

Research and Development Plan for Advanced Transmission and Distribution Technologies – PROGRESS REPORT

Respectfully submitted by the Joint Utilities of New York,

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1 BACKGROUND AND OBJECTIVES

1.1 Background

On July 20, 2022, the Joint Utilities of New York submitted a Research and Development Plan for Advanced Transmission and Distribution Technologies (“R&D Plan”).¹ The R&D Plan addressed the deployment of advanced technologies in electric transmission and distribution (T&D) systems to help support the achievement of objectives of the Climate Leadership and Community Protection Act (“CLCPA”) and the Accelerated Renewable Energy Growth and Community Benefit Act (Act). The R&D Plan focused on two near-term goals:

1. Establish a sustainable working group and R&D program that can support the achievement of CLCPA goals; and
2. Identify and remove barriers to deploying technologies from the three high-priority areas identified by the Advanced Technologies Working Group (“ATWG”).

This document serves as a progress report for the R&D Plan (“Progress Report”) as required by the New York Public Service Commission (Commission) Order on Power Grid Study Recommendations (the “Order”).²

This Progress Report is organized into three parts.

- Section 1 – Background and Objectives
- Section 2 – Activities and milestones in 2022
- Section 3 – Program plan for 2023

1.2 Objectives and Challenges

A key near-term objective is to ensure the ATWG is a sustainable working group and to establish an R&D program to help support the achievement of CLCPA goals on the New York T&D systems. The ATWG will leverage its R&D program to create a standard approach for technology R&D that will focus on the near-term integration of dynamic line rