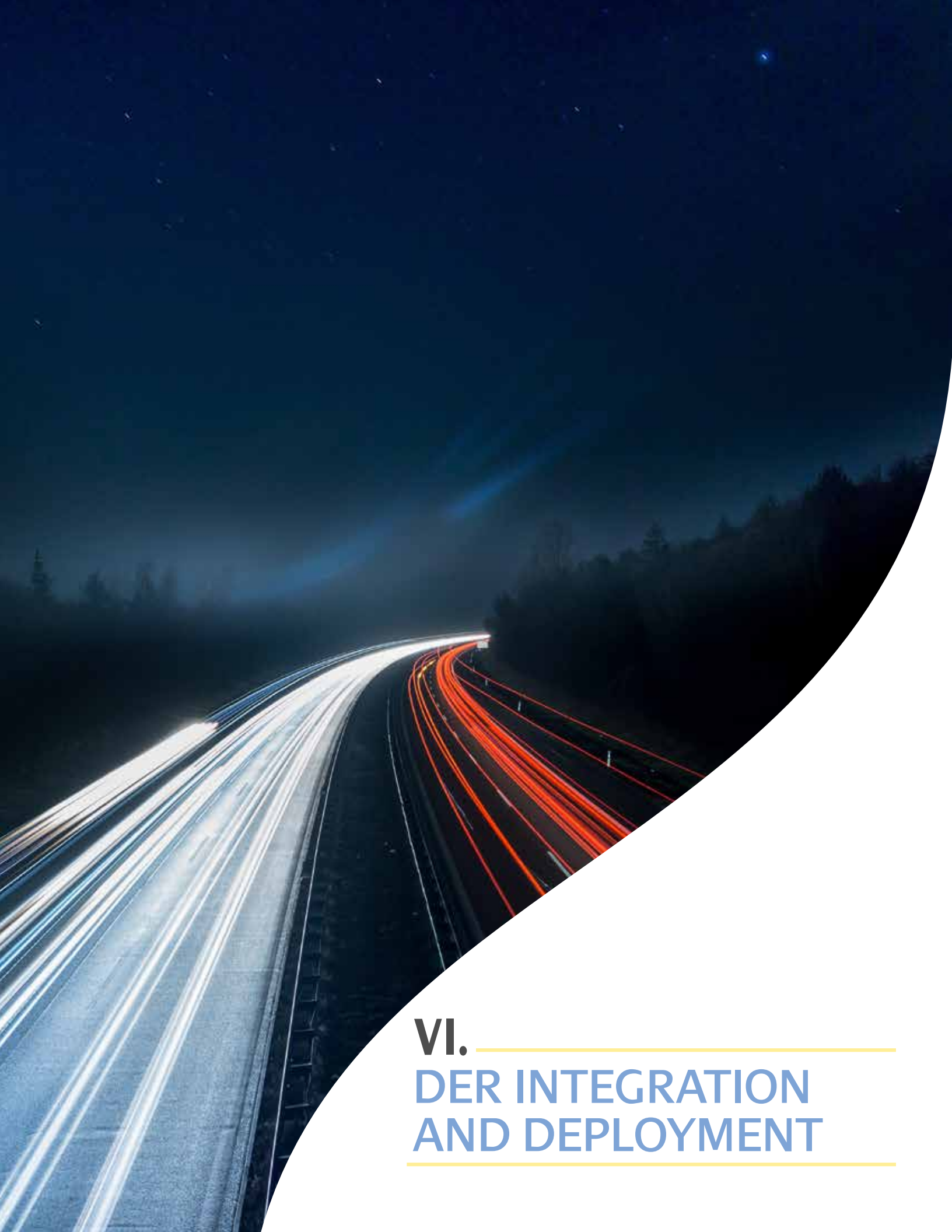
NYSEG and RG&E have continued to add to the portfolio of innovation projects, both within and beyond the ESC. A recent focus is energy storage, including integration with EVs.

TABLE V-2: OTHER REV INNOVATION PROJECTS

INNOVATION PROJECT	DELIVERABLES
FLEXIBLE INTERCONNECT CAPACITY SOLUTIONS (FICS)	• Develop Active Network Management (ANM) techniques to minimize interconnection costs by enabling utility management that reduces the need for system upgrades that would otherwise be paid by system developers.
RG&E MARKETPLACE	• An online products and services marketplace test in the RG&E service area
INTEGRATED EV WITH BATTERY STORAGE	• Integrate stationary battery storage with EV chargers to reduce circuit and customer peak demand, and increase the building load factor
PEAK SHAVING SUBSTATION STORAGE	• Effectively integrate, operate and optimize the value of a grid-side battery storage system, reducing a substation's peak demand
ENHANCED DER M&C	• Develop economic solution for enhanced DER M&C
SMART METER-SMART INVERTER INTERFACE	• Perform a proof-of-concept interface for integrating smart inverters into an envisioned ancillary services market where these resources are used to optimize voltage and VARs
CLOSED-LOOP VOLTAGE OPTIMIZATION UTILIZING AMI	• Integrate AMI smart meters as end-of-line voltage sensors for closed-loop VVO control. This enhancement will increase the effectiveness of the VVO by utilizing actual grid measurements.

Many other innovation projects will be referenced throughout the balance of the DSIP to describe how they are impacting the development of our DSP. For example, more detail is provided on each of our four energy storage projects in Chapter VI.

Since the initial DSIP filing in 2016, the Companies have made considerable progress in integrating emerging technologies, testing new business models, and enabling market opportunities that meet the energy-related needs of our customers. Our portfolio of innovation projects has provided value and lessons learned in building our DSP capabilities and the results are being integrated into our core DSP functions. Current and future innovation projects will enable the Companies to further expand our DSP knowledge, experiences, and capabilities. We will apply our innovation process to identify and test potential new solutions that will be required to meet the evolving energy market and the needs of our customers.



VI.
DER INTEGRATION AND DEPLOYMENT

VI. DER INTEGRATION AND DEPLOYMENT

As introduced in our 2016 DSIP, we are implementing a Smart Integrator future utility model that directly aligns with our corporate strategies and our commitments to carbon reduction through clean energy, energy efficiency, and technology innovation. Integration and deployment of DER is the core of our Smart Integrator future utility model that places customers at the center and relies on operational improvements that drive efficiency and delivery of new products and services. It leverages big data and grid analytics, automation capabilities, and digitalization of customer experience, including e-solutions. The Smart Integrator role supports the State of New York's targets for carbon reduction and deployment of energy efficiency, energy storage, and electric vehicles.

A. INTRODUCTION

Integration and deployment of DER is the core of the Smart Integrator role. Indeed, the State of New York has established targets for carbon reduction, and the integration and deployment of energy efficiency, energy storage, and electric vehicles that are consistent with our corporate vision and require that we succeed as the Smart Integrator.

Successful integration and deployment of DER requires that we perform five functions well:

1. **INTEGRATED PLANNING:** studying what type and where DER should be located to provide the greatest value to customers and the grid and how DER can be combined with investments in distribution infrastructure to build a more efficient and resilient grid;

1. **INTERCONNECTION:** safely connecting DER equipment to the grid; and

1. **GRID OPERATIONS:** monitoring the real-time impact of connected DER on power flows and taking action if necessary to maintain power quality.

We are building capabilities in each of these areas, with investments in technologies and systems that help us collect, manage, assess and act upon information that helps us answer a range of planning and operational questions that allow us to build an efficient grid to accommodate a proliferation of DER in the future.

> *Our goal is to continuously improve in each of these three areas in order to optimize the contribution that DER can make to our customers, the grid, and the environment.*

The various types of DER *(e.g., roof-top solar DG, dispatchable DG, energy storage, demand response, and energy efficiency)* all have varying operating characteristics and different implications for planning and operations. Large numbers of connected DER require significant changes to the way the Companies plan and operate the grid The cumulative impact of connected DERs will have implications for the planning and operation of distribution circuits, distribution substations, and medium and high voltage transmission.

> *Successful DER integration and deployment requires current data regarding the size, location and operating characteristics of DER, including whether we will be able to control and dispatch DER to help manage the grid.*

Integration of DER is certainly a new challenge, but we are building capabilities to leverage AMI and other grid technology that provide the granular data we need to integrate large numbers of DER while maintaining reliability, power quality, resiliency, and safety. A related challenge is keeping pace with the evolution of energy technologies. Significant amounts of rooftop solar is a relatively recent development, with innovation in energy storage and electric vehicle supply equipment rapidly evolving. Integration of DER involves each of the DSP functions described in this chapter *(Integrated Planning, Interconnection, and Grid Operations) and in the next chapter (Market Services and Information Sharing).*

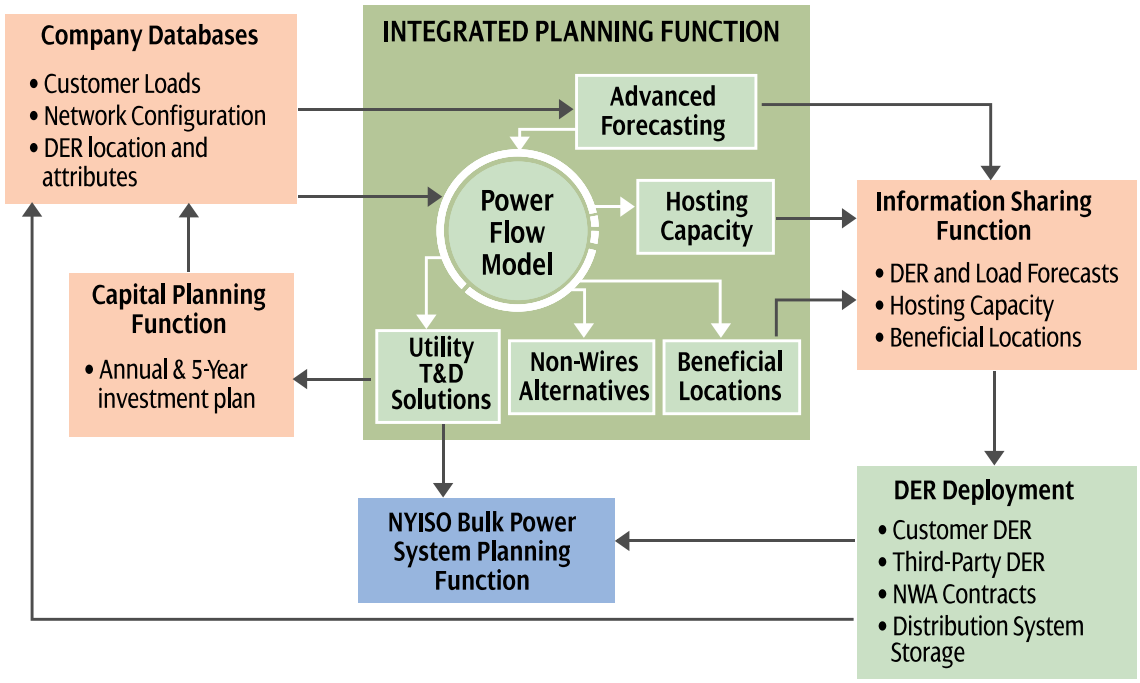
B. INTEGRATED PLANNING[31]

We are building our Integrated Planning function to achieve the following outcomes:

- Maintain a safe, reliable, resilient network by making investments in distribution facilities and/or connecting new DER;
- Deliver value to customers over the long-term by enabling efficient investment decisions by the Companies and DER developers;
- Accommodate high levels of DER penetration, maximizing the contribution to customer value for any given amount, type, and location of DERs;
- Communicate system information and insights to DER developers to inform their investment decisions; and
- Provide system information and insights to other NYSEG and RG&E functions to support their respective DSP responsibilities.

The Integrated Planning function is depicted in in Figure VI-1.

FIGURE VI-1: INTEGRATED PLANNING FUNCTION



Integrated Planning's primary analytical engine is the Power Flow Model, a tool that relies on an up-to-date mathematical representation of the physical and electrical attributes of distribution infrastructure that comprise the network, system flow data from our Supervisory Control and Data Acquisition (SCADA) system and AMI, a forecast of loads by circuit, and the location and operational attributes of connected and forecasted DER.

31 *Refer to Appendix A, Topic 1 for a more detailed description of Integrated Planning*

Our distribution planning team performs power flow studies[32] that:

- Identify areas of the network that will require either a traditional T&D investment or an NWA solution to address grid needs;
- Estimate hosting capacity by circuit; and
- Identify beneficial locations where programs and/or market incentives can attract DER that will help to address constraints.

Our technology platform will provide the granular data to enable Integrated Planning capabilities. As new investments are made and new DER are connected, we update our network configuration and DER database.

The Integrated Planning function generates information and insights that market participants *(customers, DER providers, NWA suppliers, and vendors)* can act upon. In order to perform Integrated Planning in a more challenging environment, we are building three capabilities.

FIGURE VI-2: INTEGRATED PLANNING CAPABILITIES AND OUTCOMES

Capability	Outcome	Value to Customers	Value to Grid	DER Optimization
Develop Forecasting, Hosting Capacity, and NWA Processes	Locational Based Planning	✓	✓	✓
Incorporate DER (DG, Energy Efficiency, Storage, DR) into System Planning	Optimal Grid Design, Including DER	✓	✓	✓
Perform Scenario and Probabilistic Planning Analyses	Robust Planning Decisions	✓	✓	✓

Integrated Planning incorporates five sub-functions:

2. **ADVANCED FORECASTING[33]:** granular forecasting of load and DER by location and hour of the year;
3. **UTILITY T&D SOLUTIONS:** identifying areas of the grid that require an investment and determining if they can be addressed by a traditional grid investment, a non-wires alternative, or by accelerated deployment of DER;
4. **NON-WIRES ALTERNATIVES[34]:** procurement of non-wires alternatives through a competitive solicitation process;
5. **HOSTING CAPACITY[35]**: estimating the amount of DER (in kW) that can be accommodated by a circuit without adversely affecting reliability or power quality without requiring infrastructure investments that will increase the cost of interconnecting;[36] and

32 *A 2017 Department of Energy report describes a power flow study as, "an analysis that seeks to determine the voltages, currents, real and reactive power flows and power quality characteristics in a system under given load and operating (e.g. normal and contingency) conditions.' "Modern Distribution Grid, Volume I: Customer and State Policy Driven Functionality", Version 1.1, May 27, 2017, p. 62.*
33 *Refer to Appendix A, Topic 2 for a more detailed description of Advanced Forecasting*
34 *Refer to Appendix A, Topics 13 and 14 for a more detailed description of Non-Wires Alternatives*
35 *Refer to Appendix A, Topic 12 for a more detailed description of Hosting Capacity*
36 *Refer to Appendix B for link.*

6. **BENEFICIAL LOCATIONS**[37]: identifying circuits on the grid where DER could help address constraints and potentially defer grid investments.

These five functions work together to achieve our Integrated Planning outcomes.

In order to integrate and optimize DER, we need advanced forecasting that examines all locations on the grid *(i.e., each substation and feeder)* including more granular DER and load forecasts by time of day (8,760 hours per year). Accurate DER and load forecasts help us identify grid solutions that ensure that all areas of the grid will be able to reliably serve customers at the lowest reasonable cost.

The ability to accurately forecast load by substation and circuit, independent of DER impacts, is a foundational capability that supports Integrated Planning and Grid Operations.

INNOVATION

We are performing two Advanced Forecasting innovation projects: (1) Clean Power Research' WattPlan to predict customer DER adoption; and (2) Integral Analytics' LoadSEER to forecast customer energy usage and power changes, incorporating probabilities and assessing the impact on circuit load shapes.

If a planned system project meets ***Non-Wires Alternative*** suitability criteria, NYSEG or RG&E will conduct a competitive solicitation process, determine the best solution, and if a viable and more cost-effective solution is identified through the application of Benefit Cost Analysis, enter into a contract with the developer that offers the best solution.

If it is most efficient to defer an investment by connecting a sufficient amount of DER or the right mix of DER, we will engage customers and DER developers with energy efficiency and other potential solutions.[38] These market engagement efforts include sharing information and insights with our customers regarding how they can manage their energy usage, and communicating ***hosting capacity***[39], ***beneficial locations,*** and other system information to DER developers regarding areas of our grid that would benefit from greater deployment of DER.[40]

The Companies have collaborated with stakeholders to continuously improve the granularity and presentation of hosting capacity to enable DER developers to make more informed business decisions.

37 *Refer to Appendix A, Topic 13 for a more detailed description of Beneficial Locations*

38 *See Appendix B for NWA opportunities links.*

39 *EPRI defines hosting capacity 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." Electric Power Research Institute (EPRI), Defining a Roadmap for Successful Implementation of a Hosting Capacity Method for New York State, Report Number 3002008848, June 2016, p. 2. NYSEG, RG&E and the other New York investor-owned utilities post hosting capacity maps on the internet that provide insights as to which areas of the grid can readily accommodate new DER connections*

40 *The Joint Utilities are currently participating with Staff and stakeholders on a regulatory policy and plan to post location-specific price-signals to attract DER where it can provide value to the grid. State of New York Public Service Commission, Case 15-E-0751, In the Matter of the Value of Distributed Energy Resources.*

As shown in Table VI-1, each of these five Integrated Planning functions has its own distinct set of capabilities and positive outcomes.

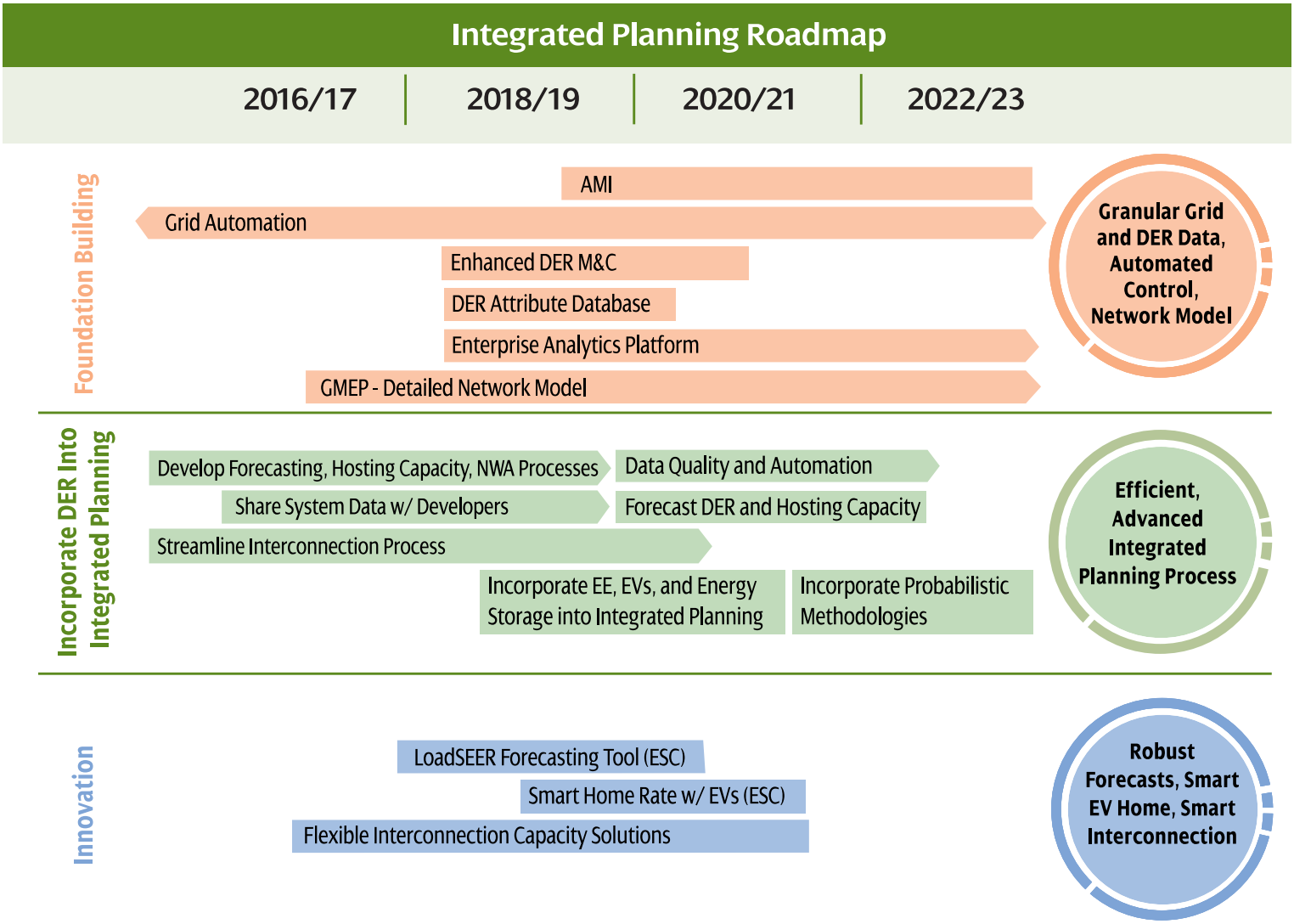
TABLE VI-1: INTEGRATED PLANNING FUNCTIONS' CAPABILITIES AND POSITIVE OUTCOMES

Capability	Outcome	Value to Customers	Value to Grid	DER Optimization
ADVANCED FORECASTING				
Forecast load by circuit and time period	Granular Forecasts	✓	✓	✓
Forecast DER supply by resource type, location and time period	More Accurate Forecasts	✓	✓	✓
Perform scenario analyses that evaluate alternative load and DER forecast assumptions	More Robust Forecasts	✓	✓	✓
Incorporate probabilistic techniques into load and DER forecasts	Robust Consideration of Uncertainties	✓	✓	✓
GRID SOLUTIONS				
Identify areas of the grid that require an investment	Maintain Reliability	✓	✓	
Identify potential NWA opportunities	Lower Costs	✓	✓	✓
NON-WIRES ALTERNATIVES				
Screen potential NWA opportunities	Lower Costs	✓	✓	✓
Procure NWAs through competitive solicitations	Lower Costs	✓	✓	✓
Administer NWA contracts	Maintain Reliability	✓	✓	✓

Capability	Outcome	Value to Customers	Value to Grid	DER Optimization
		HOSTING CAPACITY		
Estimate hosting capacity along circuits	Granular Estimates		✓	✓
Forecast hosting capacity for 3 to 5 years	Forecast of Hosting Capacity		✓	✓
Communicate hosting capacity to DER developers	More Informed DER Developers	✓	✓	✓
		BENEFICIAL LOCATIONS		
Identify high-priority locations where DER can provide grid relief	DER Investment Insights		✓	✓
Estimate the locational value of DER to the grid	Efficient Price Signals	✓	✓	✓

The following roadmap provides a high-level overview of progress that has been made building the Integrated Planning function since 2016 and planned actions.

FIGURE VI-3: INTEGRATED PLANNING ROADMAP



The Companies are focused in the near term on continuing to build processes and technologies that will support large numbers of DER. As shown in the roadmap, this involves efforts to improve processes that have been established over the past two years, build databases that support distribution planning down to the sub-circuit and customer level, improve efficiencies with related internal functions *(e.g., Capital Planning and Information Sharing)* and engage our external stakeholders *(e.g., market participants, communities, and policy makers).*

The NYSEG/RG&E 2016 DSIP filing and the Joint Utilities' Supplemental DSIP filing[41] identified probabilistic integrated planning as a future enhancement. This was responsive to guidance that had been provided by the Commission.[42] The 2016 DSIP guidance recommended that utilities develop the capability to use probabilistic-based forecasting and modeling to assess how much energy DER can reliably deliver.[43] This remains a long-term initiative in the 2018 DSIP due to the need to improve the quality and refinement of data and automate Integrated Planning processes before developing and applying probabilistic approaches that depend on statistical analyses applied to data of improved and granular quality. Our LoadSEER innovation project may inform the probabilistic planning methodology.[44]

41 *Filed November 1, 2016 in Case 16-M-0411.*
42 *Order Adopting Distributed System Implementation Plan Guidance, Case 14-M-0101, issued April 20, 2016.*
43 *Id., at 12, 46-47, and Attachment 1, p. 15, 19-20.*
44 *Refer to Appendix A, Topic 2 (Advanced Forecasting) for more discussion of the LoadSEER tool.*

C. INTERCONNECTION[45]

Interconnection is the connection of DER to the Companies' distribution system in a safe, efficient, and reliable manner, thus contributing these same attributes to the grid. We have made substantial improvements in the Interconnection process, reducing the size of the queue, and reducing wait times through improvements to the portal, automation, and applying more personnel and technology resources to the interconnection process.

The Interconnection process has been developed with guidance from Staff and participation of DER developers as part of a Joint Utilities stakeholder engagement effort. Since filing the Supplemental DSIP, the Joint Utilities have developed several technical documents addressing interconnection priorities while clarifying and formalizing aspects of the Interconnection process[46], including:

- Interim requirements on anti-islanding;
- Monitoring and Control requirements;
- Recommended changes to the Commission's Standardized Interconnection Requirements (SIR) process to improve effectiveness and support future automation;
- Documentation specific to voltage issues and voltage flicker in support of the SIR revisions; and
- Proposed energy storage application requirements and associated SIR revisions.

Having implemented Phase 1 (automation of the application process) and developed an online portal for DER developers, we are currently working on automation of more technical requirements specified in the SIR (Phase 2). Joint Utilities' collaboration with stakeholders will continue as we work toward implementation of Phase 3 (full automation of all processes). It is not yet clear whether we will be able to achieve "full" automation of "all" processes, but we are certainly working toward that goal.

INNOVATION:

We are also partners in a completed NYSERDA PON3397 research project to integrate PowerClerk (Interconnection Administration), CYME (Interconnection Analysis), and Connect+ (ANM solution) as a proof-of-concept to support Phase 2 and Phase 3 Interconnection requirements.

We are currently conducting our Flexible Interconnect Capacity Solutions demonstration project to test the ability to work with developers to come to agreement under a flexible interconnect protocol. Under the FICS, the DER developer agrees to allow the utility to curtail the electricity generation export below maximum capacity during constrained periods caused by the DER when voltage or thermal limits may be breached. In exchange for allowing their facility to be constrained, the DER developer is able to reduce or avoid incremental network reinforcement costs that they may have incurred under the existing interconnection process. FICS uses Smarter Grid Solutions' Active Network Management technology to allow communication and management of the flexibly interconnected DERs.

In order to perform interconnections that meet the needs of DER developers that are investing in our service areas, we are building the four capabilities shown in Figure VI-4.

45 *Refer to Appendix A, Topic 10 for a more detailed description of Interconnection*

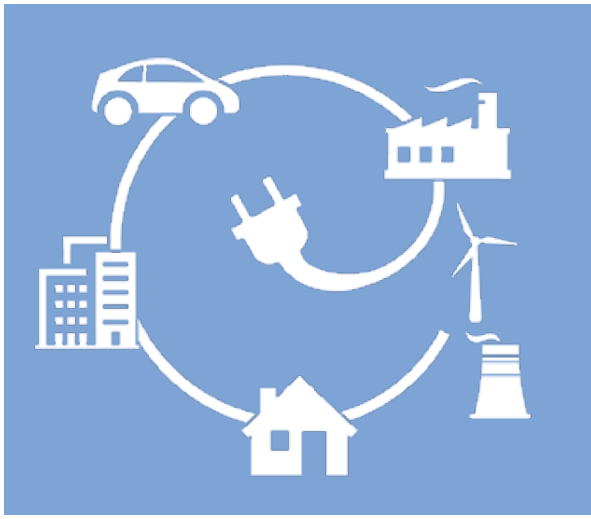
46 *These discussions were organized by the Interconnection Technical Working Group. The ITWG promotes consistent standards across the utilities to address technical concerns affecting the DG community and interconnection procedures.*

FIGURE VI-4: INTERCONNECTION CAPABILITIES AND OUTCOMES

Capability	Outcome	Value to Customers	Value to Grid	DER Optimization
Process Interconnection Applications as Efficiently as Possible.	Efficient interconnection Process	✓	✓	✓
Manage Interconnection Applications to Achieve SIR Timelines	Reduced Queue Times			✓
Execute Flexible Interconnections Capacity Service	Lower Developer Costs, Increase Hosting Capacity	✓	✓	✓
Construct Interconnections & Inform Developers	Developer Satisfaction			✓

Our future efforts include enhancements to the interconnection process to accommodate emerging technologies, such as energy storage. Given the growing interest in energy storage, the Joint Utilities are working to remove barriers to energy storage interconnections by developing a standardized technical screening process for energy storage interconnection applications. The Joint Utilities are currently working to resolve issues related to the application information requirements, technical screening process related to the need to evaluate the protection and controls, and the timing and costs associated with storage interconnections.

D. GRID OPERATIONS[47]



Grid Operations is the core DSP function that monitors and operates the distribution grid to provide safe, reliable, and resilient distribution service. Integration of various types of DER dispersed throughout the grid presents challenges that operators in our Energy Control Center (ECC) must meet in order to take advantage of DER attributes while maintaining the quality of service that customers expect.

Our approach to Grid Operations relies on (1) an up-to-date inventory of all DER and distribution assets and their capabilities, (2) near real-time data regarding customer usage and power flows throughout the distribution grid, and (3) systems and technology that respond automatically to mitigate potential issues and notify our grid operators to take actions to resolve an issue. These actions include the ability to ramp certain DER down or up *(e.g., demand response, storage, or dispatchable distributed generation)* in order to address a system constraint or unplanned event.

Since power flows on the distribution network will have an impact on transmission operations, our ECC must coordinate with the New York Independent System Operator, the operator of the regional transmission system and wholesale market.

47 *Refer to Appendix A, Topic 3 for a more detailed description of Grid Operations*

The principal parties involved in performing grid operations and integrating DER are our ECC, NYISO, aggregators, and DER owners and operators.

- **ECC:** Our ECC carries out their responsibility for operation our utility grids by monitoring and responding to changing network conditions, utilizing grid-side, supply-side, and demand-side resources. ECCs will require new tools and more granular grid visibility to dispatch DER.
- **NYISO:** Our ECC or planning engineers will coordinate with the NYISO for real-time, day-ahead, short-term, and long-term planning and operations that affects the transmission grid and to resolve unplanned events.
- **AGGREGATORS:** An aggregator bundles individual DER from multiple customers, which can then be managed collectively to provide energy, capacity, or other services. Third-party aggregators will need to coordinate with our ECC and our energy supply function to manage these resources, which can be used for many functions including solutions that reduce energy demand during periods of peak demand.
- **DER OWNERS AND OPERATORS:** DER owners and operators will increasingly be able to provide benefits to the grid, and will become key players as the distribution network gains more granular Monitoring and Control and the ability to integrate these assets. To facilitate this integration, our Distributed Energy Resource Management System (DERMS) analyzes available DER and dispatches it as needed. DERMS will also have the flexibility and scalability to interact with multiple aggregators and customers for DER-sourced voltage and VAR control.

We are building four sets of capabilities to perform Grid Operations while accommodating high penetrations of DER:

- **MEASUREMENT, MONITORING, AND CONTROL** of the performance of assets on the grid, including DER assets, to provide real-time visibility of grid status;
- **GRID OPTIMIZATION** to apply real-time power flow functions to optimize the grid, including distributed generation, storage, and demand response;
- **DER MANAGEMENT** to manage multiple types of intermittent and limited resources and to provide dispatch directives to each DER and aggregator in a target area *(e.g., distribution circuit, substation bus, substation, zone of protection[48], or stage of voltage regulation[49])* within resource limitations and program constraints; and
- **NYISO COORDINATION** to develop standards and protocols to reliably and safely integrate DER into both transmission and distribution (T&D) sides of the grid, as well as NYISO's plan to integrate DER.[50]

INNOVATION

We are testing our ability to integrate Monitoring & Control into grid operations in our Energy Smart Community.

Another innovation project is Enhanced DER M&C that would provide more granular control, acting like a dimmer, rather than an on/off switch. Additionally, a smart meter-smart inverter interface proof-of-concept project will demostrate this level of control for smaller, behind-the-meter resources.

ENABLING TECHNOLOGIES

SCADA measures grid performance and controls grid devices.

DER MM&C provides DER visibility, real-time data, and control.

DERMS aggregates, disaggregates, optimizes, and translates directives to the varied and granular DER.

48 *Circuit breakers, reclosers, or fuses are devices which trip to isolate short-circuits to protect utility and customer equipment from damage. Each of these devices only protect within a certain zone of a circuit, and must be coordinated with each other to work properly. Where a DER connects on a distribution circuit may affect this coordination and may require changes.*

49 *Distribution substations and circuits may have several voltage regulating devices between the source at the substation, and the end of the distribution circuit. These devices are transformer load-tap-changers and distribution voltage regulators; and they each maintain the voltage along a distribution circuit within regulatory requirements and criteria, to maintain quality of service to our customers. We may also use capacitors to improve voltage regulation. Where a DER connects on a distribution circuit may affect the voltage profile, and require changes to voltage regulating equipment.*

50 *The NYISO has developed a DER Roadmap.*

With these enhanced capabilities, the Grid Operations function will contribute to greater reliability and resiliency, increased value for our customers, and improved efficiency of our electric system. A brief expansion on each function is appropriate.

1. Measurement, Monitoring, and Control

Integration of DER into the grid requires granular monitoring and control mechanisms:

- to **measure** dynamic grid, DER, and load status and performance[51] at points where we serve customers and at strategic points along the grid,
- to **monitor** grid and DER performance as well as the status of distribution assets to detect issues, and
- to respond to these issues by exercising **control** over distribution assets and DER.

Grid operators must be able to monitor and control DER in order to optimize the grid and maximize hosting capacity.

NYSEG and RG&E advocate lowering the size thresholds of units that will be monitored from 500 kW to 300 kW in order to improve our ability to detect and respond to operational issues. In our view, a lower threshold improves our situational awareness and will ensure safer and more reliable operation of the distribution system.

MM&C supports our efforts to integrate storage and other DER that have potential impacts on system reliability and power quality. It also supports our ability to optimize grid performance reflecting the contribution of DER and to maximize hosting capacity. As DER penetration increases, we must be able to monitor and control DER for safety, optimal power quality and reliability.[52]

2. Grid Optimization

Grid optimization entails utilizing all available assets, including utility and DER assets, to optimize system flows and achieve the maximum level of system efficiency, reliability, and resiliency in a cost-effective manner. Grid optimization relies on automation technologies and more granular control of DER to improve integration among demand-, grid-, and supply-side resources. It provides several related benefits to the grid including responding to unplanned events and outages, resolving violations and minimizing adverse system impacts, achieving cost savings through Voltage-VAR optimization, and possibly increasing hosting capacity.

INNOVATION

We are partnering with Rochester Institute of Technology on a Smart Inverter-Smart Meter interface "proof-of-concept" innovation project to use smart inverters to optimize voltage and VARs.

ENABLING TECHNOLOGIES

The **ADMS** (Advanced Distribution Management System) creates the platform to optomize the grid and consists of several applications including a state estimator, optimal power flow, **VVO** (Volt-Var Optimization), feeder optimization, and **FLISR** (Fault Location, Isolation and Service Restoration)

INNOVATION

We are deploying an aggregated behind-the-meter storage innovation project to test interfacing with DER aggregators.

51 *"Status" refers to the status of real-time system conditions, including power quality, outage information, and equipment condition (such as alarms for equipment problems). "Performance" refers to power quality and the response and/or control of grid assets to meet operational needs.*

52 *An example of a controllable device would be a DER above the kW threshold for MM&C, whereas a non-controllable device would be behind-the-meter resources below the kW threshold to MM&C.*

Our recently upgraded Outage Management System[53] includes full distribution SCADA capabilities and full distribution maps (both geographic and schematic).

We are demonstrating all of the optimization technologies and functionality working together in the Energy Smart Community.

3. DER Management

DER management includes the aggregation, simplification, optimization, and translation of grid directives to the correct DER and aggregators. The DERMS will utilize group management functionality as specified in the IEEE-2030.5 standard to manage grid dispatch by location *(i.e., by transmission node, substation, distribution circuit, lateral, etc.*). A DERMS will aggregate, disaggregate, and/or combine the services of many individual DER and third-party aggregators, and present them as a managed group of virtual resources based on locational needs. A DERMS will simplify the details of handling DER settings and managing services. It will optimize the utilization of DER within various groups and types (distributed generation, energy storage, demand response) to achieve the desired outcome at minimal cost and maximum power quality, ensuring resource constraints and program limits are not exceeded. In addition, a DERMS will translate grid-level dispatch directives to each DER and third-party aggregator in the appropriate format and protocol. The Distributed Energy Resource Market Management System (DER MMS) will support measurement and verification (M&V) and market settlement activities. Our ADMS and DERMS technologies together support DER optimization and management activities.

INNOVATION

We are developing an aggregated behind-the-meter battery storage demostration project that enables participation in NYISO demand response programs.

4. NYISO Coordination

Greater numbers of DER will require greater coordination and communication between the DSP and the NYISO around planning and operational issues. Large numbers of DER connected to our distribution system will have impacts on bulk system planning and operations performed by NYISO and the Companies. Day-ahead and real-time dispatch of DER will impact NYISO operations, requiring communication and coordination between the DSP and the NYISO. The NYISO developed a DER Roadmap[54] to offer DER the ability to participate in wholesale market revenue opportunities, in addition to any compensation they receive from distribution companies. Aggregators and other DER that want access to both the distribution and NYISO revenue streams require the DSP to serve in a facilitation role and to coordinate with the NYISO on rules that prevent double-counting for DER compensation purposes. The NYISO's DER Roadmap outlines the progress the NYISO anticipates making in the next three to five years to integrate dispatchable DER *(i.e., controllable resources)* into the wholesale energy, ancillary service, and capacity markets.[55]

The Joint Utilities have been working on these issues since forming a joint task force at the beginning of 2017 and the Joint Utilities and NYISO continue efforts to develop a DER participation model. The NYISO-DSP joint task force is working on a DSP Communications and Coordination Manual to address operational issues. One of the anticipated outcomes is a DSP-Aggregator Agreement that addresses the

53 *OMS is a system used by grid operators to aid in power restoration through providing data on outages, prioritizing restoration tasks, calculating restoration timing, analyzing crews required, and managing restoration crews.*

54 *New York Independent System Operator, Distributed Energy Resources Roadmap for New York's Wholesale Electricity Markets, January 2017.*

55 *On February 15, 2018, the FERC issued Order 841 to remove barriers to the participation of electric storage resources in the capacity, energy and ancillary services markets.*

participation of aggregators in both wholesale and retail market functions. There are several practical details to be worked out including the communications protocols, metering requirements, and dispatch protocols.

5. Grid Operations Capabilities and Positive Outcomes

As shown in Table VI-2, each of these functions has its own distinct set of capabilities and positive outcomes.

TABLE VI-2: GRID OPERATIONS CAPABILITIES AND POSITIVE OUTCOMES

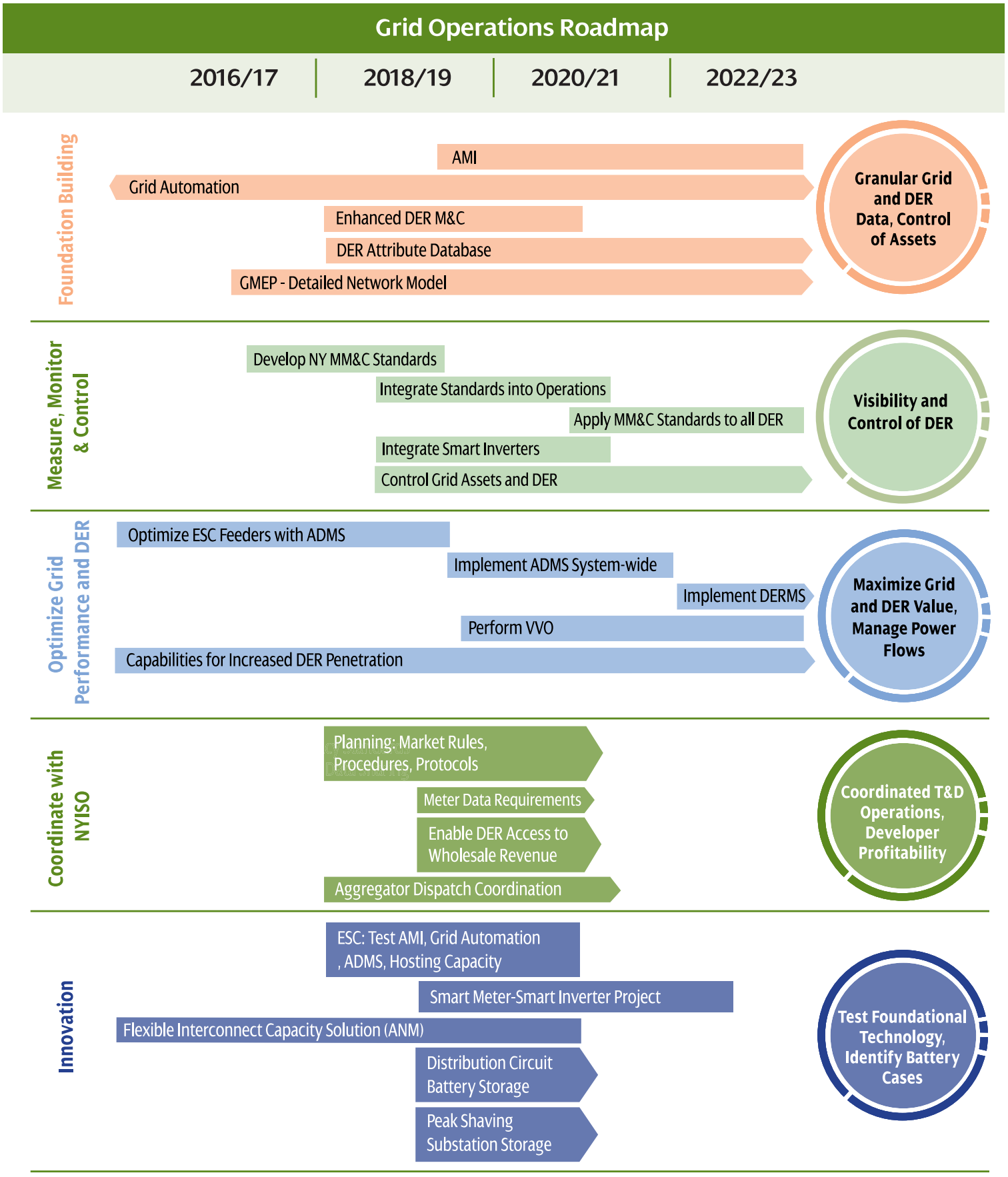
Capability	Outcome	Value to Customers	Value to Grid	DER Optimization
MEASUREMENT, MONITORING, AND CONTROL				
Measure dynamic grid, load, and DER status and performance at strategic points along the grid, and at the grid edge, and at behind-the-meter DER.	Situational Awareness		✓	✓
Monitor grid and DER performance, status of distribution assets	Situational Awareness		✓	✓
Control distribution asset and DER performance to achieve operational needs	Maintain Reliability and Power Quality	✓	✓	✓
GRID OPTIMIZATION				
Optimize grid infrastructure and connected DER to maximize value to the grid and customers while maintaining reliability and power quality	Maximize Value	✓	✓	✓
Respond to grid and DER outages to resolve violations and minimize adverse system impacts	Maintain Reliability and Power Quality	✓	✓	✓
Accommodate reverse power flows	Increased Hosting Capacity	✓	✓	✓
Perform Voltage and VAR Optimization	Lower Costs Increased System Efficiency	✓	✓	✓

Capability	Outcome	Value to Customers	Value to Grid	DER Optimization
Increase hosting capacity by integrating MM&C into grid optimization schemes	Increased Hosting Capacity	✓	✓	✓
DER MANAGEMENT				
Perform optimal dispatch of all types of DER including DG, storage, and DR	Maximize DER Contributions	✓	✓	✓
Procure NWAs through competitive solicitations	Maximize DER Contributions	✓	✓	✓
Simultaneously dispatch DER with multiple aggregators	Enable Aggregation	✓	✓	✓
Maintain a record of DER/Aggregator dispatch for M&V and settlement purposes	Accurate Pay for Performance	✓	✓	✓
NYISO COORDINATION				
Enable coordinated long-term planning that considers high DER penetrations	Improved T&D Planning	✓	✓	✓
Inform NYISO day-ahead planning	Maintain Reliability		✓	✓
Facilitate DER access to DSP and NYISO revenue streams, resolving dual participation conflicts	DER Developer Profitability			✓
Interface with aggrega-tors to coordinate DER participation in NYISO markets	DER Developer Profitability	✓	✓	✓

Our technology platform will provide the granular data needed to enable Grid Operations capabilities.

The following roadmap provides a high-level overview of progress that has been made building the Grid Operations function since 2016 and planned actions.

FIGURE VI-5: GRID OPERATIONS ROADMAP



E. INTEGRATION AND DEPLOYMENT OF ENERGY EFFICIENCY

AVANGRID and its utility subsidiaries, including NYSEG and RG&E, are completely aligned with New York State's energy efficiency goals and the supporting concepts laid out in NYSERDA's April 2018 white paper, "Energy Efficiency New York" ("EE New York"). As observed in the EE New York white paper, energy efficiency has the potential to deliver one-third of New York's greenhouse gas emissions reduction goal.

> *Energy efficiency and finding ways to engage our customers through innovative offerings, engagement strategies, and delivery models is a foundational component of our global aspiration to deliver clean energy.*

The Companies are committed to provide our customers with the insights and options to invest in energy efficiency that reduces their costs, contributes to lower carbon emissions, and under the appropriate circumstances, provides value to the grid by helping to avoid or defer investments in transmission and distribution infrastructure. We welcome the adoption of energy efficiency whether it is self-directed based on customer education or insights provided by NYSEG or RG&E, delivered by one of our utility programs, or provided by NYSERDA or any other third party. Our online products and services marketplace will provide a single point of connection that allows our customers to obtain their own energy usage information, obtain energy savings insights that reflect our research and analytics, get self-directed solutions, and receive rebates.

INNOVATION

Our ESC customers have access to their detailed personal energy data and usage alerts, along with tools and tips to help better manage their energy usage

Our energy efficiency initiatives are informed by innovation projects that we have been executing over the past three years. As discussed in Chapter VII, our RG&E "Your Energy Marketplace" ("YES Store") offers point-of-sale on products such as LED lighting, advanced power strips, and Wi-Fi enabled thermostats that help customers reduce their energy usage and contribution to system peak demand. The portal also offers water saving devices and connected home technologies in which customers can connect to their home monitoring systems, smoke alarms, and even control their lighting through use of a smart phone.[56] The RG&E YES Store is also being leveraged as a distribution channel to cross-promote the Smart Savings Rewards Direct Load Control Demand Response program. Each eligible thermostat product page contains links to the demand response program and email marketing campaigns that target previous YES Store smart thermostat purchasers, further integrating energy reduction and demand response.

INNOVATION

RG&E's Yes Store is an e-commerce site launched in 2016 to test energy-related products and services online, transactions, customer satisfaction, and the delivery of more comprehen-size energy solutions for customers.

Our NYSEG Smart Solutions platform reflects lessons learned in our 2015 Community Energy Coordination demonstration project that tested approaches to reducing customer barriers to the adoption of DER, including energy efficiency. More recently, in April 2018, the Companies launched the Smart Partner Program as part of our Energy Smart Community demonstration project. This is a partnership with Cornell's Cooperative Extension that provides energy efficiency outreach and education for low- and moderate-income customers within Ithaca and Tompkins County.

56 *The RG&E YES Store is also being leveraged as a distribution channel to cross-promote the Smart Savings Rewards Direct Load Control Demand Response program. Each eligible thermostat product page contains links to the demand response program and email marketing campaigns that have been developed to target previous YES Store smart thermostat purchasers, further integrating energy reduction and demand response.*

We anticipate that our portfolio of strategies and tactics will evolve over the five-year DSIP period and include the following:

1. Options and targeted insights made available to customers through our easy-to-use online products and services marketplace;

2. Conservation and load management, including DR programs, that become a DSP contribution to supplement an NWA[57];

3. Energy efficiency programs that are offered to all of our customers that have a positive benefit-cost analysis (BCA);

4. Energy efficiency programs that are made available to LMI customers separately or in coordination with NYSERDA or another public agency; and

5. Targeted energy efficiency to a location that we anticipate will be experiencing constraints within a few years, but may not end up being a good NWA opportunity;

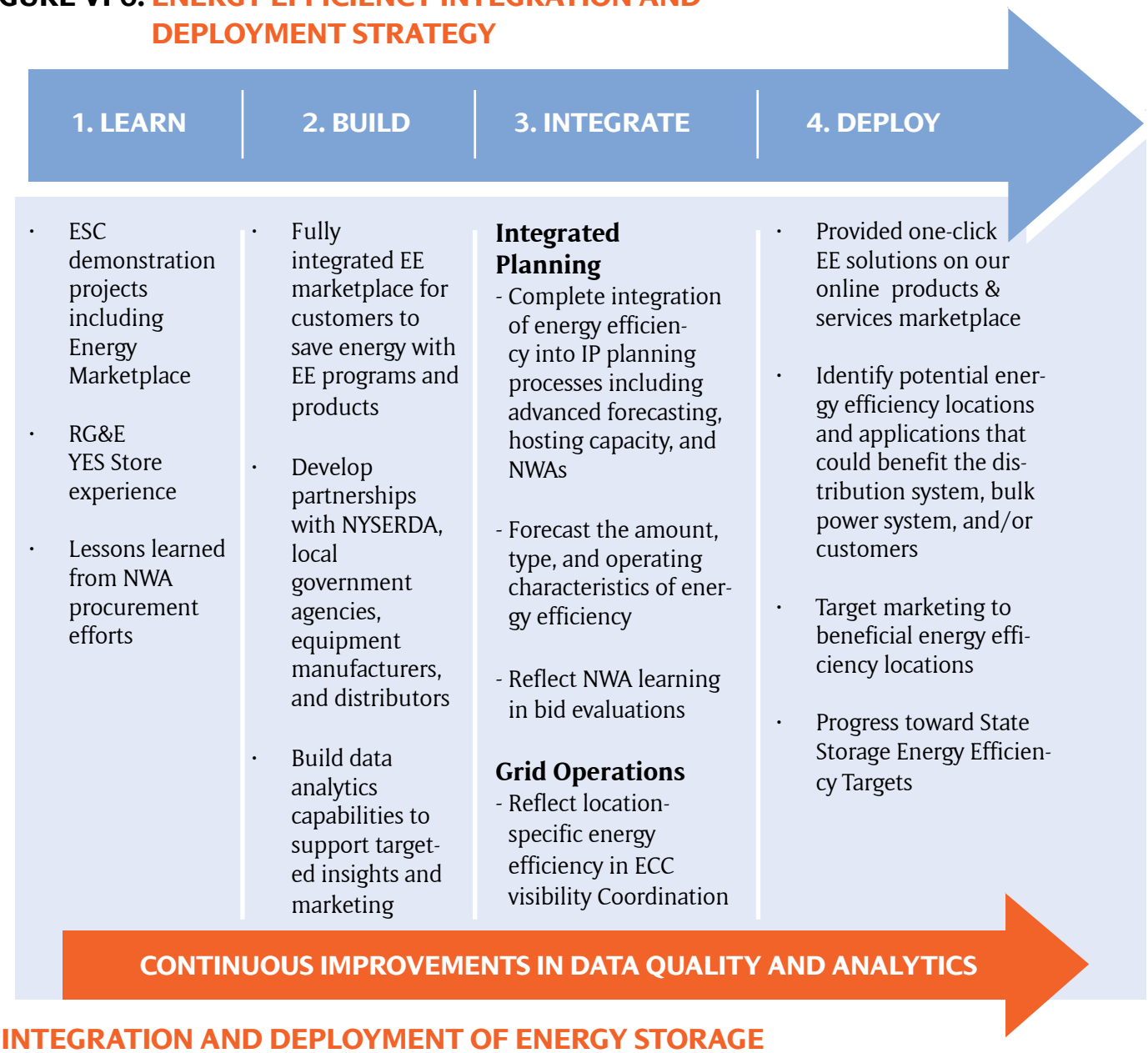
Our targeted insights and energy efficiency efforts will be enabled by data analytics using AMI data. We will rely on analytics to increase customer engagement with solutions offered by NYSEG, RG&E, NYSERDA, and DER providers, or enabling our customers to use our insights and/or platforms to self-direct their own solutions. Our solutions could take the form of incentives to turn down air conditioning a few degrees during peak periods or pay-for-performance compensation models. Our Connecticut affiliate, The United Illuminating Company, has been exploring similar strategies and has two location-focused DER innovation projects that are in development.

AMI metering data provides more granularity around the impacts of energy efficiency on usage, providing additional rigor to measurement and verification of energy efficiency actions. Over time, this will allow us to design and implement better and more cost-effective programs, and demonstrate the value of energy efficiency.

The Companies are integrating energy efficiency function by applying a four-step DER Integration and deployment framework. We apply a similar framework to the integration and deployment of energy storage and electric vehicles. Integration of these three emerging technologies requires efforts to learn, build, integrate and most significantly, enable realization of New York's policy targets. We are performing these four steps simultaneously in order to accelerate the deployment of each of these resources.

57 *For example, we have targeted a few large customers located behind Station 51, a currently planned NWA, in an effort to identify energy efficiency and other demand-side actions that would reduce the peak demand that would otherwise need to be met by the NWA.*

FIGURE VI-6: ENERGY EFFICIENCY INTEGRATION AND DEPLOYMENT STRATEGY



F. INTEGRATION AND DEPLOYMENT OF ENERGY STORAGE

On June 21, 2018, NYSERDA published an Energy Storage Roadmap that includes policy, regulatory, and programmatic actions designed to accelerate the development of energy storage in New York by accelerating the learning curve and helping to drive down development costs. These actions are designed to place New York on a path to achieve the previously announced 2030 Energy Storage goal.[58]

The Companies participated in the stakeholder sessions that informed the Energy Storage Roadmap and have been actively preparing for the integration of battery storage on our system. In the two years since our 2016 DSIP filing, we have been developing innovative energy storage projects to test business cases that will inform the use of energy storage as an effective solution to traditional infrastructure challenges.

Our objective is to proactively support the identification and development of energy storage projects that benefit our customers and the grid, and provide a return on investment to DER developers.

58 *The NYSERDA analysis examines several alternative energy storage use cases and contemplates that several programmatic policy, regulatory and actions are being considered to address economic challenges faced by energy storage as an emerging technology.*

Each of the Integrated Planning sub-functions *(i.e., Advanced Forecasting, Hosting Capacity, and NWAs)* is being designed to integrate all DER including energy storage. Our technology and systems investments will help us identify potential locations for energy storage and improve the quality of our storage-related analyses as AMI data becomes available.

Our NWA solicitations have provided valuable learning as approximately 90% of the respondents have incorporated battery storage as part of their proposed solution. The review and evaluation of these proposals by a cross-functional team has provided us with valuable experience regarding the potential value of storage as a resource and how it can benefit the grid and our customers.

Our plan for integrating energy storage is based on our four-step integration and deployment process for emerging technologies:

1. **LEARN:** Energy Storage is a relatively new technology that is the subject of R&D efforts that consider the technology, performance under alternative use cases, and alternative business models. AVANGRID and the Iberdrola Group are active participants in this learning stage, through developing our own innovation projects and from similar efforts throughout the world.

2. **BUILD:** We are planning and pursuing certain foundational grid modernization and DSP investments, preparing to support energy storage and other DER. These foundational investments will support the range of storage use cases that are being considered by the industry.

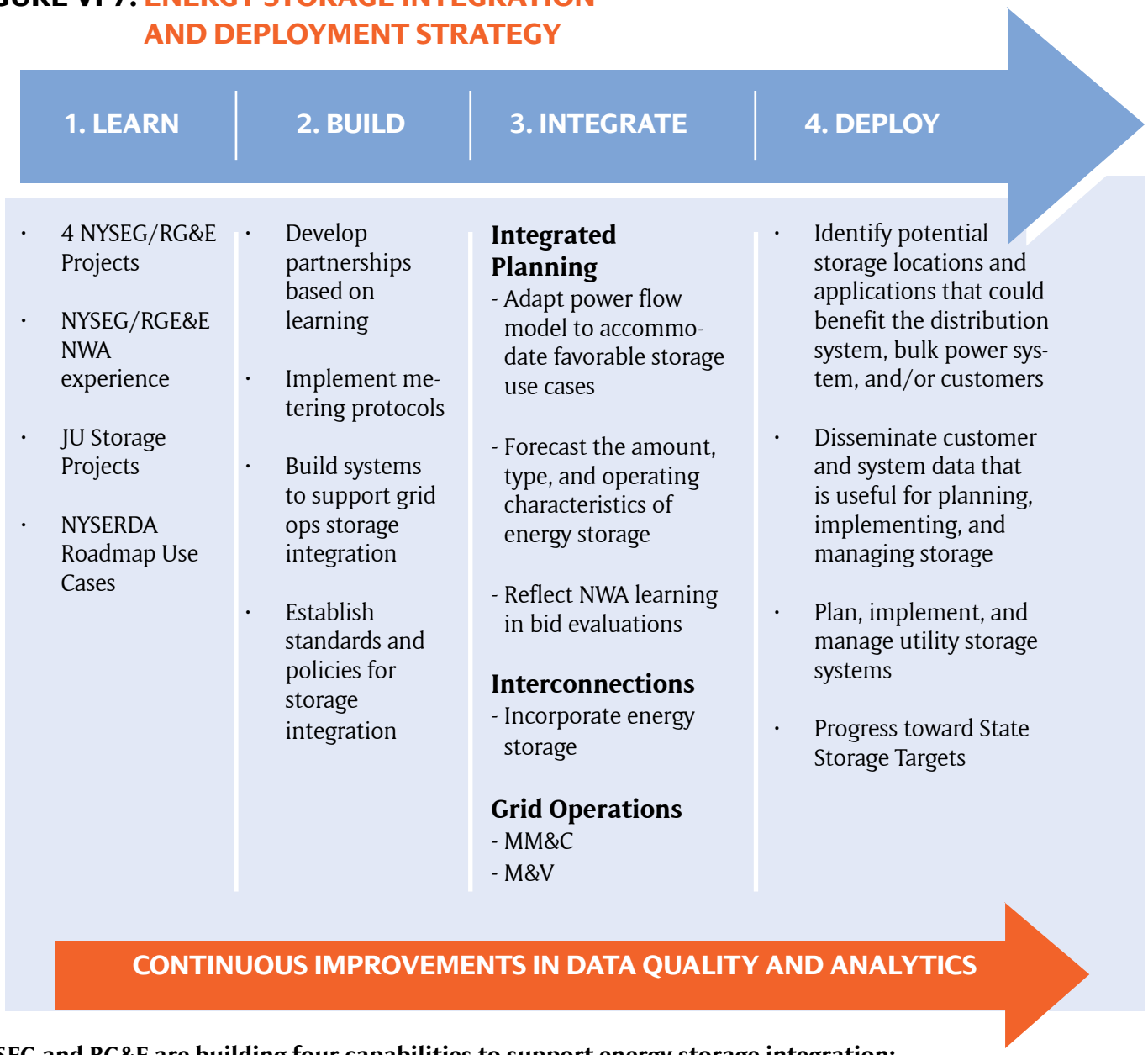
3. **INTEGRATE INTO PLANNING, GRID OPERATIONS, INTERCONNECTIONS, AND INFORMATION SHARING**: As use cases are validated, they will be considered to be solutions within our existing functions and we will identify opportunities and locations that are well-suited to replicate the use case, for both utility-owned and third-party projects.

4. **DEPLOY**: As use cases are validated, we will identify opportunities and locations that are well suited for utility and third-party energy storage projects.

We expect this four-stage process to continue during the over the next five years, even as we begin deploying energy storage throughout the NYSEG and RG&E service areas. We also expect that the economics of energy storage will improve over the next five years and beyond from RD&D efforts and experience gained from project deployment and initial operations. Stronger storage economics will improve the results of Benefit/Cost Analyses for utility-owned projects and returns on investment will improve for third party energy storage developers.

The following graphic presents our four-step integration and deployment strategy for energy storage.

FIGURE VI-7: ENERGY STORAGE INTEGRATION AND DEPLOYMENT STRATEGY



NYSEG and RG&E are building four capabilities to support energy storage integration:

a) Identify potential energy storage locations and applications that could benefit the distribution system, bulk power system, and/or customers;

b) Plan, implement, and monitor performance attributes, and manage utility storage systems;

c) Forecast the amount, type, and operating characteristics of energy storage, including inputs that inform the DER forecast being prepared by the Advanced Forecasting function; and

d) Disseminate customer and system data that is useful for planning, implementing, and managing storage.

These capabilities combine to support realization of New York's energy storage goals, while providing value to customers, the grid, and DER developers.

G. ENERGY STORAGE INNOVATION PROJECTS

NYSEG and RG&E are developing four energy storage innovation projects. Two of the projects are associated with our Energy Smart Community in NYSEG's service territory:

1. **AGGREGATED BEHIND-THE-METER BATTERY STORAGE:** aggregation of small (approximately 50 kW), medium (approximately 150 kW), and large (approximately 250 kW) battery storage DER with a combined capacity of 1 MW and a storage energy capability of 4 MWh (referred to in the storage industry segment as a 1 MW/4 MWh facility) located on up to eight commercial and industrial customer sites. The primary goal of the project is to reduce customer demand, smooth customer load shapes, and bid a portion of the total capacity into the NYISO capacity market. A secondary business case is to reduce circuit and system peak demand, while gathering data on the impact of alternative rate designs on the value of behind-the-meter battery storage to our customers. This project tests the potential for aggregation to provide a dual purpose; to provide grid support and generate a revenue stream that would not be available to an individual customer.

2. **DISTRIBUTION CIRCUIT DEPLOYED BATTERY STORAGE:** examines the potential to integrate, operate, and optimize the value from a 500 kW/2 MWh battery storage system that is located at the end of a distribution circuit. The primary goal is to reduce circuit daily and monthly peak demand, while maintaining circuit loading consistent with the circuit's hypothetical capacity rating. Secondary use cases test voltage regulation capabilities, the potential to increase hosting capacity along the circuit, and the ability to participate in NYISO demand response programs.

The other two projects are located in our RG&E service territory:

3. **INTEGRATED EV AND BATTERY STORAGE:** This project is comprised of five plug-in electric passenger vehicles powered by a portfolio consisting of two DC Fast Chargers (approximately 50 kW each), five "Level 2" chargers (7.2 kW each), and a 150 kW/600 kWh stationary battery. We are interested to learn how the stationary battery can be integrated with EV chargers to reduce circuit and building peak demand, increase the building load factor by at least 10%, and improve the economics of EV adoption.

4. **PEAK SHAVING SUBSTATION STORAGE:** This project locates a 2 MW/10 MWh battery storage system adjacent to Station 127, a Farmington New York substation. We are interested to learn how to effectively integrate, operate and optimize the value of a grid-side battery storage system to reduce the station's peak demand while maintaining substation loading with its thermal rating. We also want to test the ability of the battery storage system to substantially reduce the number of power quality issues that we have been experiencing in this area of our system. A secondary objective is to increase substation loading efficiency, reduce O&M expenses, and maintain a constant power factor.

The first and third projects are filed as REV Demonstration projects, as defined by the Commission[59]. All four projects are currently in the implementation phase with commercial operation targeted for the end of 2018.

H. INTEGRATION AND DEPLOYMENT OF ELECTRIC VEHICLE SUPPLY EQUIPMENT

NYSEG and RG&E support electrification of the transportation sector as a contributor to de-carbonization of New York's economy and as an activity that has the potential to place downward pressure on the electricity rates paid by all customers to the extent that vehicle charging occurs during off-peak hours. We will be focused on taking steps to ensure that the growth in EVs provides benefits to our grid and all customers.

However, in order to realize these clear benefits, several barriers must be addressed in order to increase customer adoption of electric vehicles. These barriers are:

- Perceived EV model design shortcomings;
- The cost of purchasing an EV relative to comparable fossil fuel-powered vehicles;
- Range limitations and charging infrastructure availability; and
- Consumer familiarity.

59 *Pursuant to New York State Public Service Commission's Order Adopting Regulatory Policy Framework and Implementation Plan, issued and effective February 26, 2015.*

While some of these barriers will need to be addressed by producers of EVs, other barriers can be influenced by NYSEG and RG&E actions. For example, NYSEG and RG&E can help address the range limitation barrier by supporting the development of fast charging infrastructure that is accessible to the public either in the communities we serve or along major New York highways. NYSEG and RG&E can also leverage our position as a trusted energy advisor to educate customers about electric vehicles and charging infrastructure and to articulate the benefits of EV adoption.

NYSEG and RG&E have been working collaboratively with the Joint Utilities to prepare an EV Readiness Framework.[60] With the benefit of this exercise, we have been developing our own EV roadmap. These efforts are responsive to New York's establishment of a target of approximately 800,000 zero emissions vehicles by 2025, a June 1, 2018 commitment to contribute $250 million to build out EV charging infrastructure on New York's interstate highways, and other public-private sector initiatives to accelerate the adoption of electric vehicles in the State.[61] Transportation is the single largest contributor to greenhouse gases in New York and the realization of New York's EV goals would contribute significantly to achievement of the targeted reduction in greenhouse gas emissions of 40 percent by 2030 and 80 percent by 2050.[62]

The Joint Utilities' EV Readiness Framework set out to identify, prioritize, and execute actions in the near- to mid-term in order to unlock the potential of transportation electrification.

The near-term priorities identified in the EV Readiness Framework include:

- Planning of EV charging infrastructure;
- Forecasting EV growth to assess and mitigate potential system impacts;
- Streamlining deployment of New York's charging infrastructure by addressing local building codes and ordinances and other challenges to siting charging infrastructure;
- Advancing rate design considerations that will improve the customer experience while minimizing impacts to utility system operation; and
- Conducting education and outreach efforts that improve customer awareness about the benefits of EVs

.

NYSEG and RG&E have used the EV Readiness Framework as a starting point to EV market development, EVSE integration, and EVSE deployment that is aligned with our circumstances and overall approach to the DSP.

Our goal is to create an environment that facilitates and supports the adoption of electric transportation within our service territories. We are building four capabilities to support a robust electric vehicle market:

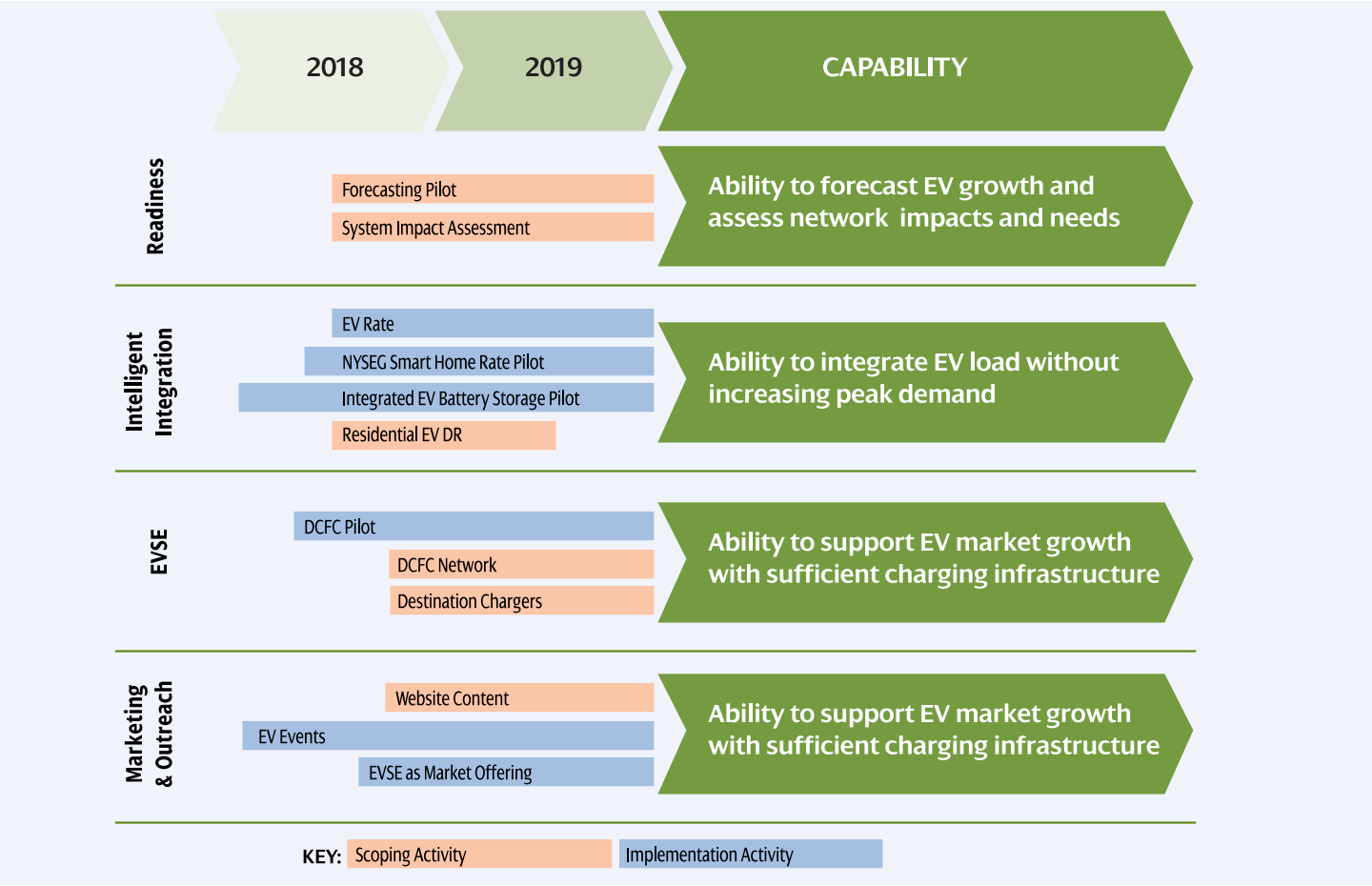
1. the ability to forecast EV growth and assess network impacts and needs;
2. the ability to integrate EV load while minimizing impact on peak demand;
3. the ability to support EV market growth with sufficient charging station capacity infrastructure; and
4. the ability to positively influence our customers' perception of EVs.

By developing these capabilities, NYSEG and RG&E will support realization of New York's zero emission vehicle goals, while providing value to customers, the grid, and supporting the EV and EVSE markets.

Twelve initiatives that will help build these four capabilities are presented in Figure VI-8.

60 Joint Utilities of New York EV Readiness Framework, Final Draft, March 2018.
61 New York's participation in the 2014 Multi-State ZEV Task Force establishes a target of New York of 800,000 ZEV by 2025.
62 Established by the 2015 New York State Energy Plan.

FIGURE VI-8: NYSEG AND RG&E EV PORTFOLIO



Our eleven initiatives are:

1. **EV FORECASTING PILOT:** we will develop granular EV adoption forecasts at the circuit level based on a "propensity to adopt" methodology. Our objective is to develop and test a scalable methodology to forecast EV-related load growth by circuit and substation.

2. **SYSTEM IMPACT ASSESSMENT:** Utilizing the results of the EV forecasting pilot, we will evaluate expected system impacts, infrastructure requirements, and investments under alternative EV adoption scenarios.

3. **EV RATE:** we have developed and filed a time-of-use rate will be available to all electric vehicle owners and lessees that provides them with an incentive to charge their vehicle during off-peak hours.

4. **SMART HOME RATE PILOT:** this project will assess the effectiveness of and value created by time-differentiated EV charging prices, where customers identify the time by which they need their vehicle charged, and we optimize when their vehicle charges based on prices and system needs.

5. **INTEGRATED EV CHARGING & BATTERY STORAGE:** (as described above in our Energy Storage section) comprised of five plug-in electric passenger vehicles powered by a portfolio consisting of two DC Fast Chargers (approximately 50 kW each), five Level 2 chargers (7.2 kW each), and a 150 kW/600 kWh stationary battery and management system. We will test how the stationary battery can be integrated with EV chargers to reduce circuit and building peak demand, increase the building load factor by at least 10%, and improve the economics of EV adoption. A secondary goal is to enable intra-day energy price arbitrage and participate in NYISO demand response programs.

6. **RESIDENTIAL EV DEMAND RESPONSE:** We are working with a demand response partner to design a project that will test whether EVs could be a valuable component of demand response programs at scale. The program will provide an incentive for EV owners not to charge their vehicles during demand response events, responding to a request to curtail their energy demand. It will be initially targeted to EV owners that are currently participating in our smart thermostat demand response program.

7. **DC FAST CHARGER PILOT:** this project is being developed in order to design a market partnership structure that will animate the market for DC fast charging infrastructure, expediting real delivery of DC fast charging stations within the NYSEG and RG&E service territories. NYSEG and its market partner will identify appropriate utility investments that will support the development of DC fast chargers, the locations and business types that make the best site hosts, and how a utility programmatic approach can help streamline deployment and achieve New York's ZEV goals.

8. **DESTINATION CHARGERS:** Based on input from stakeholders, we will develop a program that will support the development of a robust network of destination "Level 2" chargers. This will support deployment of chargers at locations such as workplaces, hotels, public parking lots, parks, resorts, etc.

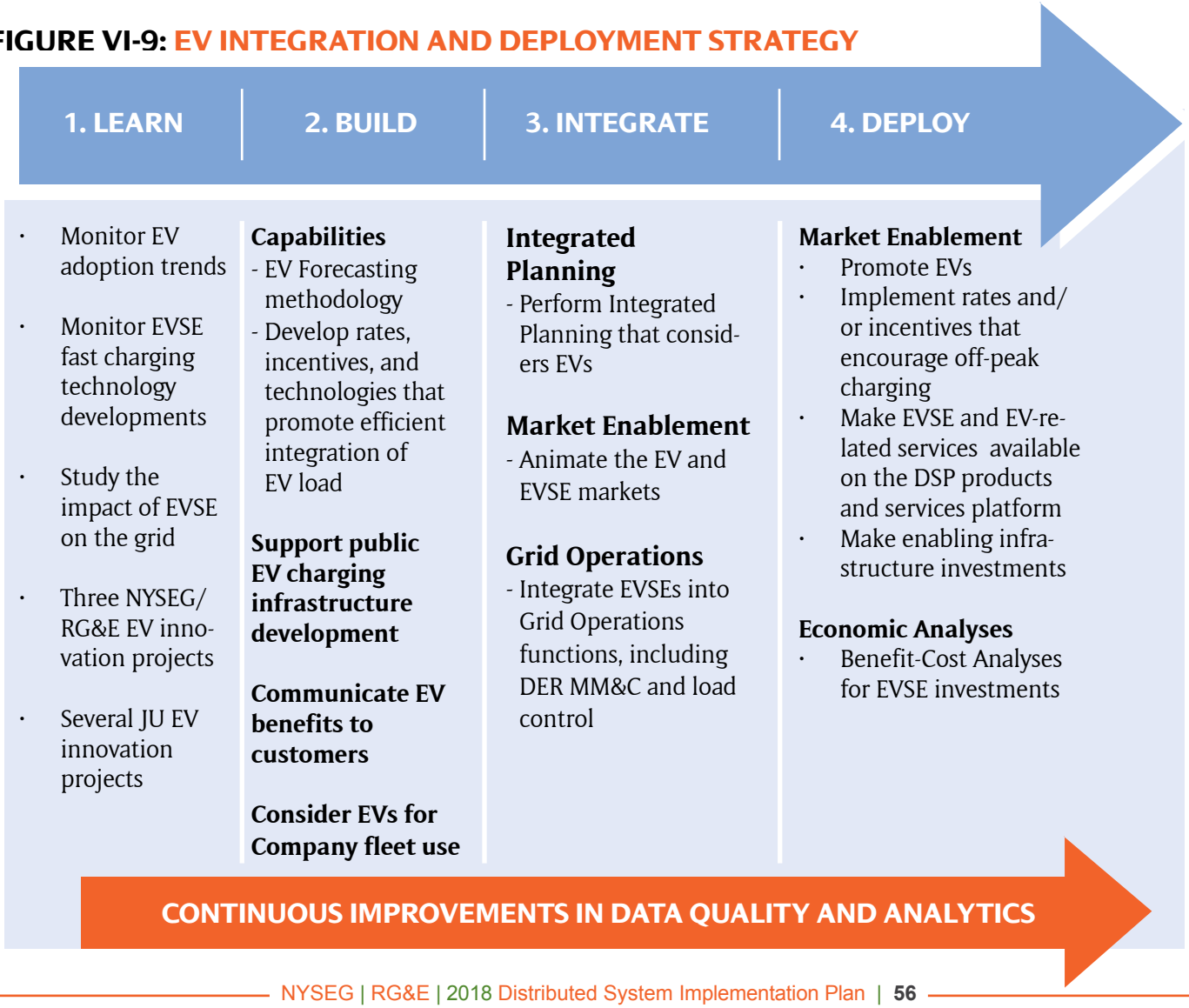
9. **EV CUSTOMER COMMUNICATIONS & CONTENT:** we will leverage our utility communications channels and websites to educate and promote the benefits of EVs to customers.

10. **EV EVENTS:** We have been hosting ride-and-drive events for our employees to promote the benefits of EVs and allow our employees to experience driving an EV. We will collaborate with local stakeholders to support similar public events that have proven to be an effective method for raising awareness of EVs.

11. **EVSE MARKET OFFERING:** we are adding residential EVSE as a product offering to customers on our energy products and services marketplace websites. Level 2 EVSE are now available for purchase on RG&E's Your Energy Savings Store website and NYSEG's Smart Solutions website. Over time, this offering could be integrated with future demand response programs or other offerings that promote efficient off-peak charging options.

Our EV integration and deployment strategy is presented in Figure VI-9.

FIGURE VI-9: EV INTEGRATION AND DEPLOYMENT STRATEGY



VII.
MARKET SERVICES AND INFORMATION SHARING

VII. MARKET SERVICES AND INFORMATION SHARING

Our Smart integrator role includes serving as a platform for customers, DER developers and other third-party product and service providers to transact with the DSP and with each other. Our role is to enable the market by promoting engagement by customers to help them consider DER as a resource to manage their energy usage, including their potential to produce and store energy.

A. INTRODUCTION

In this capacity, the DSP is a "Market Maker", connecting our customers to products and services and connecting our third-party partners to system data and other support services through our products and services platform and DER developer portal. It is our belief that our portals and others like it in New York and elsewhere will promote the development of new products and services that benefit customers directly, while also contributing to realization of New York's clean energy goals.

NYSEG and RG&E are testing concepts that reflect our market services perspectives and goals:

- We will enable market activities that provide value to our customers, the grid, DER developers, and other third-party suppliers;
- We will serve as trusted advisors to our customers providing them with their own detailed energy usage data, as well as objective insights that help them manage their energy usage;
- We will be trusted partners to third-parties that have DER, supply, and other products and services to offer our customers;
- We will provide system data and insights that enable third-party suppliers to make sound investment decisions;
- Our products and services platform will be easy to navigate and easy to use for our customers, with our customers in charge;
- We will protect the security and privacy of our customers' data and require suppliers to do the same;
- We will learn and adapt as markets evolve, operating efficiently to benefit our customers, third parties, and the grid; and
- We will remain faithful to our vision as a provider of clean energy and responsive to New York's policy goals by leveraging our market function to support energy efficiency, demand response, energy storage, and strategic electrification.

Our ability to accomplish these goals leverages and is closely integrated with our other DSP responsibilities. Our DSP functions work together to empower customers, promote end-to-end efficiency in the energy market, and achieve New York's and our corporate clean energy objectives.

We anticipate that the DSP market requirements will evolve with respect to ***location***, ***granularity***, and ***time sensitivity*** to deliver efficiency, attract customer and third party participation, and deliver value to our customers and the grid. The Companies will work with the Joint Utilities to prepare a DSP Market Design and Integration Report in accordance with the Staff 2018 Guidance.

The same technology, systems, and granular data that support our Integrated Planning and Grid Operations functions will support our Market Maker role and empower customers to become more aware, take action to manage their energy usage, and contribute to a cleaner environment.

B. MARKET MAKER

The DSP's role as Market Maker is to organize and facilitate activity that delivers value to customers and contributes as much as possible to the realization of New York's clean energy goals. This requires that we deliver on our Market Services goals. We need to establish and leverage multiple marketing "channels" and "touch points" with our customers and establish trust with both customers and third party market participants. With all the attention being given to data privacy and security, addressing these concerns is an absolute requirement.

We will address three functions necessary to serve as Market Maker, based on our lessons learned to date in our Energy Smart Community.

1. Customer Empowerment

Our view of future markets places the customer in a position where they are aware of their current energy usage patterns and energy options, have tailored information and insights to make informed decisions that meet their needs, and they can self-direct the solution and do so with ease.

We are building four capabilities to empower our customers:

1. Educate our customers regarding evolving energy technologies and market opportunities and what that might mean for them;

2. Provide targeted information, insights, and advice to customers based on our understanding of their usage and what they value;

3. Provide easy secure access to their own energy usage information and the ability to authorize sharing that information with a third party; and

4. Enable self-service transactions for energy and related products and services *(e.g., a smart thermostat or participation in a demand response program).*

We will apply lessons learned, supplemented by ongoing market research to understand the needs of our customers by market segment. We will combine this intelligence with targeted data analytics that provides tailored insights and advice to our customers regarding services, programs, and products that will help them manage their energy usage and engage safely and securely with emerging energy technologies, consistent with their life-style and business goals. We will follow up with customers and ask them how we are doing and what they would like to see us improve.

As a trusted advisor, we will present a range of options to address our customers' needs. These will include products and services offered by DER developers and other third-party suppliers as well as tariff pricing options and programs offered by our DSP, third parties, and NYSERDA. Customers will be able to self-select their own bundle of DSP and third-party/NYSERDA services that meets their needs.

We will require our third-party partners to agree to abide by Commission regulations with regard to business practices and the privacy and security of customer data and we will enable and encourage customers to express concerns to provide feedback or express concerns or provide feedback regarding the performance of any third-party partner.

We want our customers to drive the evolution of the market.

2. DSP as Market Maker

Our role as Market Maker is to provide our customers with access to products and services and to provide third parties and NYSERDA with the ability to efficiently and securely transact with our customers. We are building five capabilities to support our Market Maker role:

1. Share customer data with third parties, subject to customer authorization and data privacy requirements;
2. Share system data, including aggregated customer information that does not reveal the data associated with any individual customer, with third parties that have been vetted and adhere to our data security requirements;
3. Offer new DSP service options *(e.g., time-varying or dynamic pricing options)* and programs *(e.g., new energy efficiency and Low-and Moderate-Income programs)*;
4. Provide a gateway to NYSERDA services and programs; and
5. Provide a gateway to DSP locational procurement and compensation options *(e.g., NWAs or Value of DER).*

We will do everything we can to support our third-party partners, while adhering to customer data privacy rules. We will share the lessons learned from our Energy Smart Community and other innovation projects, insights regarding sources of customer value from our customer research, and any feedback we receive from customers that helps third parties improve their product and service offerings and quality of customer support. As Market Maker, we will connect customers directly with products and services providers *(e.g., installing roof top solar installers or a smart home technology providers)*. We will engage with third parties to share lessons learned and discuss ways for us to enhance the services we provide as the DSP Market Maker.

Third parties will also be able to offer bundled services that include a DSP or NYSERDA service or program as part of a package, for example.

3. DSP Products and Services Platform

We will leverage our initial experience with customer and DER developer portals to deliver an efficient, easy-to-use online products and services platform to our customers and third-party partners.

We are building five capabilities to deliver a successful DSP platform to our customers and third parties:

1. Design, build, and maintain a portal that attracts customers and third parties to transact with each other and with the DSP;
2. Enable all of our customers to make informed decisions regarding DER and energy savings opportunities;
3. Enable third parties to sell unbundled and bundled *(i.e., with DSP or NYSERDA services or programs)* products and services;
4. Enable community and third-party aggregation of individual DER; and
5. Securely execute market clearing and settlement responsibilities.

We will offer a products and services platform that provides a preferred, one-stop marketplace to all of our customers, including customers that may not speak English or have special needs. The marketplace would provide end-to-end services and solutions while enabling customers to transact for a single service, or combine and stack services in various ways to tailor a solution that meets their particular needs. In this way, the platform will maximize the value to each customer, enabling customers to easily navigate the portal and address their specific needs. These needs may include education on a new market development, information regarding an existing product or service,

evaluation of alternative solutions to meet their needs, or purchasing a product or service from a third party, NY-SERDA or our DSP. Customers will also be able to have an upstream rebate offered by a market participant automatically included in their price at the point of transaction.

We anticipate that customer aggregation may grow as a viable service delivery model and that we will need to provide electronic pool management services to our aggregators and customers. We also anticipate that we will be working directly with some of the communities we serve to help them achieve environmental or other community goals, using the portal to help foster those relationships.

The DSP products and services marketplace will incorporate Green Button Connect functionality within our DSP Marketplace portal.

C. MARKET SERVICES CAPABILITIES AND ROADMAP

The capabilities and positive outcomes associated with the Market Maker role are summarized in Table VII-1.

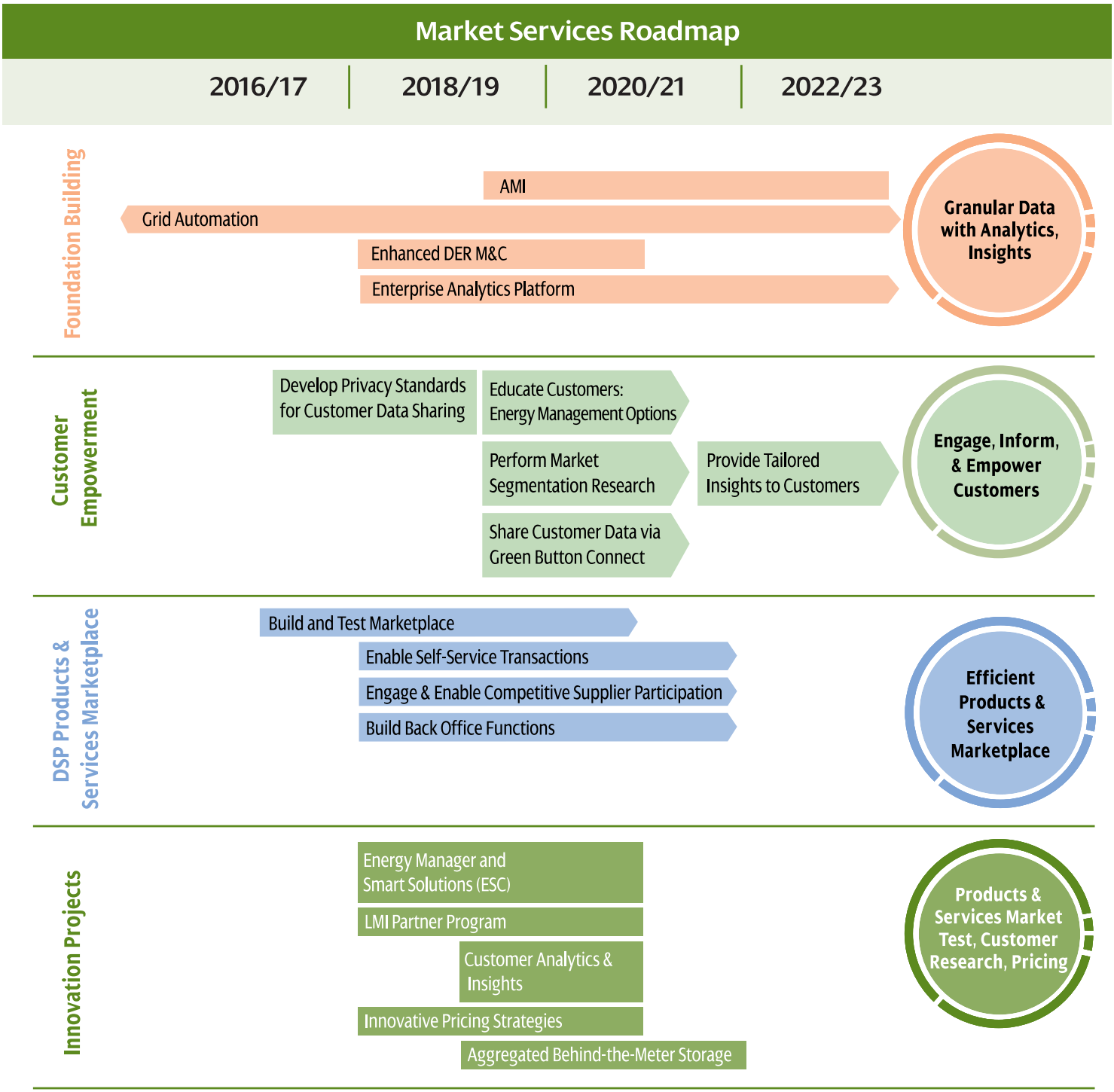
TABLE VII-1: DETAILED LIST OF CAPABILITIES AND POSITIVE OUTCOMES

Capability	Outcome	Value to Customers	Value to Grid	DER Optimization
CUSTOMER EMPOWERMENT				
Educate our customers regarding evolving energy market opportunities and what that might mean for them	Customer Awareness	✓		✓
Provide targeted information, insights, and advice to customers based on our understanding of their usage and what they value	Informed, Engaged Customers	✓	✓	✓
Provide easy, secure access to their own energy usage information and the ability to authorize and share with a third parties	Informed Customers and Third Parties	✓		✓
Enable self-service transactions for energy and related products and services	Self-Service Option	✓	✓	✓
DSP AS MARKET MAKER				
Share system data, including aggregated customer information, with third parties	Informed Third Parties	✓	✓	✓

Capability	Outcome	Value to Customers	Value to Grid	DER Optimization
Offer new DSP services and programs	More Efficient Grid Utilization, NY Policy Goals	✓	✓	
Provide a gateway to NYSERDA services and programs	NY Policy Goals	✓	✓	
Provide a gateway to DSP locational procurement and compensation options	More Efficient Grid	✓	✓	✓
DSP PRODUCTS AND SERVICES MARKETPLACE				
Design, build, and maintain a portal that attracts customers and third parties to transact with each other and with the DSP	Vibrant Market, Market Efficiency	✓	✓	✓
Enable all of our customers to make informed decisions regarding DER and energy savings opportunities	Universal Access	✓	✓	✓
Enable third parties to sell unbundled and bundled products and services	Customized Solutions	✓	✓	✓
Enable community and third-party aggregation	Broader Market Reach	✓	✓	✓
Securely execute market clearing and settlement responsibilities	Secure Transactions	✓	✓	✓

The Roadmap to build out the Market Services capabilities is presented in Figure VII-1.

FIGURE VII-1: MARKET SERVICES ROADMAP



Our development of Market Services functionality reflects our need to test several concepts and functionalities before offering an online platform that our customers can use to self-direct their energy solutions. Over time, and moving across our service areas, market providers including the DSP, third parties, and NYSERDA will be able to respond to the increasing granularity of customer usage data that is shared with them, consistent with data privacy requirements. For example, the DSP will be able to offer time-varying pricing and other dynamic tariffs for distribution service. More customers will be able to take advantage of demand response, including programs offered through third-party aggregators. The ability for third parties to offer energy storage plus solar options will similarly be enabled by more granular data.

We are already learning a great deal about customer engagement and the needs of various customer segments. This, along with a more informed customer base from having access to their own usage information and insights supported by data analytics, should create momentum for the online marketplace.

The Market Services functions are supported by greater visibility and control as a result of foundational investments that support all three primary DSP functions.

We also expect to learn a great deal as we engage more frequently with the communities we serve. Communities are increasingly interested in establishing relationships with advisors and providers that enable them to pursue community goals, such as reduction of their carbon footprint. A third party could offer a Community Choice Aggregation (CCA) service to a community that includes solar generation and demand response packaged together in a single offering to a community. These activities must be tailored to meet the individual needs of each community.[63]

There will no doubt be challenges. Many customers may be passive or feel overwhelmed with respect to managing their energy usage. Our Energy Smart Community is providing a wealth of lessons learned through various innovation projects, including:

- How to deepen customer relationships (customer engagement) through communications and our Energy
- Manager product and services marketplace;
- Identifying value added to customers by gathering data on preferences;
- How to deliver value to Low- and Moderate-Income customers through our Smart Partner Program; and
- Developing insights to advise customers (serving as a trusted partner) using usage data and segmentation analysis.

D. INFORMATION SHARING

Information Sharing consists of: (1) sharing usage information and related insights with our customers to help them make wise energy choices, and (2) sharing grid information with developers to help them market their services to our customers. We will discuss sharing of Customer Data and System Data, respectively.

1. Customer Data Sharing[64]

As we implement AMI throughout our service areas, NYSEG and RG&E will be able to share hourly usage data with customers and properly vetted suppliers of products and services, with customer permission. This provides customers with a baseline as they consider participation in a DSP or NYSERDA program such as energy efficiency or demand response, converting their home to a smart home or simply installing a smart thermostat, and as they consider offers from third parties for innovative products and services. We want to make it as easy as possible for customers to access their data on any device or in any format.

Potential suppliers of products and services want to be able to look at customer data for a specific customer or a collection of anonymous customers in order to design new products and services, focus their marketing efforts and investments, or tailor an offering to a specific customer.[65] As the DSP provider, we are in a position to share a specific customer's data with a third party that the customer has authorized, or perform data analytics for a segment of customers and share those results with both customers and third parties. At some point in the future, we anticipate being able to share insights with individual customers along with suggested solutions, and then connect those customers to our online marketplace where they can self-direct their own solutions.

In each and every circumstance, we implement the controls needed

63 *Our Connecticut utility affiliate, United Illuminating, has developed a model for working with communities on energy solutions from which we expect to learn.*

64 *See Appendix A, Topic 8 for a more detailed discussion of Customer Data Sharing*

65 *Sharing of aggregated customer data that preserves the privacy of individual customer data is subject to requirements. The Joint Utilities have established a "15/15" standard which states that aggregation of customer usage information must include a minimum of 15 customer accounts and no one customer can represent more the 15% of the total usage.*

to protect the privacy and security of our customers' data, including Personally Identifiable Information (PII).

As an active member of the Joint Utilities Cyber Security and Customer Data Working Groups, we are actively exploring ways to improve access to data while continuing to strengthen privacy and cyber security controls to protect our customers' data[66] and our own distribution system data. During the last two years, the Companies, working with the Joint Utilities, have continued to evolve customer data sharing procedures, standards, and protocols.

The protection of customer information, including energy usage data and personal information, is an integral part of our responsibilities and commitment to our customers.

Within the next few months, we will be installing and testing Green Button Connect capabilities in the Energy Smart Community. Green Button Connect and other protocols provide a more current data exchange standard that utilizes new capabilities such as cloud sharing and web services at scale to support large information sharing transactions that are expected in the future. Our ESC customers will be able to view and provide us with permission to share their detailed customer information.

Customer data is shared with competitive suppliers in a variety of ways. Authorized Energy Service Companies (ESCOs), DER providers, and other suppliers will have access to approved customer data via a secured website.[67] Customers enable the sharing of their data by providing their Point of Delivery ID with an authorized third party. This ensures that providers have access to the information only after receiving authorization from the customers except where required or permitted by Commission order.[68]

Customer data is also shared with ESCOs and other parties via Electronic Data Interchange (EDI). EDI is the secure exchange of information in a standardized format and is used to communicate a variety of pre-defined information including usage and billing information, payment, eligibility, and other information.

With the prospect for increasing requests for aggregated customer information, the Joint Utilities have been engaging with stakeholders to discuss the specific information that is of value to communities and other aggregators, to address how data can be shared with them, and the steps necessary to ensure the privacy and security of aggregated customer data. In some cases, particularly if customized analysis is requested, we will charge a fee to provide the data, as contemplated the Commission.[69]

We anticipate that the types of data to be communicated to customers and third parties will evolve over time to include on-site generation (if metered by the Companies), peak load data, and

INNOVATION : ENERGY SMART COMMUNITY INFORMATION SHARING PILOT PROJECTS

Our ESC project includes several projects that support future developement of information sharing. With approximately 12,300 electric smart meters installed in the ESC, we have a strong foundation to assess and understand more granular data.

Through the ESC project, we are able to:

- Develop and engage customers on sharing more granular usage information and provide a means to share this information with third parties, with permission
- Develop new online markets to bring together service providers enabled by more detailed customer information
- Leverage granular information to test new rates and customer offerings
- Develop new sharing machanisms such as the Energy Manager portal. Energy Manager will house Green Button Connect which will allow customers to share their energy data.

Through the ESC, we are testing new concepts that will subsequently be leveraged to offer information services throughout our service area.

66 *Case 14-M-0101 Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Staff Proposal Distributed System Implementation Plan Guidance (issued October 15, 2015), p. 21.*

67 *The secure website for NYSEG and RG&E.*

68 *Such as with CCA. For all CCA requests, the companies require all parties participating in the formation and operation of a CCA to complete the Vendor Risk Assessment (VRA) and execute the Data Security Agreement (DSA). Once an Energy Services Company is selected and has completed the VRA and DSA and is under contract with the CCA, the approved ESCOs may receive customer-specific information.*

69 *CASE 14-M-0224, et al.*

information on appliances and other home devices would help third parties tailor services to our customers. NYSEG and RG&E will make all customer data that is collected by the utility available to customers and third parties only if the customer has authorized sharing the data, subject to the requirement that the third party has satisfied security conditions that have been developed by the Joint Utilities.

2. System Data Sharing[70]

DER developers and other third-party suppliers are interested in a variety of distribution system data, including hosting capacity, forecast data, and NWA opportunities. They rely on this data to direct their marketing efforts to locations on our grid that provide the opportunity for revenues and profit. The Joint Utilities have been working with stakeholders to determine what data is of value, what data is available and can be provided, as well as data sharing procedures, standards, and protocols. Each of the Joint Utilities, including NYSEG and RG&E, have developed portals to securely share their system data with third parties.

System data can be collected at various granularities including the distribution circuit, substation, and overall system level. System operators, planners, and designers rely on system data to generate useful information for Integrated Planning and Grid Operations. Sharing system data provides insight into areas a DER developer could interconnect with the system at a lower cost. It also helps DER providers tailor their responses to NWA RFPs.

The Joint Utilities System Data Working Group will continue 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 data.

A list of the system data being shared with third parties is presented in Table VII-2. Appendix B presents links to NYSEG and RG&E websites that present system data for third parties.[71]

TABLE VII-2: SYSTEM DATA AVAILABLE TO THIRD PARTIES

DATA FIELD	DATA AVAILABILITY
System Load Forecast	Public - DSIP Filing
System Voltage	Public - FERC Form 1
System Reliability	Public – Annual Reliability Report
Substation Load	SIR – Pre-Application Report
Substation Voltage	SIR – Pre-Application Report
Voltage at Point of Common Coupling	SIR – Pre-Application Report
Substation Reliability	All DER Providers[71]
Circuit Load	SIR – Pre-Application Report
Circuit Voltage	SIR – Pre-Application Report
Circuit Reliability	Public – Annual Reliability Report
Stage 1 Indicators	Public – Distributed Interconnection Guide Map Website
Minimum Day Load Curve by Substation (Estimated)	All DER Providers
Minimum Day Load Curve by Circuit (Estimated)	All DER Providers

70 See Appendix A, Topic 7 for a more detailed discussion of System Data Sharing
71 System data available through the Joint Utilities' system data portal, which includes utility-specific system links.
72 The Companies are developing a process to securely provide these data to DER providers. The Supplemental DSIP will identify data subject to fees.

DATA FIELD	DATA AVAILABILITY
Peak Day Load Curve by Substation (Estimated)	All DER Providers
Peak Day Load Curve by Circuit (Estimated)	All DER Providers
Circuit peak demand forecast	SIR – Pre-Application Report
Circuit statistics (incl. ID, voltage, length, min and max load, min and max noon load, min and max daily energy)	SIR – Pre-Application Report
Substation Bank Capacity	SIR – Pre-Application Report
Aggregate existing distributed generation on the circuit (kW)	SIR – Pre-Application Report
Aggregate queued distribution generation on the circuit (kW)	SIR – Pre-Application Report
Distribution Capital Investments	Public – Capital Investment Plan in DSIP Filing

Future efforts will focus on refining sharing mechanisms and proactively responding to third-party provider system data needs. An increase of frequency and usefulness of system information will lead to an optimized and integrated platform with increased levels of DER. This integrated platform will provide benefits to customers in the form of a more resilient and reliable grid with reduced carbon emissions. We will continually identify new data and assess what information can and should be shared based on the value to customers and the market. The Companies will also continue to focus on updates to our data portals, as well as refining and/or expanding system data use cases to better meet stakeholder needs. For example, the Companies are investing in technology and systems to acquire 8,760-hour annual load data at substations, along circuits, and at customer premises to improve the accuracy of its hosting capacity.

3. Protection of Customer and System Data

The successful implementation of REV initiatives depends on the reliable functioning of the Companies' cyber infrastructure. The Companies adhere to the AVANGRID Cybersecurity Controls Framework and the AVANGRID Cybersecurity Policy. The Cybersecurity Controls Framework and Policy, along with associated rules and corporate procedures support a governance program for the protection of both customer and system information and data. The governance program and associated controls are based on industry best practice, as well as legal and regulatory obligations.

As indicated throughout this filing, the Companies, as the DSP, will have increasing dependences on third parties. New product and service offerings will be provided by third-party suppliers. The Companies participate in the AVANGRID Third-Party Risk Management Program which requires that information/data is classified, based on criticality and requires that all third parties validate that they have the protections in place to secure that information/data. This includes collaboration among the Companies' cybersecurity, legal services, business areas and procurement, ensuring that the risk management process applies to all third parties who have contractual relationships with the Companies. The process includes a standardized procedure for identifying, assessing, and mitigating security risks that can be introduced at the vendor level.

All contractual relationships the Companies engage in with third parties must include a Security Requirements section that documents a comprehensive Cyber Security Plan (CSP) describing the cyber security controls and requirements implemented to safeguard information/data against cyber threats. The plan must include controls that reflect our commitment to the protection of customer and system information/data from disclosure or harm.

VIII.
TECHNOLOGY PLATFORM

VIII. TECHNOLOGY PLATFORM

The Companies' Technology Platform is the integrated set of technology investments that enables the DSP to maintain safe, reliable, and efficient operations, while supporting the ability to connect and integrate a large number DER.

A. INTRODUCTION

The goal of our Technology Platform is to build an integrated set of technologies and systems that work together to support the Companies' business needs in an efficient manner. Certain foundational technology investments provide the granular data necessary to support all three DSP business functions: Integrated Planning, Grid Operations, and Market Services.

We apply a similar set of guiding principles that we apply to the development of Grid Operations functions and capabilities:

1. Develop an integrated solution, connecting multiple technologies, and leveraging existing corporate systems;
2. Incorporate DER-supporting technologies and systems;
3. Rely on a common, up-to-date, and accurate model of the grid and DER;
4. Integrate data integrity and management capabilities into all systems; and
5. Apply an open standards and interoperability strategy to retain flexibility for the inevitable evolution of technologies.

OUR APPROACH

Our Technology Platform development approach employs grid-, supply-, and demand-side resources to optimize value to customers and the grid and accomodate the largest number of DER. This approach will enhance reliability, resiliency, and safety, as well as align with state policy goals and meet the needs of the Companies, our customers, and the market. Deployment will take a stepwise "test, learn, and scale" approach to efficiently and effectively deploy new and maturing technologies.

The design of our Technology Platform begins with a list of technology requirements for the DSP, reflecting the capabilities identified in the previous sections.

The remainder of this chapter focuses on technology investments that enable DSP functions in order to integrate large numbers of DER and operate the grid. The Companies and other Joint Utilities have relied upon the next generation system platform ("DSPx") developed by the United States Department of Energy's Office of Electricity Delivery and Energy Reliability (DOE-OE), with guidance from the New York Public Service Commission, the California Public Utilities Commission, and other industry stakeholders. The DSPx concept creates a "line of sight" from the business area needs to technology investment requirements.

B. DSP TECHNOLOGY REQUIREMENTS

The technology requirements support capabilities in each of the three DSP functions. Integrated Planning business functions rely on technology investments to collect and manage customer and system data to perform planning analyses. Grid Operations requires new technologies to accommodate high DER penetrations and to monitor and operate the distribution system on a real-time basis in order to maintain power system stability, power quality, resiliency, and reliability of service. Market Services requires technology enhancements to engage customers with new products and services, communicate customer and system data securely to market participants, and to support more complex market transactions and settlement that will develop as the market functions evolve.

FUNCTION	REQUIREMENTS
INTEGRATED PLANNING	
DER and Load Forecasting	• Granular historical load and generation information for each element of the network (substation, distribution circuit, customer premises) and for all DER • Installed DER characteristics *(i.e., DER type, performance attributes and location)* • Forecasts of load and DER (along the distribution circuit and by type of DER)
Hosting Capacity	• Power flow, power quality and fault analysis along circuits • Hosting capacity maps, updated frequently
Interconnection	• Dynamic power flow analyses including scenarios that combine system loading, DER penetration, and changes in power flow, power quality, and fault analysis. • Online interconnection application and automated evaluation screens
Non-Wires Alternatives	• Screening process to identify potential NWAs • Benefit cost analysis that assesses system need and related infrastructure costs, alternative DER resource costs and optimization
Integrated Planning	• Up-to-date network configuration, including DER, to support power flow modeling • Automated and secure data flows among Integrated Planning functions
GRID OPERATIONS	
Measure, Monitor, and Control	• Measure and monitor grid and DER performance attributes • Real-time operational visibility of the entire grid and connected DER • Ability to actively manage grid equipment and DERs to optimize distribution system performance
Grid Optimization	• Real-time power flow, feeder optimization, VVO, and FLISR, including DER • Constraint and contingency management, including DER
DER Management	• Real-time control and coordination of all types (DG, Storage, DR) and sub-types (Photovoltaics, wind, Combined Heat and Power, battery, flywheel, Direct Load Control, etc.) of DER by location *(e.g., transmission node, substation, bus, distribution circuit, etc.)*
ISO- DSP Coordination	• Coordination of power flows across the transmission nodes[73] and distribution interface between the DSP and the ISO including coordination, scheduling, and managing of distributed DER • Day-ahead communication of expected loads and DER output to NYISO • Coordination of DER activation
Outage Management	• Outage and fault detection • Reconfigure distribution circuits • Customer notifications

73 *Transmission nodes are locations identified on the NYISO grid model that is used to support transmission planning and operations. In order for NYISO to model and consider DER impacts on and value to the New York transmission system; they need to be able to "map" each DER connected to the distribution system to the applicable "node" on the New York transmission system.*

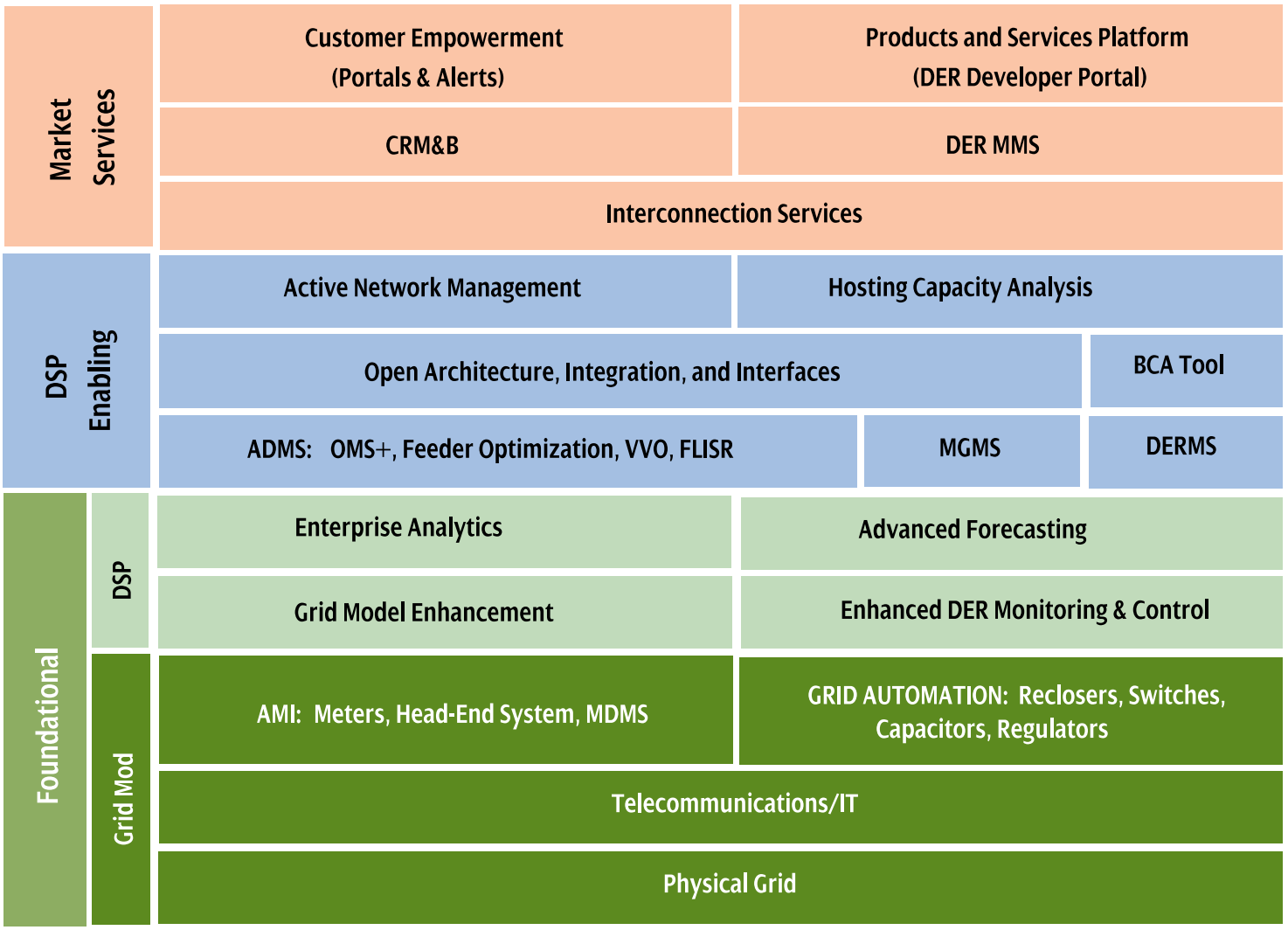
FUNCTION	REQUIREMENTS
MARKET SERVICES	
DER Sourcing	• Enable DER to provide services as an alternative to distribution capital or operational costs • Support DER sourcing through NWA procurement, Energy Efficiency, Demand Response and the VDER tariff that is under development; future sourcing capabilities could include price signals and innovative rates
DSP Programs	• Enrollment and management of DSP program offerings including the ability for customers to compare, enroll and manage participation • Current programs include Energy Efficiency and Demand Response; future programs include innovative rate designs. • DER aggregation services support DER sourcing
Products and Services Platform	• Information exchange between ISO, DER developers, and the DSP • Shared market information will evolve with more granular, detailed information and more sophisticated analytics capabilities • Existing and future portal communications include hosting capacity maps, Interconnection Portal, NWA portal, EDI and Green Button Connect.
Customer Empowerment	• Information exchange between customers and the DSP or via the DSP on behalf of third parties • Support customer engagement, education, and participation in programs, as well as outage information • Existing or future sharing mechanism include Energy Manager, Smart Solutions, Green Button Connect, and outage notifications
Market Settlement	• Includes the governance of DER-related contractual, program or tariff obligations and the related transactions; transactions could include performance verification, credits, and charges for DER and other services • Market settlement capabilities will evolve with Market Services functions

C. THE TECHNOLOGY PLATFORM

As shown in Figure VIII-1, certain technology investments are foundational because they support all three main DSP functions: Integrated Planning, Grid Operations and Market Services. These are located at the bottom of the diagram in green boxes.

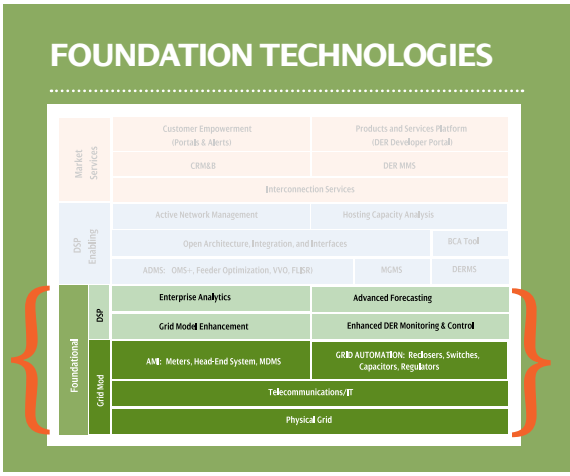
The blue (middle) part of the diagram identifies DSP enabling technologies that build from the foundational components and support the reliability, DER integration, and DER value optimization in an increasingly complex grid. The orange (top) section of the diagram presents technologies that support market functions, including capabilities to provide more options to and share more information with customers, DER owners and operators, and third-party providers. We will discuss each of these layers in turn.

FIGURE VIII-1: TECHNOLOGY PLATFORM[74]



1. Foundational Technologies

There are two categories of foundational investments. First, grid modernization investments provide the raw, granular, time-differentiated data required by DSP enabling technologies. By doing so, they enhance the reliability and operation of the grid and enable new tariff offerings. Second, foundational DSP technology investments process, analyze, and format this data for use by DSP enabling technologies that accommodate and optimize the contribution of large numbers of connected DER.



a. Foundational Technologies: Grid Modernization

The foundational grid modernization technologies improve the reliability, resiliency, and automation of the transmission and distribution system, thus contributing to a more efficient grid. There are three foundational grid modernization investments: AMI, Grid Automation, and Telecommunications/IT. As described below, they provide operational and customer benefits, while also supporting DER integration. These three grid modernization investments contribute to resiliency and complement our recently announced system hardening and other resiliency investments.

74 *This graphic is adapted from DOE-OE's Modern Distribution Grid, Volume III, Figure 8, p. 26.*

i. Advanced Metering Infrastructure[75]

Implementation of full-scale AMI is a foundational system for the DSP. The AMI project will include installation of intelligent or smart meters, including new electric and gas meters and new gas modules to be retrofitted on existing gas meters, a supporting telecommunications network and IT infrastructure comprised of diverse communications solutions (*e.g., radio frequency, cell, fiber*), and software applications to process data and interact with field devices. In addition, the telecommunications network will provide a channel for grid automation. Specifically, NYSEG's and RG&E's AMI system will enable:

- a new customer information data stream consisting of granular consumption data that will support time-varying pricing and other innovative rates that have the potential to reduce energy costs for customers;
- a web portal[76] that communicates energy usage to help customers make better decisions about their DER investments and energy purchase options;
- a new enterprise analytics system to use energy consumption and grid performance data to plan and operate the distribution grid more efficiently;
- real-time outage and power restoration notifications that yield a more reliable and resilient distribution grid; and
- operational efficiencies by enabling grid automation functions closed-loop (such as VVO).

AVANGRID is well prepared to install AMI meters and the communication network over a four-year period beginning in 2019. We have deployed approximately 12,300 electric and 7,600 gas AMI meters in our Energy Smart Community. This experience has informed the development of our statewide deployment plan.

AMI will benefit customers by providing large volumes of granular usage and event information to optimize customer value through demand response and energy efficiency programs, as well as Time Varying Pricing and future innovative rate structures.

Customer information will be integrated into customer facing applications enabling customers to better manage their electricity and gas usage and energy bills and improve our system operators' situational awareness. Additional benefits include decreased estimated readings, incremental energy savings by utilizing energy management made possible with AMI; integration of AMI with the Companies' Outage Management System to reduce outage duration and customer outage costs; and the potential creation of innovative energy- and cost-saving programs by customer sharing of granular usage information with third parties, with permission. Investment in AMI is aligned with AVANGRID's commitments to carbon reduction, clean energy, energy efficiency, and technology innovation.[77]

ii. Grid Automation

Automation elements are comprised of circuit breakers, distribution reclosers, transformer load-tap changers, voltage regulators, capacitor banks, switches, and supporting telecommunications networks that allow the Companies to measure and control power flows on distribution circuits in response to system conditions and events.

The Companies' vision is to have all distribution control devices automated. Automating these devices will provide Supervisory Control and Data Acquisition visibility, system metering, alarm notifications, and remote-control capabilities to grid operators, resulting in reduced customer outage minutes, fewer field crew truck rolls, and increased system efficiency.

75 *See Appendix A, Topic 11 for more detail on our plans to implement AMI.*

76 *Energy usage data available to customers through NYSEG's ESC Energy Manager and RG&E's Energy Marketplace. See Appendix B for more details on the Companies' tools available for DER developers and customers.*

77 *Please refer to Appendix A, Section 4.11 for more detail on our AMI investment.*

Grid Automation will result in efficiency gains through remote troubleshooting and analysis; timely outage response; reduced energy losses from improved power factor and voltage control; and increased visibility, control, and optimization of DER on the grid.

The Companies are planning a three-stage Grid Automation program to allow for iterative system improvements through applying lessons learned during the program rollout.

LEVEL I: Automate all distribution substations and three-phase distribution reclosers. This automation provides remote visibility of these critical devices to SCADA and OMS. This initiative will allow our system operators to view alarm notifications and unplanned operations, and allow remote control of these devices to restore outages in a timely manner. This will result in faster outage responses, reduced outage minutes, reduced truck rolls, and reduced on-site crew time for restoration activities.

LEVEL II: Automate all distribution regulators, capacitors, circuit tie switches, and sectionalizing switches, to enable VVO, feeder optimization, and FLISR applications. By enabling VVO, the system will be able to automatically manage the voltage and VARs, adjusting settings on these devices based on real-time information collected from the automated devices.

LEVEL III: Automate all single-phase distribution reclosers to further increase situational awareness and granularity of control.

The Companies have been implementing the first two phases of Grid Automation and are planning the third phase. Automation is nearly complete in our Energy Smart Community project.

iii. Telecommunications/Information Technology

A telecommunications network is required to support both AMI and Grid Automation. Both projects require the telecommunications network to process data and interact with field devices. The telecommunication network will:

- include diverse communications solutions *(e.g., radio frequency, cellular phone, microwave frequency, fiber optics, leased circuits)*;
- allow us to remotely access and control devices on the grid;
- transmit data on the performance of installed DER and support our DR programs;
- communicate with Remote Terminal Units and equipment at substations, providing better visibility into substation operations; and
- provide real-time situational awareness that will reduce outages and improve response time.

The Companies plan to build and/or lease the telecommunications infrastructure. This involves the strategic addition of fiber optic, microwave links, and digital radio capability, depending on security and cost effectiveness of each application. Additionally, the Companies will erect towers to support radio frequency communication with the ECC from remote locations.

Construction of a system-wide communication network is expected to improve capital efficiency by connecting individual devices, provide for higher device availability, and reduce customer outage durations.

In anticipation of AMI, the Companies are prepared to engineer, procure, and construct a telecommunications network across territories to support automation and AMI efforts. As a common network is deployed, additional nodes and services can be added with minimal incremental cost. The Companies will work with telecommunications providers to determine the most cost-effective approach to achieve our objectives. These communication links are vital to realizing the benefits of automating our substations and distribution system.

b. Foundational Technologies: DSP

There are four foundational DSP technologies that support the three primary DSP functions: Grid Model Enhancement, Enhanced DER Monitoring and Control, Enterprise Analytics, and Advanced Forecasting. These foundational technologies will support the following capabilities:

1. Ability to record and measure grid metrics and DER output and performance;
2. Operational visibility of the distribution grid and integrated DER;
3. Ability to monitor and control grid equipment and DER;
4. Analytical capabilities to analyze raw data and include locational information;
5. Development and maintenance of network, load, and DER models for power flow analysis; and
6. Granular load and DER forecasts.

i. Grid Model Enhancement Project

The comprehensiveness and quality of information for grid assets and DER is becoming more critical as more granular and locational data is required to operate the grid. The DER database supplements the grid model by providing the DER characteristics and location on the grid. Automation and AMI provide the temporal load and DER model. The GMEP will support defining and maintaining a complete model of resources and assets on the grid. The power flow model also requires phasing information for all grid model elements. AVANGRID plans to use our existing Geographic Information System (GIS) as the system of record for most GMEP data. The result of the GMEP will be a complete distribution model including network load and DER characteristics. **The information in the GMEP will feed the Distribution Planning Tools to support effective planning (including NWA analysis), to calculate hosting capacity, and to analyze interconnection requests. The data will also feed the ADMS as the basis for power flow calculations for optimization and congestion management. The GMEP project includes:**

- A data needs and gap analysis for Integrated Planning and Grid Operations;
- A compilation of data requirements to be verified and/or captured via survey and through other technologies, including AMI;
- A data map to determine the system of record for the data captured by field surveys;
- Data Governance;
- Data quality verification;
- A compilation of documents to forward to the procurement group in order to release a field survey Request For Information. The information received will be used to determine the feasibility and viability of combining this survey with the existing inspection programs;
- Identification of resources needed to perform a field survey pilot on two distribution circuits within the ESC; and
- Upgrade to an existing inspection application that to will be configured and used for the Field Survey.

The GMEP will initiate a 5-year survey starting in 2019. A data governance and data quality verification pilot project is also being developed for completion by year-end 2018.

ii. Enhance DER Monitoring and Control

In order for DER to provide retail services and to host DER at the levels specified in State policy and objectives, DER will need to be actively managed. This means that the watts, VARs, and voltage supplied by these resources will have to be managed within grid limits, to optimize the grid, and to maximize the value of the DER. With this in mind, the Companies have launched innovation projects to demonstrate these capabilities at the lowest cost possible to stakeholders.

In an effort to allow for greater optimization and higher hosting capacity, AVANGRID has two short-term M&C initiatives. The first is the Enhanced DER M&C innovation project for community-sized resources. Traditional point-of-connection reclosers provide metering and monitoring, but no management capabilities for DER. The Enhanced DER M&C project will add capabilities to manage the output of DER to increase hosting capacity, grid efficiency, and DER value.

The second is the Smart Inverter-Smart Meter (SI-SM) interface proof-of-concept project for small *(i.e., behind-the-meter)* DER. AVANGRID will perform a proof-of-concept interface for integrating smart inverters where these resources are used to optimize voltage and VARs through a project partnering with Rochester Institute of Technology.

The functionality of the project is planned to trial three levels of integration:

STAGE 1 (METERING): record inverter AC output data synchronized with the net metering data. This will allow disaggregation of the net metered data into load and DER for planning, operations, and forecasting.

STAGE 2 (MONITORING): Include inverter status and alarms (online/offline, errors/faults, control mode, set-point) for increased situational awareness and operational planning.

STAGE 3 (COORDINATION AND CONTROL): Provide two-way communications to send control mode, set-point, and curtailment commands to DER. This potentially allows net-metered DER to participate in ancillary *(e.g., VVO)* services and reliability (flexibility) programs. The SI-SM interface and Enhanced DER M&C projects seek to solve the issue of integrating DER into grid solutions. AVANGRID is also interfacing with third-party aggregators and testing these concepts through both behind- and in-front-of-the-meter energy storage demonstration projects to improve power management. Over the longer term, AVANGRID plans to fully align its M&C advances with other advanced grid functions, such as ADMS, DERMS, and VVO.

iii. Enterprise Analytics

The development of the DSP platform will introduce a variety of new granular data from AMI and Grid Automation, including:

- sub-hourly customer consumption data and voltage data from smart meters;
- status, grid metering, and event data from automated grid devices;
- interval measurements of service conditions on distribution feeders from smart sensors; and
- metering, monitoring, and control information from DER.

As the volume of data collected increases in magnitude and diversity through the platform investments, we recognize the importance of leveraging data management, business intelligence, and advanced analytics to extract insights from this data.

Increased analytics capabilities will be required for nearly all areas of the DSP. Integrated Planning, Grid Operations, and Market Services functions require the availability of vast amounts of varied data and powerful tools to extract valuable information from multiple datasets.

A team comprised of our subject matter experts from IT, Electric Operations, Customer Service and AMI, Asset Management and Planning, Smart Grids, Energy Smart Community, and Grid Modernization business areas defined an Analytics Roadmap to identify, prioritize and select initial use cases using the following methodology:

- Identifying and prioritizing use cases;
- Selecting initial "Golden Use Cases" to be implemented by 2020;
- Preparing a Technology Architecture and Infrastructure Roadmap to support the implementation of the use cases; and
- Implementing of a Proof of Concept to demonstrate delivery capability and gain experience applying the roadmap.

We have begun efforts to deploy four of the use cases using a structured and value-driven approach to be completed in approximately two years. The outputs will include in-depth Use Case deployment, technology architecture and infrastructure hardware and software deployment, and a comprehensive data governance deployment that aligns with the Companies requirements, and ensures data quality for internal and external users.

iv. Advanced Forecasting Tools

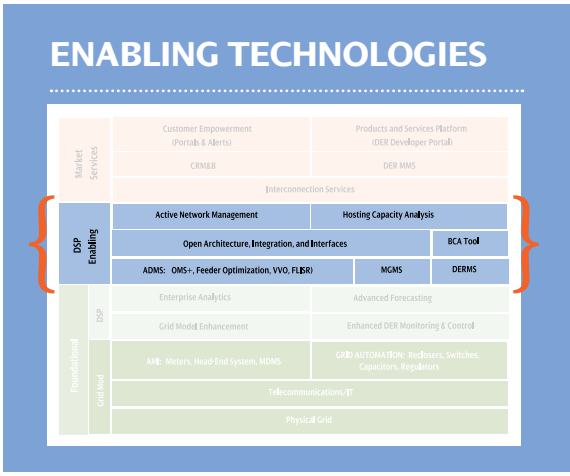
This project will provide the capability to accurately forecast load, generation, storage, and demand response resources to support modeling for ongoing Integrated Planning. In addition, adoption rates of EVs will need to be forecast as well.

The load and DER forecast will be used for distribution planning, interconnections analysis, outage scheduling, and day-ahead planning. Integral Analytics' LoadSEER software has been installed and is being used to analyze 15 circuits in the Energy Smart Community. The analysis will be updated with a year's worth of AMI data at the end of 2018. Other load forecasting tools are also being explored in the ESC. Based on the assessment and scalability plan from the ESC, the Companies will assess which technologies would be deployed at scale.

2. Enabling Technologies

The technologies included in Enabling Functions build from the foundational Technology Platform. Some of the business function characteristics addressed by Enabling Functions includes:

- Power flow, power quality and fault analysis down to each feeder segment;
- Dynamic analysis including scenarios that combine system loading with DER penetration with changes in power flow, power quality and fault analysis;
- Screening process and assessment to determine potential for NWA;
- Benefit cost analysis that assesses system need and related infrastructure costs, alternative DER resource costs and optimization;
- Prevention of interruptions to electric service and restoration of service as quickly as possible including increased visibility on outage, outage predictions and improved crew dispatch; and
- Processes and systems to achieve the reliability performance.



Appendix E presents a diagram of the technologies that will enable DSP performance.

The following DSP enabling technologies are being deployed to help meet the requirements for DSP 2.0 as discussed in the DSP long-term vision chapter.

a. Advanced Distribution Management System

The ADMS is comprised of a suite of applications that are required to operate a highly dynamic grid, working in concert with a DERMS. A key capability of the DSP is the ability to plan, monitor and control all DER connected to the distribution grid in order to ensure the reliability and resilience of the network. Our objective is to consider all DER connected to the distribution grid, regardless of size, for voltage and VAR support for system efficiency, reliability, and safety. This will require that the DSP be aware of all DER in the system, their grid connection, potential grid contributions, control capabilities *(e.g. direct control or through third-party providers, telecommunication protocols, etc.)*, and market program incentives or constraints that may impact the ability to control the resources. **The ADMS will provide real-time circuit optimization, DER monitoring and control with applications such as:**

- Distribution state estimator and power flow capabilities to detect system issues under current or forecast system conditions (and to verify alternative system configurations and dispatches will resolve these issues);
- VVO to increase system efficiency and hosting capacity;
- Optimal Feeder Reconfiguration to recommend changes to the grid configuration based on current or forecast system conditions; and
- FLISR to automatically reconfigure the grid and restore power to the maximum number of customers following a system event utilizing automated devices at key points in the distribution system to detect outages, isolate the faulted areas and restore service. These capabilities reduce outages and improve reliability.

The ADMS tool suite also enables study-mode and advanced pre-switching validation. This enables more informed decision-making by the grid operator.

The new ADMS is being deployed and is being tested in the ESC. The ESC ADMS is testing this functionality to support DER integration at scale. Starting in 2019, we plan to integrate the ADMS system-wide.

b. Distributed Energy Resource Management System

The DERMS optimizes the dispatch of the various DERs including storage and demand-side management assets in response to system needs and market signals by network topology location, and within applicable resource and program limitations. The DERMS also has the capability to aggregate and disaggregate dispatch directives to the appropriate locations on the grid as needed for local, nodal, or global conditions (utilizing the IEEE-2030.5 group management functionality). The DERMS will be supported by a DER database that stores the location, interconnection details, type, capacity, charging/discharging rate, state of charge, monitoring and control capabilities, planned connection date, and connection status among other information. A DERMs can increase the value provided by DER, increase the efficiency of DER programs, and improve grid performance and efficiency. To do this effectively, the DERMS needs to be aware of the location and electrical characteristics of the resources on the network that contribute to load, generation, and storage in order to ensure power quality, and to enhance energy efficiency. Most importantly, the DERMS needs the ability to manage and adjust the DER to meet grid needs and to maximize DER value.

DERMS will also have the flexibility and scalability to interact with multiple third parties *(i.e. individual customers and aggregators)* for dispatching and grid services provided by DER.

The DERMS will be developed after the ADMS is fully integrated and will be driven by increasing levels of DER penetration and market development. DERMS development is forecast in the long-term (2020+) timeframe.

c. Microgrid Management System (MGMS)

The timing of this system will be driven by the increase in installation of community microgrids. Currently,

microgrids generally exist outside of the Companies' purview and primarily serving one customer, but from a technical perspective, when microgrids start serving multiple customers over the distribution network the Companies may have an obligation to ensure reliability and service even while islanded. MGMS will require increased levels of monitoring and control above DERMs capabilities to ensure proper voltage, frequency, load balance, and power quality while islanded, while separating, and while re-synchronizing with the grid. The MGMS will likely be built as an enhancement to the controls and capabilities in DERMs. We do not expect to develop the MGMS until after 2020, based on the timing and number of community microgrid developments.

d. Open Architecture, Integration and Interfaces

Given the reach and complexity of the DSP, the maturity of some of the DSP technology, cyber security, data privacy, and the rapidly evolving DSP and market design, it is critical to construct the platform in the most thoughtful, open, and interoperable manner. Many internal and external interfaces must be specified and system functional requirements must be coordinated. As such, the Companies have launched an effort to architect the platform with the guidance of architecture and integration experts.

e. BCA Tool

The BCA tool is a tool that facilitates benefit-cost analyses required to support significant REV investments. It was developed by the Joint Utilities in compliance with orders issued by the Commission.[78] The calculations are performed as specified in a BCA Handbook. A link to this handbook is provided as Appendix D.[79]

f. Active Network Management

ANM is a control system for managing DER within system limits in real-time. ANM allows increased DER hosting capacity by incorporating various smart grid components (such as regulators, capacitors, sensors, and switches) and managing the DER watts, VARs, and/or voltage within system limits. ANM has the potential to provide a viable alternative to conventional grid integration procedures and may be a valuable tool for achieving the levels of DER adoption on the grid that are necessary to achieve the State's goals. Thus, ANM, as piloted by the FICS innovation project, is an important part of our role as the DSP provider.

g. Hosting Capacity Analysis

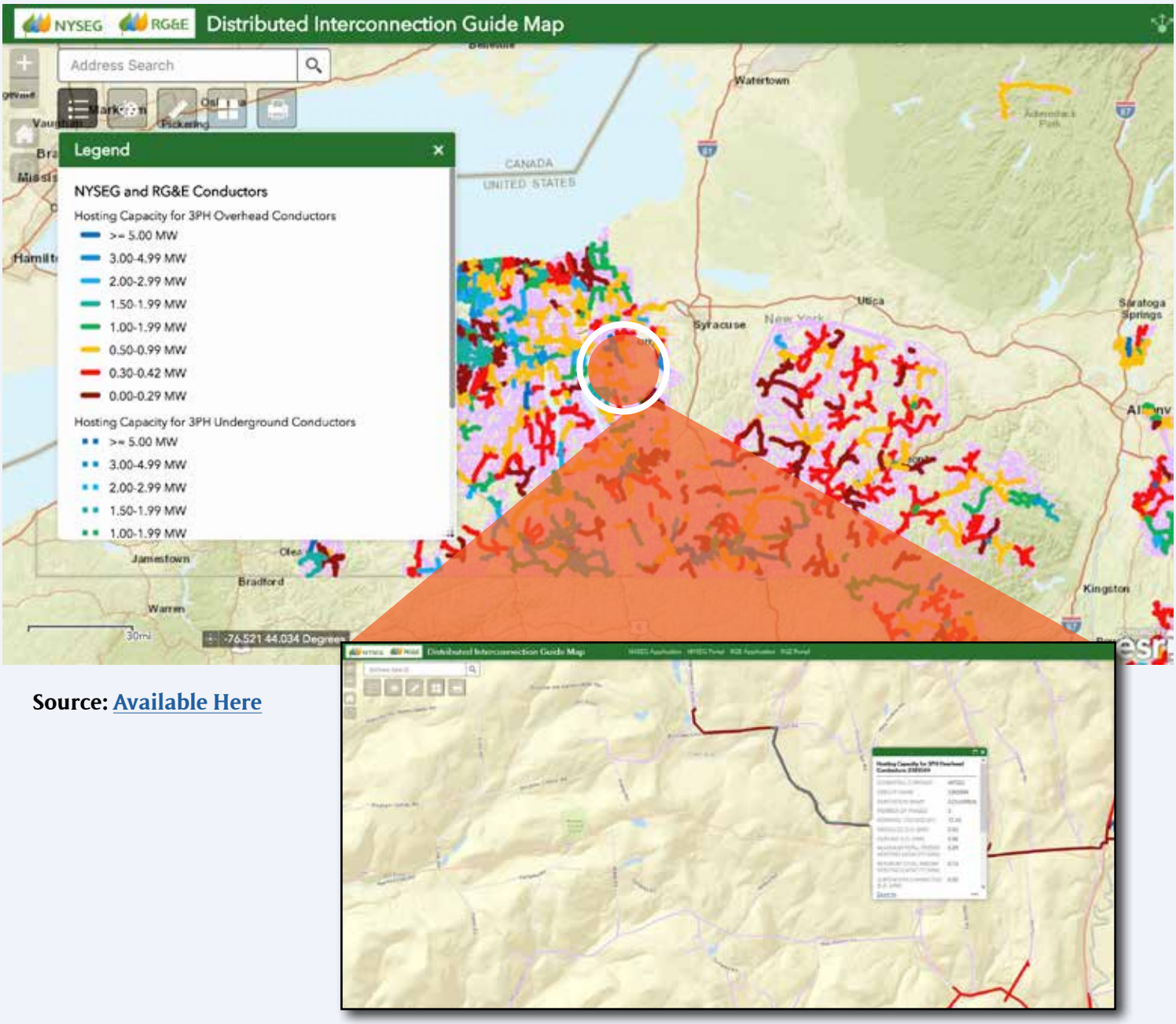
AVANGRID has developed the first two stages of a hosting capacity tool including estimates for all radial distribution circuits. Future developments of the hosting capacity tool, will include more granular information including circuit- and segment-level information. The technology foundation for the hosting capacity analyses is the EPRI DRIVE™ tool[80]. Over the course of the next 3-4 years, the Companies will continue to increase the granularity of hosting capacity analyses, and include the 8,760 forecasts, and queued DER interconnection requests.

The DSP must be able to determine the amount of DER that can be accommodated without impacting power quality or reliability under existing control and infrastructure configurations. This amount of DER is referred to as the hosting capacity. The results of planning studies are key drivers for utility decisions to invest in capital projects to reinforce the distribution system. Accurate planning studies require accurate load forecast data and, with the increasing penetration of DER, accurate DER forecast data. The approach to determining hosting capacity will use the EPRI Streamlined Methodology for Characterizing Distribution System Hosting Capacity for Distributed Energy Resources. This information is provided in a geospatial view to produce a DER "heat map", which is available to external third-party providers.

78 *April 26, 2016 Order Adopting Distributed System Implementation Plan Guidance, p. 64: "shall file subsequent Distributed System Implementation Plans on a biennial basis beginning June 30, 2018."*

79 *Refer to Appendix C for a link to the Marginal Cost of Service (MCOS) Study.*

80 *The EPRI DRIVE tool was developed to estimate hosting capacity. The DRIVE tool was chosen to support further alignment and a common approach across the Joint Utilities, as it leverages existing circuit models in a utility's native distribution planning software to carry out a streamlined analysis of hosting capacity. The Joint Utilities remain engaged in EPRI's DRIVE User's Group and continue to raise areas within the DRIVE tool that require future enhancements to meet both utility and stakeholder interests.*



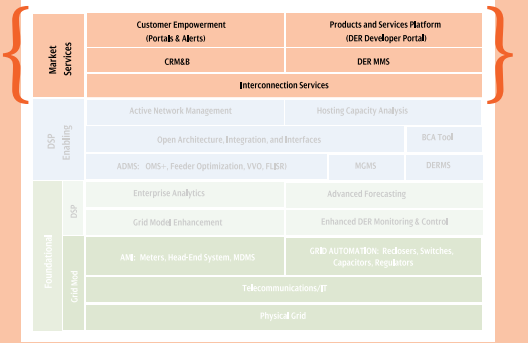
Source: [Available Here]

3. Market Services Technologies

Market Services includes the capabilities to share more information and options for customers, DER owners and operators, and third-party providers. Some of the business area characteristics addressed by the market enablement technologies include:

- Information exchange among NYISO, DER developers, and the DSP;
- Information exchange between customers and the DSP or via the DSP on behalf of third parties;
- Capabilities to support customer engagement, education, and participation in programs as well as outage information; and

MARKET SERVICES TECHNOLOGIES



- Governance of DER-related contractual, program or tariff obligations and the related transactions; transactions could include performance verification, credits, and charges for DER and other services.

a. Interconnection Services

The interconnect portal provides information for DER developers to easily file for interconnection onto the Companies' systems[81]. A number of process improvements will be made in order to automate some of the screenings in order to expedite the review process. This portal will also be integrated with a DER database that will allow NYSEG and RG&E to keep track of all DERs in the queue, being constructed and on the system. Future features will include a SIR administration tool, automatic screening analyses, and flagging of projects for Active Network Management analysis. AVANGRID recently completed a proof-of-concept of these functionalities as a NYSERDA PON 3397 project.

b. Customer Relationship Management and Billing System (CRM&B)

Upgrading the existing SAP customer service application to a CRM&B system will provide an individualized customer experience, which the Companies expect will increase customer engagement and satisfaction. The CRM&B component of the AMI system will enable more comprehensive billing options and the flexibility to report price and billing data to customers. It will also enable time-varying price rate design programs, improved outage management, and faster response times for service change requests.

c. Distributed Energy Resource Market Management System

The DER MMS will help manage settlement and market transactions as a full distribution-level transactive market is developed and in place. It is envisioned that with increased levels of DER, and mature DER products and services transacting on the distribution system, a DER MMS will be required to manage the market and track transactions, perform market clearing, support measurement and verification, and settle transactions. Like the MGMS, the DER MMS will build on the capabilities enabled by the DERMS after 2020.

d. Customer Empowerment

The Customer Empowerment project includes Energy Manager/Green Button Connect, Smart Solutions, communications including calls, emails, and texts for alerts like usage and outages. ESC customers can access information on energy usage and energy efficiency, demand response, and other programs the Energy Manager portal. RG&E customers can access energy savings programs and other customer services through the Your Energy Savings (YES) portal[82] and NYSEG's Smart Solutions portal is an online marketplace to connect customers with DER developers.[83]

e. Products and Services Platform

Since the 2016 DSIP, the Companies updated or launched a number of system data sharing portals to support system sharing. Our portals are identified in Figure VIII-2.

81 See Appendix B for more details on the Companies' tools available for DER developers and customers
82 IBID
83 See Appendix B for NYSEG Smart Solutions link.

TABLE VIII-2: SYSTEM DATA SHARING PORTAL

INFORMATION PROVIDED VIA PORTALS	
Hosting Capacity	Feeder level hosting capacity for analyzed feeders[85]
Interconnection Portal	Interconnection application and status[86]
System Data Portal	Links to key system data information including portal links, filings and system reporting[87]
NWA Portal	NWA project summaries and status[88]

The Companies will continue to focus on updates to its data portals, as well as refining and/or expanding system data use cases to better meet stakeholder needs. For example, the Companies are investing in technology and systems to acquire 8,760-hour annual load data at substations, along circuits, and at customer premises to improve the accuracy of its hosting capacity. We will also need to update our hosting capacity and interconnection portals and system data to incorporate the latest requirements from the SIR.

D. STAGING OF TECHNOLOGY INVESTMENTS

The DSP functions and characteristics reflect the envisioned DSP evolution that requires technology investments for current and future requirements. The timing of technology needs will be influenced by the evolution of functional requirements, as determined by:

- DER penetrations;
- Market and operational complexity;
- Number of transactions;
- Granularity of information *(i.e., location and time dimensions)*;
- Transaction and response speed *(e.g., real time response)*;
- DER Value realized *(e.g., through ancillary services)*; and
- Technology investments will be in line with these market development characteristics including DER penetration and market and operational complexity.

Our staging of functionality and supporting technology requirements is aligned with the discussion of DSP capabilities as described in the Chapter III presentation of the Joint Utilities' long-term vision.

DSP 1.0 will require grid modernization investments and foundational technologies that support grid reliability and operational efficiency. The characteristics of the foundational investments include increased visibility and controls, and more frequent and granular system information. These characteristics support future capabilities as the platform evolves.

DSP 2.0 will require enabling technology investments to support DER integration. These investments support the benefits of DER integration or value capture and build upon the technologies in DSP 1.0.

Our detailed staging plans reflect these general concepts but also align each investment with specific business area needs and reflect the time necessary to capture lessons learned from our Energy Smart Community and other innovation projects. In addition, our plan reflects the many interrelationships among technologies. Finally, we are not

84 See Appendix B for hosting capacity map.
85 See Appendix B for NYSEG interconnection portal.
86 See Appendix B for system data.
87 See Appendix B for NYSEG NWA opportunities.

developing the Technology Platform in a linear fashion. Rather, we are testing, designing, and building DSP components in parallel in order to deliver on policy goal timelines that have been established by the State of New York.

E. TECHNOLOGY RISK AND MITIGATION

The Technology Platform performs multiple functions including the compilation, analysis, and sharing of data that is critical for all three DSP functions. The Companies recognize and remain focused on the fact that the design and implementation of new technologies, such as those required to build an efficient, secure DSP, has potential risks that need to be planned for from the outset.

The three significant risks attributable to developing the Technology Platform, and our approach to risk mitigation are:

1) The integrated set of distribution system and information technologies need to be correctly specified and then implemented according to plan, recognizing that regulatory actions (or inaction) will need to be managed.

This first risk is being managed by the following mitigation activities:

- Develop master schedule and establish accountability
- Standardize solution alignment, linked to strategy
- Compile technology needs by business area and identify interdependencies among needs and technologies within DSP and with other corporate platforms and solutions
- Communicate consequences of delay to the PSC

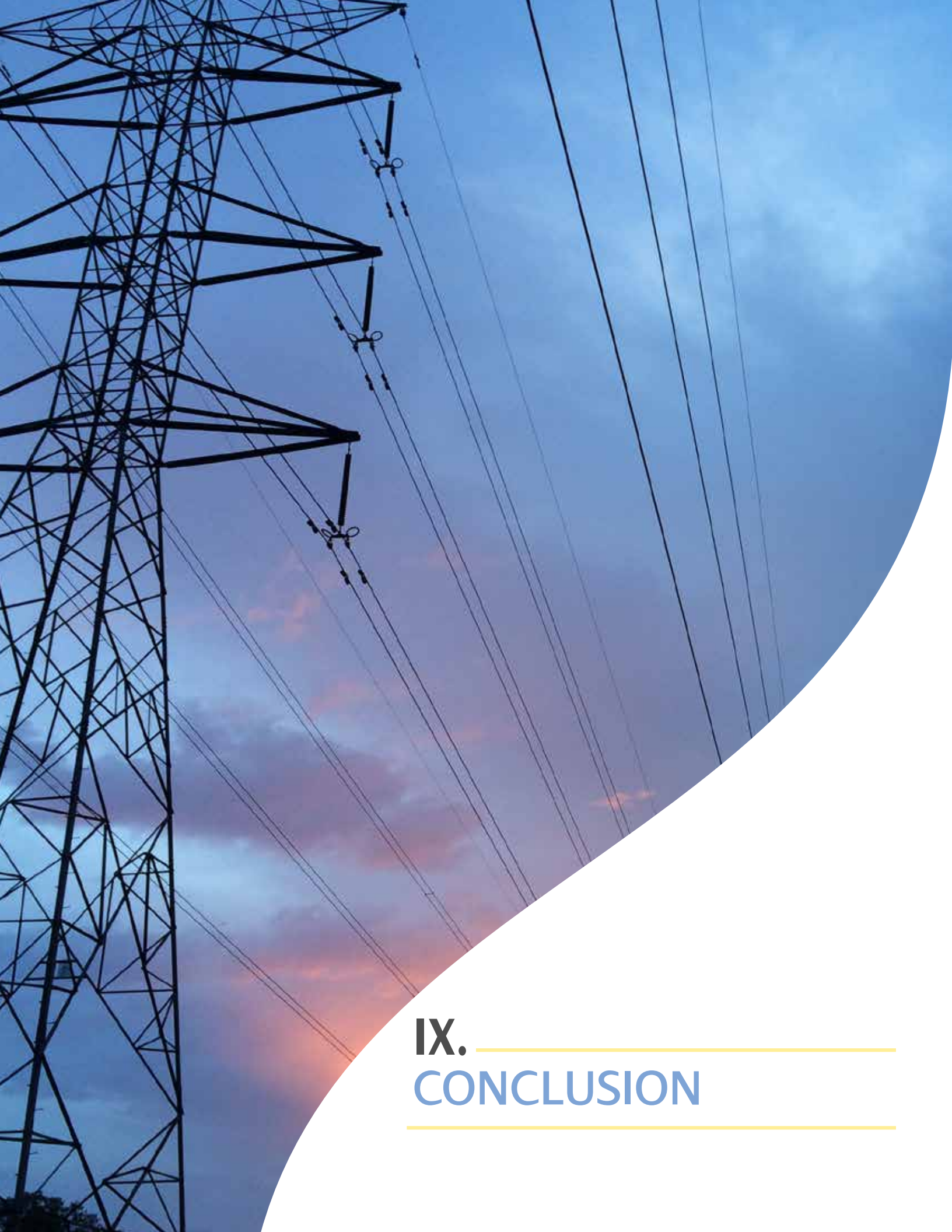
2) Technology obsolescence is a risk because of the recent and accelerated development of technologies that comprise our Technology Platform in response to the changes in the industry.

   This risk is being mitigated by our fundamental approach to building a global technology platform that reflects adherence to open standards and interoperability strategies wherever possible.

3) DSP performance will depend on the quality and security of data that is relied upon by the DSP, third parties, and customers to make decisions.

This third risk is being managed by the following mitigation activities:

- Design Grid Model Enhancement Project (GMEP) Phase 1 to incorporate governance and data processes and flows
- Clearly specify Enterprise Data Platform deliverables: data architecture, dictionary, flow diagrams, etc.
- Perform a data governance/data quality pilot roadmap for DER integration
- Build redundancy into AMI telecommunications infrastructure



IX. CONCLUSION

IX. CONCLUSION

The Companies – NYSEG and RG&E – have made substantial progress in building the capabilities necessary to perform as the Smart Integrator and the Distributed System Platform since our initial 2016 DSIP filing. Much of this progress has been made through collaboration with the Joint Utilities of New York, including outreach to our stakeholders to develop common approaches to our interactions with customers and third parties across New York State.

As we build our capabilities in the primary DSP functions, we are building a technology platform to support these functions and testing new models through our Energy Smart Community and other demonstration projects. Our innovation projects are providing lessons learned that inform our plans to deliver value to our customers and DER developers, while contributing to New York's clean energy policy goals.

We are designing and building our DSP to provide several benefits to customers

- Insights regarding their energy usage and the ability to evaluate and acquire solutions;
- Efficient access to products and services offered by third parties;
- Innovative pricing options and programs offered by the DSP; and
- Reliable, resilient, safe electricity service.

DER providers will have secure access to the Companies' customers, with their permission, with information and transaction support provided by us as their DSP provider. Our ability to perform market functions will benefit from testing of platform functions in our Energy Smart Community.

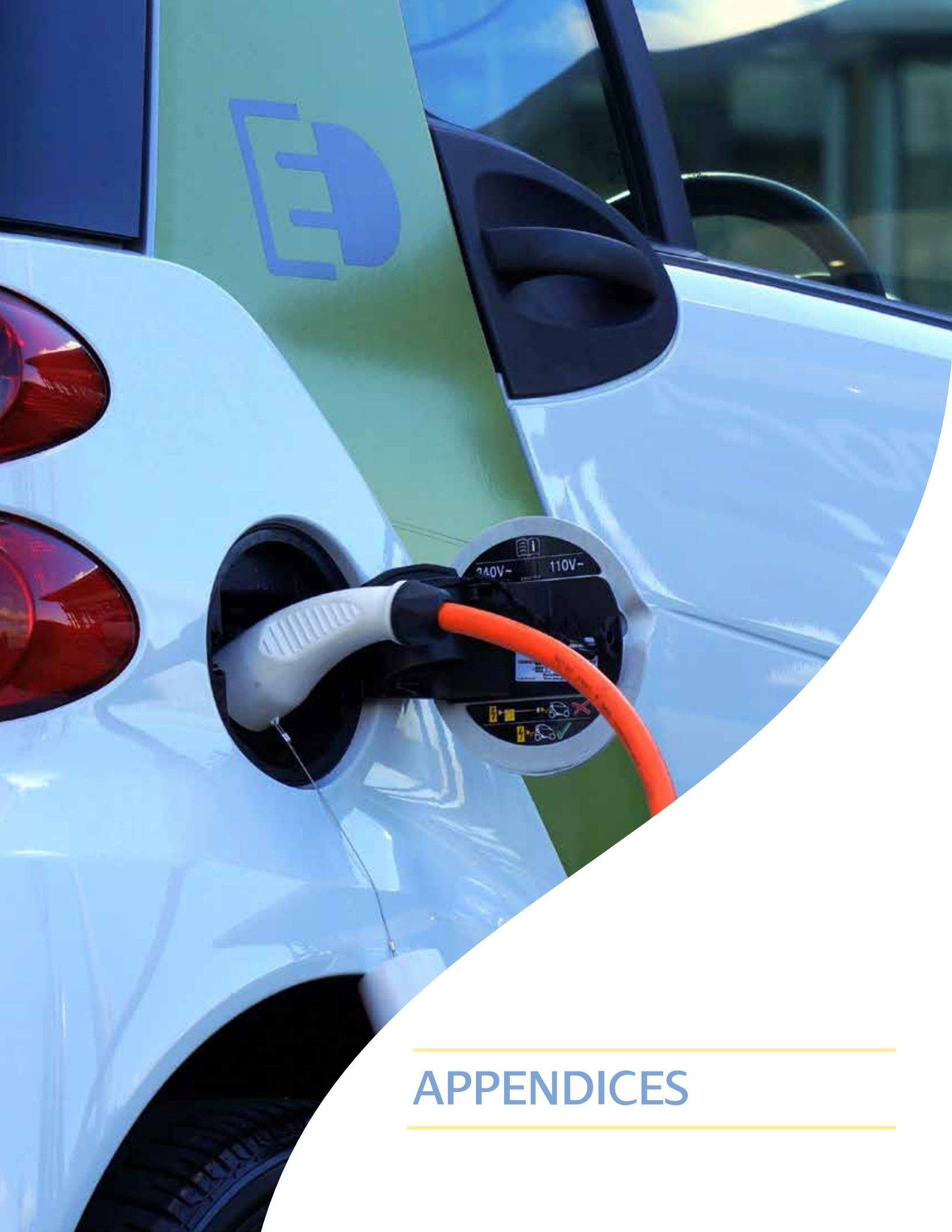
We will maintain or enhance reliability and other important service quality attributes including the quality of delivered power. We will operate efficiently and at the lowest reasonable cost to provide value to our customers and third parties, while maintaining the privacy and security of our customer and system data. Our innovation culture will allow us to anticipate and integrate new technologies as they become commercially available.

Having focused for the past two years on building foundational capabilities and testing our foundational technology in the Energy Smart Community, we are now in position to begin to integrate and deploy emerging technologies including electric vehicles and energy storage. We are building grid capabilities to support growth of EV throughout our service territories, and plan to support the proliferation of smart EV chargers. Similarly, we are focused on identifying ways that energy storage can support our grid operations and benefit end-use customers. We continue to focus on ways to improve our marketing of energy efficiency programs by and are preparing to leverage granular usage and system data as it becomes available beyond the Energy Smart Community with the deployment of AMI and other technologies.

Finally, we are explicitly considering ways to enhance resiliency through our approach to Integrated Planning, Grid Operations, and Market Services *(e.g., our approach to contracting for NWAs)*. We view resiliency as an absolute requirement for our customers, whose reliance on electricity for their health and wellbeing is only increasing. We look forward to continuing to engage with stakeholders to discuss our DSIP and to receiving your input and feedback.

Please contact us at NYSEG.PublicAffairs@nyseg.com with any comments or requests regarding this Distributed System Implementation Plan or our role as the Distributed System Platform.

Thank you for letting us share our story with you.



APPENDICES

APPENDIX A: DSIP GUIDANCE REQUIREMENTS

Appendix A addresses specific requirements identified in the Staff Whitepaper – Guidance for 2018 DSIP Updates, issued on April 26, 2018. It is being filed contemporaneously with this Report and can be downloaded from the Department of Public Service website by under the docket file for Case 16-M-0411 - In the Matter of Distributed System Implementation Plans.

APPENDIX B: TOOLS APPENDIX

The table below includes a list of NYSEG and RG&E tools and information sources available to third parties and customers. See Appendix A for additional information.

TOOL	DESCRIPTION	LINK
SYSTEM PLANNING		
Hosting Capacity Map Portal	NYSEG and RG&E have developed circuit-level hosting capacity and made it available to third parties on a portal.	Portal
DER Developer Portal	We intend to develop a single, one-stop DER Developer portal, that will address all interactions with DER developers with various information, data, and insights, subject to access rights that will be developed by working with DER developers and other stakeholders, including Staff. For example, certain information may be considered to be commercially sensitive and DER developers will want to restrict access to their own data if it can be used for competitive purposes.	NYSEG RG&E
Interconnections Portal and SIR Inventory	We continue efforts to update their database of connected DER and improve the quality and granularity of load data that are relied upon to perform interconnection studies, where such studies are required. In the interim, we have delivered a Phase I Interconnection portal. The queued and installed DG information are available through the SIR Inventory Information. The SIR pre-application information is available through the online application.	NYSEG RG&E NYSEG Queue RG&E Queue SIR Inventory email requests made to NYRegAdmin@avangrid.com

TOOL	DESCRIPTION	LINK
Non-Wires Alternatives	The portal includes capital projects included in NYSEG and RG&E's 2018 Capital Investment Plan (CIP) Filing that passed the NWA Screening Criteria	NYSEG RG&E
GRID OPERATIONS		
Outage Information	In an effort to improve reliability and resiliency, we provide outage information through our outage central portal.	NYSEG RG&E
SYSTEM DATA		
Joint Utilities' System Data Portal	The Companies, in coordination with the Joint Utilities developed a central data portal on the Joint Utilities' website in June 2017 with links to utility-specific web portals. The system data website includes utility-specific links to an expanded range of useful information.	Joint Utilities
MARKET SERVICES		
Customer Data	Customers have and will continue to have access to their data through our customer portal which is likely to be much easier and more reliable for customers than reading their own meter and tracking the usage.	Energy Marketplace Energy Manager
Smart Solutions	An online marketplace concept that tests ability to connect customers with DER developers	NYSEG
Utility Energy Registry (UER)	We, in coordination with the Joint Utilities, have developed standard electric and gas load aggregations grouped by Municipal Tax District and County. Municipalities, Community Choice Aggregation (CCA) Administrators, DER Providers, and Customers, will have access to these aggregations through the UER Portal administered by NYSERDA and their contractor.	UER Portal Not Yet Available

APPENDIX C: BENEFIT COST ANALYSIS HANDBOOK LINK

The updated BCA Handbook is available on the New York Department of Public Service website at http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={7CB8876F-D3A8-4AB9-BB09-CFA857C5791C}

APPENDIX D: MARGINAL COST OF SERVICE (MCOS) STUDY

The Companies are preparing updated Marginal Cost of Service Studies for NYSEG and RG&E based on the methodology described below. The updated studies will be posted on the NYSEG and RG&E websites, respectively, as soon as they are completed. They will replace the current MCOS that are posted on our websites.[88]

Description of Methodology Used to Determine Marginal Costs on a System-Wide and Locational Basis
Distributed System Implementation Plan - July 2018

INTRODUCTION

New York State Electric & Gas Corporation ("NYSEG") and Rochester Gas and Electric Corporation ("RG&E"), collectively the "Companies", retained NERA Economic Consulting (NERA) to assist in the development of updated location-based marginal costs within the context of the New York Public Service Commission's Reforming the Energy Vision initiative and more specifically, Case 15-E-0751 –In the Matter of the Value of Distributed Energy Resources. NERA prepared the following exhibits for inclusion with the Companies' July 2018 updates to the Distributed System Implementation Plan (DSIP):

NERA EXHIBIT 1: NYSEG Systemwide Marginal Cost of Service
NERA EXHIBIT 2: NYSEG Locational Marginal Cost of Service for LSRV and DRV areas
NERA EXHIBIT 3: RG&E Systemwide Marginal Cost of Service
NERA EXHIBIT 4: RG&E Locational Marginal Cost of Service for LSRV and DRV areas

The methodology employed by NERA to determine the marginal costs presented in these exhibits is an extension of NERA's traditional approach, used for decades by NERA economists and furthering the work of the late Dr. Alfred Kahn. In theory, marginal cost is the change in total cost with respect to a small change in output. In practice, NERA determines the marginal cost of electricity by examining the utility's planning processes to determine what drives new investment and operating decisions and how changes in consumption affect utility system operations.

STEP 1: Identify Pertinent Capital Investment Projects
The first step in the marginal cost of service ("MCOS") study involved an examination of the Companies' five-year capital investment plans. NERA examined each project listed in those plans and screened out projects that were not undertaken to respond to growth on the distribution system. We also screened out projects that were customer-funded. The remaining projects—all of which were initiated to respond to load growth on the Companies' distribution networks—formed the basis for our MCOS analysis.

Marginal cost estimates were developed for the distribution network component costs that each Company anticipates could be deferred or avoided by the installation of Distributed Energy Resources ("DER") on their respective systems. For the application of the MCOS study to DER, NERA has focused on costs for (a) stations upstream of the distribution substations (labeled "Upstream" in the NERA exhibits) and (b) distribution substations & trunkline feeders (labeled "Distribution" in the NERA exhibits). The MCOS study does not capture local distribution facilities costs (local primary and secondary lines and transformers) and does not capture customer-related facilities. The Companies have determined that it is not possible, at the current time, to defer or avoid any local facilities or customer-related costs in response to DER.

STEP 2: Identify Initial Set of Projects on LSRV Circuits
In order to apply a locational designation to each project, the Companies identified those projects located in areas eligible for Locational System Relief Value ("LSRV") pricing. The Companies identified specific circuits within their distribution systems in which customers investing in DER could be eligible for LSRV pricing, subject to applicable

88 *Current MCOS information is available for NYSEG and for RG&E.*

megawatt caps.

STEP 3: Compute Marginal Costs
NERA used the Companies' forecast investment budget to determine the investment cost per kW of capacity added by each project and then aggregated over the appropriate area. To convert investment per kW of capacity to investment per kW of load (or load relief), a factor reflecting typical reserve margins on distribution equipment was applied. NERA then annualized the investment cost using an economic carrying charge and added in appropriate levels of operating and maintenance expenses and loaders for administrative and general expenses and general plant investment. Finally, NERA included provisions for working capital requirements and losses from the new equipment to customers' meters to arrive at a total marginal cost in each LSRV area, expressed in $/kW of peak demand met by the investment.

NERA estimated the base Demand Reduction Value (DRV) marginal costs by aggregating the costs and load growth associated with those projects not located in LSRV areas and applied the marginal costing techniques described above. To account for the fact that, outside of the identified LSRV circuits, many distribution areas are not experiencing load growth, NERA adjusted the DRV marginal cost to reflect the portion of the system that has been observed to be growing, consistent with the treatment in prior NERA MCOS studies conducted on behalf of the Companies.

NERA computed marginal costs for Upstream investments and for Distribution investments. In its exhibits, NERA presents the marginal cost of each type of facility separately.

STEP 4: Iterate to Finalize Projects on LSRV Circuits
When the estimated marginal cost for an LSRV area fell below the overall DRV marginal cost, NERA reclassified that circuit as part of the DRV area and iterated its calculation of the DRV marginal costs to include the costs of those investment projects that had previously been classified as LSRV. This approach is consistent with the Commission's March 9, 2017 Order, which anticipates higher compensation in LSRV areas.

STEP 5: Calculate Systemwide Marginal Costs
In addition to the DRV and LSRV calculations, NERA also expressed the marginal cost estimates on a systemwide basis for each Company. These estimates are included in Exhibits 1 and 3. For these calculations, NERA aggregated all growth-related investment projects and calculated the annual marginal cost without regard to location, adjusted the system-wide marginal cost to reflect the portion of the system that has been observed to be growing, and incorporated appropriate levels of operating costs and loaders.

NEW YORK STATE ELECTRIC AND GAS CORPORATION
DERIVATION OF SYSTEMWIDE MARGINAL COSTS

			Upstream	Distribution
			[A]	[B]
(1)	Number of projects considered		1	13
	Marginal investment with general plant loading:			
(2)	Investment in growth projects ($)		1,303,633	91,373,134
(3)	Investment in growth projects (kW)		112,000	370,800
(4)	Investment in growth projects ($/kW)	(2)/(3)	11.64	246.42
(5)	Typical reserve margin (%)[1]		29.56%	29.56%
(6)	Investment in growth projects after reserve margin ($/kW)	(4)*[1+(5)]	15.08	319.26
(7)	Portion of the system that is growing (%)		43.72%	43.72%
(8)	Marginal investment ($/kW)	(6)*(7)	6.59	139.58
(9)	General plant loading (%)[2]		21.09%	21.09%
(10)	Marginal investment with general plant loading ($/kW)	(8)*[1+(9)]	7.98	169.02
	Annual cost before O&M and working capital:			
(11)	Annual economic carrying charge related to capital investment (%)[3]		10.23%	10.23%
(12)	A&G loading (plant-related) (%)[4]		0.03%	0.03%
(13)	Total annual carrying charge (%)	(11)+(12)	10.26%	10.26%
(14)	Annual cost before O&M and working capital ($/kW-year)	(10)*(13)	0.82	17.34
	Annual O&M charge:			
(15)	O&M expenses before spreading ($/kW-year)[5]		1.06	0.95
(16)	O&M expenses after spreading ($/kW-year)	(7)*(15)	0.46	0.42
(17)	With A&G loading (non-plant-related) ($/kW-year)[6]	(16)*2.02%	0.01	0.01
(18)	Annual O&M charge ($/kW-year)	(16)+(17)	0.47	0.42
	Annual working capital charge:			
(19)	Material and supplies ($/kW-year)[7]	(10)*0.14%	0.01	0.23
(20)	Prepayments ($/kW-year)[8]	(10)*1.03%	0.08	1.74
(21)	Cash working capital allowance ($/kW-year)[9]	(18)*12.50%	0.06	0.05
(22)	Total working capital ($/kW-year)	(19)+(20)+(21)	0.15	2.02
(23)	Annual working capital charge ($/kW-year)[10]	(22)*8.34%	0.01	0.17
(24)	Total annual cost before losses ($/kW-year)	(14)+(18)+(23)	1.31	17.93
(25)	Loss factor[11]		1.11	1.08
(26)	**Total annual cost ($/kW-year)**	**(24)*(25)**	**1.44**	**19.40**

Notes:

1. 2013 median reserve margin (relative to summer normal rated capacity) of distribution substations with projected load growth-related investments in years 2014-2018.
2. Cumulative additions to general plant and electric share of common plant were regressed on Cumulative Additions to Plant Less General and Common Plant. A dummy shift variable was used to account for large increases in general plant. The coefficient of the explanatory variable is the loader.
3. Reflects the first-year annual economic carrying charge related to incremental investments, incorporating the most recent capital structure and WACC, including changes resulting from the 2017 Tax Act.
4. Reflects the ratio of property insurance premiums to property insured.
5. Relies principally on FERC Form 1 data to compare total distribution station O&M expenses to upstream and distribution non-coincident peak load, adjusted by the labor and materials index.
6. Relies principally on FERC Form 1 data to determine the ratio of social security and unemployment taxes to O&M less fuel, purchased power and transmission by others.
7. Relies principally on FERC Form 1 and PSC data to determine the ratio of materials and supplies relative to total distribution plant.
8. Relies principally on FERC Form 1 data to determine the ratio of electric distribution share of prepayments relative to electric distribution plant.
9. Per FERC approach of allowing 1/8 of O&M as a cash working capital allowance.
10. Multiplies the total working capital by the revenue requirement for working capital factor, as derived from the company's capital structure, cost of capital, and marginal tax rate.
11. Accounts for demand losses occurring between the point at which the marginal costs are measured and the location of the distributed generation on the system.

ROCHESTER GAS & ELECTRIC CORPORATION
DERIVATION OF SYSTEMWIDE MARGINAL COSTS

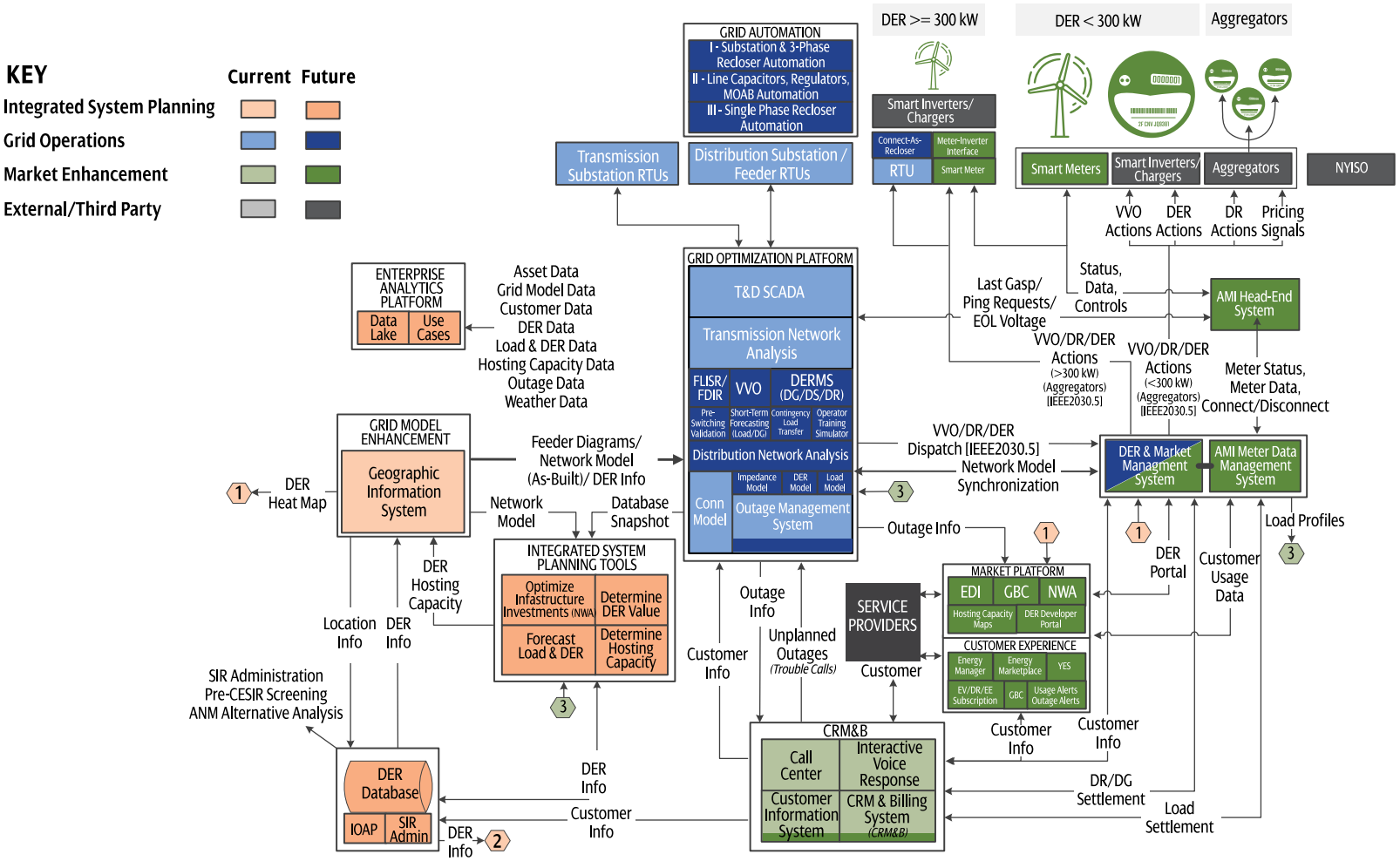
			Upstream	Distribution
			[A]	[B]
(1)	Number of projects considered		-	9
	Marginal investment with general plant loading:			
(2)	Investment in growth projects ($)		-	103,974,188
(3)	Investment in growth projects (kW)		-	361,500
(4)	Investment in growth projects ($/kW)	(2)/(3)	-	287.62
(5)	Typical reserve margin (%)[1]		-	30.00%
(6)	Investment in growth projects after reserve margin ($/kW)	(4)*[1+(5)]	-	373.90
(7)	Portion of the system that is growing (%)		-	36.00%
(8)	Marginal investment ($/kW)	(6)*(7)	-	134.61
(9)	General plant loading (%)[2]		-	33.40%
(10)	Marginal investment with general plant loading ($/kW)	(8)*[1+(9)]	-	179.56
	Annual cost before O&M and working capital:			
(11)	Annual economic carrying charge related to capital investment (%)[3]		-	10.35%
(12)	A&G loading (plant-related) (%)[4]		-	0.04%
(13)	Total annual carrying charge (%)	(11)+(12)	-	10.38%
(14)	Annual cost before O&M and working capital ($/kW-year)	(10)*(13)	-	18.64
	Annual O&M charge:			
(15)	O&M expenses before spreading ($/kW-year)[5]		-	1.86
(16)	O&M expenses after spreading ($/kW-year)	(7)*(15)	-	0.67
(17)	With A&G loading (non-plant-related) ($/kW-year)[6]	(16)*1.89%	-	0.01
(18)	Annual O&M charge ($/kW-year)	(16)+(17)	-	0.68
	Annual working capital charge:			
(19)	Material and supplies ($/kW-year)[7]	(10)*0.25%	-	0.45
(20)	Prepayments ($/kW-year)[8]	(10)*1.20%	-	2.15
(21)	Cash working capital allowance ($/kW-year)[9]	(18)*12.50%	-	0.09
(22)	Total working capital ($/kW-year)	(19)+(20)+(21)	-	2.68
(23)	Annual working capital charge ($/kW-year)[10]	(22)*9.01%	-	0.24
(24)	Total annual cost before losses ($/kW-year)	(14)+(18)+(23)	-	19.57
(25)	Loss factor[11]		-	1.06
(26)	**Total annual cost ($/kW-year)**	**(24)*(25)**	**-**	**20.65**

Footnotes:

1. Sourced from the 2015 MCOS study performed by NERA for RG&E.
2. Sourced from the 2015 MCOS study performed by NERA for RG&E. Based on historic cumulative additions to plant using regressions of cumulative additions to general and common plant on cumulative additions to total plant less common and general, functional dummy variable reflecting shifts in underlying costs.
3. Reflects the first-year annual economic carrying charge related to incremental investments, incorporating the most recent capital structure and WACC, including changes resulting from the 2017 Tax Act.
4. Reflects the ratio of property insurance premiums to property insured.
5. Relies principally on FERC Form 1 data to compare total distribution station O&M expenses to upstream and distribution non-coincident peak load, adjusted by the labor and materials index.
6. Relies principally on FERC Form 1 data to determine the ratio of social security and unemployment taxes to O&M less fuel, purchased power and transmission by others.
7. Relies principally on FERC Form 1 and PSC data to determine the ratio of materials and supplies relative to total distribution plant.
8. Relies principally on FERC Form 1 data to determine the ratio of electric distribution share of prepayments relative to electric distribution plant.
9. Per FERC approach of allowing 1/8 of O&M as a cash working capital allowance.
10. Multiplies the total working capital by the revenue requirement for working capital factor, as derived from the company's capital structure, cost of capital, and marginal tax rate.
11. Accounts for demand losses occurring between the point at which the marginal costs are measured and the location of the distributed generation on the system.

APPENDIX E: DIAGRAM OF ENABLING TECHNOLOGIES

[Link will be available after the MCOS is filed next week]



APPENDIX F: GLOSSARY OF TERMS

ADVANCED DISTRIBUTION MANAGEMENT SYSTEM (ADMS): Refers to the platform to optimize the grid and integrates a number of utility systems to allow for a range of advanced functions, including automated outage restoration, power flow optimization, and conservation voltage reduction.

ADVANCED METERING INFRASTRUCTURE (AMI): A metering system for measuring individual household electricity consumption at intervals of an hour or less and communicating that information at frequent intervals to the distribution utility.

ACTIVE NETWORK MANAGEMENT (ANM): Refers to a control system for managing DER within system limits in real-time. ANM allows increased DER hosting capacity by incorporating various smart grid components (such as regulators, capacitors, sensors, and switches) and managing the DER watts, VARs, and/or voltage within system limits.

AGGREGATOR: Refers to a marketer, broker, or public agency that combines the loads of multiple end-use customers to negotiate the purchase of electricity, the transmission of electricity, and other related services for these customers.

ANCILLARY SERVICE: Services, such as spinning reserves, non-spinning reserves, and regulation, that support the transmission of energy from generating resources to loads while maintaining reliable operation of the network.

BATTERY STORAGE: Refers to the use of a cell or connected group of cells to convert chemical energy into electrical energy by reversible chemical reactions and that may be recharged by passing a current through it in the direction opposite to that of its discharge. Source: NYSERDA 2017 Clean Energy Industry Report.

BEHIND-THE-METER: Relating to technology or efforts on the end-use customer side of the electric system.

BENEFICIAL LOCATION: Circuits or locations on the grid where DER could help address constraints and potentially defer grid investments.

BENEFIT COST ANALYSIS: A method of evaluating all potential costs and benefits or revenues resulting from the completion of a project.

BREAKERS: Automatically operated devices that protect a circuit from damage due to excess current from an over load or short circuit.

BUSINESS CASE: A formal justification for a proposed project or undertaking on the basis of its expected commercial benefit.

CAPACITOR BANKS: A collection of capacitors that can be switched in and out of the circuit. Capacitors are a transmission device designed to inject power into the network.

CIRCUIT: A conductor or a system of conductors through which electric current flows.

COMBINED HEAT AND POWER (CHP): A system producing both heat and electricity from a single source, often using the "waste" energy from electricity generation to produce heat.

COMMUNITY CHOICE AGGREGATION (CCA): a form of group purchasing that allows local governments or other entities to pool their demand and procure energy on behalf of their customers, while using transmission and distribution service from the utility.

COMMUNITY DISTRIBUTED GENERATION (CDG): Programs that allow customers to subscribe to large-scale solar facilities, allowing customers to support locally produced electricity generation through monthly bill credits.

CUSTOMER INFORMATION: Data pertaining to customer energy usage and account information.

CUSTOMER RELATIONSHIP MANAGEMENT AND BILLING SYSTEM (CRM&B): The Companies are planning a billing system up grade using CRM&B, which will provide individualized customer experience to improve the Companies' customer engagement.

CYBER SECURITY: The process of protecting data and information systems from unauthorized access, use, disclosure, disruption, modification, or destruction.

CYME: Refers to a distribution software suite of applications to analyze power flows.

DATA ANALYTICS PLATFORM: Refers to the platform on which Grid Operations and other business areas will compile and analyze data to optimize systems.

DATA PRIVACY: Refers to requirements of utilities to ensure that customer usage, billing, and other information is not released either through data breaches or interactions with third parties. Utilities ensure customer data privacy through a combination of measures, including removing personally identifiable information and/or providing third parties with aggregated data to ensure customer privacy.

DC FAST CHARGING: stands for Direct Current Fast Charging; these can charge electric vehicles must faster than Level 1 and Level 2 charging stations. There are 3 standard levels of EV charging. All electric cars can charge on levels 1 (charge time: 8-15 hours) and 2 (charge time: 3-8 hours). Only certain types of EVs can charge on level 3 (charge time: 20 minutes-1 hour).

DEMAND RESPONSE (DR): Refers to utility programs that send price signals to customers to lower energy consumption, particularly during times of peak energy consumption, such as hot summer days.

DEMAND SIDE MANAGEMENT (DSM): The planning, executing and monitoring of utility activities designed to help customers use electricity more efficiently.

DER DEVELOPER: A person or entity that develops, owns, or controls the means of DER generation and looks for ways to combine technologies to improve performance and efficiency of DER.

DER MANAGEMENT SYSTEM (DERMS): Software to improve an operator's real-time visibility into the status of distributed energy resources and allows distribution utilities to have more granular control and flexibility to manage grid assets.

DER MARKET MANAGEMENT SYSTEM (DER MMS): Refers to the system that will help manage settlement and market transactions as a full distribution-level transactive market is developed and in place. As DER products and services mature, a DER MMS will be required to manage the market and track transactions, perform market clearing, support Measurement and Verification, and settle transactions.

DER SOURCING: DER sourcing allows DER to provide services as an alternative to distribution capital or operational costs.

DISPATCHABLE: A generator or load that is capable of responding to real-time control.

DISTRIBUTED ENERGY RESOURCES (DER): DER includes end-use energy efficiency, demand response, distributed storage, and distributed generation. DER will principally be located on customer premises, but may also be located on distribution system facilities.

DISTRIBUTED GENERATION (DG): Electrical generation and storage performed by a variety of small, grid-connected devices.

DISTRIBUTED SYSTEM IMPLEMENTATION PLAN (DSIP): A vision for the electric industry and the expected changes over the next five years, along with progress made and plans to invest in enabling technologies.

DSIP FILING: A Commission-required filing by each NY electric utility addressing its current system status and identi fying changes to progress towards the achievement of REV goals.

DISTRIBUTED SYSTEM PLATFORM (DSP): A flexible platform for new energy products and services that incorporates DER into distribution system planning and operations in order to improve overall system efficiency and to better serve customer needs.

DISTRIBUTION: The delivery of energy to retail customers. This includes the system of equipment connecting between transmission and end customers.

DISTRIBUTION SYSTEM: The portion of the electric system that is composed of medium voltage (69 kV to 4 kV) sub-transmission lines, substations, feeders, and related equipment that transport the electricity commodity to and from customer homes and businesses and that link customers to the high-voltage transmission system.

DISTRIBUTION SYSTEM PERFORMANCE: Refers to power quality and the response and/or control of grid assets to meet operational needs.

DISTRIBUTION SYSTEM STATUS: Refers to the status of real-time system conditions, including power quality, outage information, and equipment condition (such as alarms for equipment problems).

EARNINGS ADJUSTMENT MECHANISM (EAM): Incremental performance incentives that utilities, as a DSP, can earn in return for achieving REV objectives. Source: REV Connect.

ELECTRONIC DATA INTERCHANGE (EDI): EDI is the electronic exchange of business information in a standardized format between business entities.

ENERGY CONTROL CENTER (ECC): ECCs function as a DSP and distribution grid operator. They work to optimize the grid based on changing network conditions, and maximize the utilization of grid-side, supply-side, and demand-side resources.

ENERGY EFFICIENCY (EE): Refers to the goal to reduce the amount of energy generated for a given purpose.

ENERGY STORAGE: A device that is able to store energy and release the energy on demand.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE): Equipment that supplies electric energy to recharge electric vehicles (EVs).

ELECTRIC GRID: A system of synchronized power providers and consumers connected by transmission and distribution lines and operated by one or more control centers.

EV READINESS FRAMEWORK: A framework developed by the Joint Utilities to address priorities regarding infrastructure planning, education and outreach, forecasting EV growth, and demonstration and pilot programs related to EV adoption.

FAULT: On a transmission or distribution line, an abnormal flow of electric current, e.g., an open circuit (an interruption in the flow) or a short circuit (a flow that bypasses the normal load).

FAULT LOCATION, ISOLATION, AND SERVICE RESTORATION (FLISR): A system that will use automated devices to reconfigure the grid and restore power to the maximum number of customers following a system disruption.

FEEDER: Primary distribution lines leaving distribution substations.

GREEN BUTTON CONNECT: Capability that allows utility customers to automate the secure transfer their own energy usage data to authorized third parties, based on affirmative (opt-in) customer consent and control.

GRID AUTOMATION: Refers to the Companies' vision to automate all distribution control devices, including breakers, reclosers, regulators, capacity banks, switches, and supporting telecommunications networks, to allow the Companies to measure and control power flows on circuits.

GRID MODEL ENHANCEMENT PROJECT (GMEP): Refers to the complete distribution model including network load and DER characteristics. The information in the GMEP will feed the Distribution Planning Tools to support effective planning (including NWA analysis), to calculate hosting capacity, and to analyze interconnection requests, and will also feed the ADMS as the basis for power flow calculations for optimization and congestion management.

GRID MODERNIZATION: Refers to foundational technologies and investments to improve the reliability, resiliency, and automation of the transmission and distribution system, thus contributing to a more efficient and modern grid. There are three foundational grid modernization investments: AMI, Grid Automation, and Telecommunications/IT. These technologies and investments provide the raw, granular, time-differentiated data required by DSP enabling technologies, and also support energy storage and other DER.

GRID OPERATIONS: The core function that monitors and operates the distribution grid to provide safe, reliable, and resilient distribution service.

HOME ENERGY MANAGEMENT: Systems that integrate "smart" appliances, HVAC, and other systems to optimize energy use based on granular data.

HOSTING CAPACITY: The amount of DER that can be accommodated without adversely impacting power quality or reliability without the need for grid upgrades paid for by DER developers.

INTERMITTENT RESOURCE: An electric generating resource that is not continuously available. Examples include residential rooftop solar that provide output during the day.

INNOVATION: The development of a new method, idea or product.

INTERCONNECTION: The result of the process of adding a Distributed Generation facility to the distribution network.

INTERCONNECTION ONLINE APPLICATION PORTAL (IOAP): A platform for utility-customer engagement that allows for online application submittal, automated management and screening, and greater transparency about the interconnection process.

INTERCONNECTION QUEUE: The interconnection queue is the list of projects that have requested and are awaiting interconnection.

INTERCONNECTION TECHNICAL WORKING GROUP (ITWG): The Joint Utilities working group that focuses on interconnection issues.

JOINT UTILITIES: The six electric utilities involved in REV proceedings and DSIP filings. The group is comprised of Central Hudson Gas and Electric Corporation, Consolidated Edison Company of New York, Inc., New York State Electric & Gas Corporation, Niagara Mohawk Power Corporation d/b/a National Grid, Orange and Rockland Utilities, Inc. and Rochester Gas and Electric Corporation.

KW, MW: Kilowatt – A unit of electrical power, equal to 1,000 watts. Megawatt – one million watts.

KWH, MWH: Kilowatt-hour – A unit of electrical energy, equal to one kilowatt (kW) of power used for one hour. Megawatt-hour – one megawatt (MW) used for one hour. An average household will use around 800-1300 kWh per month. Source: Duke Energy Corporation.

LOAD: The amount of power delivered or required at a point on a system.

LOADSEER: A forecasting tool that incorporates DER and probability into granular load forecasts, assessing the impact on circuits.

LOCATIONAL SYSTEM RELIEF VALUE (LSRV): These high-value locations provide an opportunity for DER developers to earn credit for development that relieves grid congestion in the area.

LOW AND MEDIUM INCOME (LMI) CUSTOMERS: A utility's customers who fall under a determined income threshold.

MARKET DESIGN AND INTEGRATION REPORT: A report to be filed by the Joint Utilities, identifying and explaining their jointly planned market organization and functions, along with the policies and resources needed to support them.

MARKET PARTICIPANT: An entity that produces and sells capacity, energy, or ancillary services into the wholesale market.

MARKET SETTLEMENT: Refers to the governance of DER-related contractual, program or tariff obligations and the related transactions.

MEASUREMENT & VERIFICATION: Refers to the process for quantifying and monetizing energy savings.

MEASUREMENT, MONITORING, AND CONTROL (MM&C): Refers to the ability to provide real-time visibility of grid status, as well as the ability to control resources. The grid has general MM&C capabilities to manage all resources, but the Companies are also putting in place advanced MM&C capabilities to provide better visibility and control of smaller DER. Microgrid: a group of interconnected loads and DERs within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island modes.

MICROGRID: a group of interconnected loads and DERs within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island modes.

MICROGRID MANAGEMENT SYSTEM (MGMS): Refers to an enabling technology (built on the ADMS platform) that will be developed based on the pace of community microgrid installations. Once microgrids begin serving multiple customers over the distribution network, the Companies will need to ensure reliability and service even while islanded. The MGMS will be built as an enhancement to the controls and capabilities in DERMS, but will require increased measurement and control to ensure proper voltage, frequency, load balance, and power quality while islanded and re-synchronizing with the grid.

NET ENERGY METERING: A billing arrangement that provides credit to solar system owners for the value of the electricity that they add to the grid. The electricity meter runs backwards to provide a credit against the amount of electricity consumed from the grid.

NETWORK: An interconnected system of electrical transmission lines, transformers, switches and other equipment connected together in such a way as to provide reliable transmission of electrical power from multiple generators to multiple load centers. Source: Duke Energy Corporation.

NEW YORK DEPARTMENT OF PUBLIC SERVICE (NYDPS, DPS): The state agency established by law with oversight responsibilities regarding the operation of regulated monopoly utilities.

NEW YORK INDEPENDENT SYSTEM OPERATOR: The organization that monitors the reliability of the power system and coordinates the supply of electricity around New York State, and facilitates the NY wholesale market.

NEW YORK PUBLIC SERVICE COMMISSION (NYSPSC, PSC): A five-member Commission within the Department of Public Service with the authority to implement provisions of the Public Service Law.

NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY (NYSERDA): An organization governed by a 13-member Board that works with stakeholders throughout NY to develop, invest and foster the development of clean energy.

NON-WIRES ALTERNATIVE: Projects that allow utilities to defer or avoid conventional infrastructure investments by procuring distributed energy resources (DER) that lower costs and emissions while maintaining or improving system reliability.

NWA SUITABILITY CRITERIA: Refers to the criteria developed with the Joint Utilities and other stakeholders in assessing NWAs as an alternative to traditional wires investments.

OFF-PEAK: The period of relatively low system demand, often occurring in daily, weekly, and seasonal patterns.

OUTAGE: The period during which a generating unit, transmission line, or other facility is out of service.

OUTAGE MANAGEMENT SYSTEM (OMS): Refers to a system to manage power outages that integrates automation capabilities for faster outage identification and response.

PEAK: Relating to the period of high system demand.

PHOTOVOLTAICS (PV): devices that generate electricity from sunlight through a process that occurs naturally in semi conducting materials.

PORTAL: specially designed Web page that brings information together from diverse sources in a uniform way.

POWERCLERK: Refers to an interconnection administration tool.

POWER FLOW MODEL: Refers to a simulation that models power flows on the Companies' system, as well as how power flows between the NYISO transmission system.

POWER QUALITY: A measurement of the extent to which a steady supply voltage stays within the prescribed range.

RECLOSER: Reclosers are small circuit breakers located at the top of distribution poles. They isolate a section of the feeder in fault conditions and thereby minimize the number of customers without service. Since they act as small circuit breakers, they have the capability to restore power automatically in temporary fault situations.

REFORMING THE ENERGY VISION (REV): A comprehensive energy strategy for New York, involving informed energy choices, new products and services, environmental protection, and new jobs and economic opportunities. The initiative involves regulators, utilities, and third-party companies.

REV DEMONSTRATION PROJECT: Projects developed by the six large NY investor owned electric utilities consistent with guidelines of the Track One REV proceeding. These projects aim to demonstrate new business models for third parties and the electric utilities, testing the potential of different aspects of REV.

REGULATORS (VOLTAGE): Voltage regulators are electronic circuits providing stable direct current (DC) voltage independent of current, temperature, and/or alternating current (AC) voltage changes.

RELIABILITY: A measure of the ability of the system to continue operation while some lines or generators are out of service. Reliability deals with the performance of the system under stress.

REMOTE TERMINAL UNIT (RTU): A remotely controlled unit that gathers accumulated and instantaneous data to be telemetered to a specified control center which displays the current status of the generation facility.

RENEWABLE ENERGY: Energy that is generated from natural processes that are continuously replenished; sources include sunlight, geothermal heat, wind, tides, water, and various forms of biomass.

REQUEST FOR PROPOSALS (RFP): a solicitation, often made through a bidding process, by an agency or company interested in procurement of a commodity, service or valuable asset, to potential suppliers to submit business proposals.

RESILIENCY: Preparation and adaptation to changing conditions, along with the ability to withstand and recover quickly from disruptions.

ROADMAP: A high-level plan and overview to support strategic and long-term planning, accompanied by short-term goals with specific solutions.

SMART HOME: A residence that uses internet-connected appliances and devices to enable remote monitoring and management of systems such as lighting and heating.

SMART INVERTER: An electronic power converter that converts direct current alternating current (inverting), and provides grid support.

SMART METER: An electronic device that records electricity consumption and communicates the information to the utility, enabling two-way communication and more granular data.

SMART PARTNER PROGRAM: Partnership with community organizations to test engagement strategies for our LMI customers.

SMART SOLUTIONS: An on-line marketplace concept that tests ability to connect customers with DER developers Standardized Interconnection Requirements (SIR): State requirements that resources must meet in order to connect with the distribution system.

SUBSTATION: Facility equipment that switches, changes, or regulates electric voltage. An electric power station serving as a control and transfer point on a transmission system, and serving as a delivery point to industrial customers.

SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA): Generally, from DOE, "systems [that] operate with coded signals over communications channels to provide control of remote equipment of assets." Source: DOE (2017)

SUPPLEMENTAL DSIP FILING: DSIP report filed by the Joint Utilities in November 2016 as a follow-on to the Initial DSIP filed by individual utilities in June 2016.

TIME-VARYING PRICING (TVP): Pricing electricity to vary throughout the day – this can involve a few periods or blocks throughout the day, or more frequent hourly differences. TVP requires advanced metering technology, and may shift demand to lower-priced times.

TRACK ONE ORDER: Also known as the Order Adopting Regulatory Policy Framework and Implementation Plan, a filing issued by the Commission in February 2015 that articulates a transformation to a future electric industry in NY, incorporating distributed resources and dynamic management. The Order requires electric utilities to provide DSP services to enable the integration of DER.

TRACK TWO ORDER: A filing issued by the Commission in May 2016 that creates a new regulatory model incentivizing utilities to take actions to achieve REV objectives by better aligning utility shareholders' financial interest with customers' interests.

TRANSFORMER LOAD-TAP-CHANGERS: Refers to a voltage regulating device located on substation transformers.

TRANSMISSION: An interconnected group of lines and associated equipment for the movement or transfer of electric energy between points of supply and points at which it is transformed for delivery to customers or is delivered to other electric systems.

TRANSMISSION NODES: refers to the NYISO high-voltage grid model for transmission planning and system operations. In order for NYISO to model and consider DER impacts on and value to the bulk electric grid of New York; they need to be able to "map" each DER connected to the distribution system, to the applicable "transmission node" on the bulk electric system.

USE CASE: A well-defined application of a technology that identifies the actors, processes involved, and output of the application, sometimes including the goals met or problems solved.

VALUE OF DER (VDER): A new mechanism designed by the NYSPSC to compensate DER, effectively replacing net energy metering. VDER compensates projects based on when and where they provide electricity to the grid.

VAR: Volt-ampere Reactive, A unit by which reactive power is expressed in an AC electric power system. Reactive power exists in an AC circuit when the current and voltage are not in phase.

VOLTAGE: The difference in electrical potential between any two conductors or between a conductor and ground. It is a measure of the electric energy per electron that electrons can acquire and/or give up as they move between the two conductors.

VOLTAGE-VAR OPTIMIZATION (VVO): A process that optimizes circuit performance and reduces line losses, managing circuit level voltage in response to the varying load conditions.

WATTPLAN: Software developed by Clean Power Research and being tested in AVANGRID's ESC to help predict customer DER adoption.

WHOLESALE MARKET: The purchase and sale of electricity from generators to resellers (who sell to retail customers), along with the ancillary services needed to maintain reliability and power quality at the transmission level.

ZERO EMISSION VEHICLE (ZEV): a vehicle that emits no exhaust gas from the source of power.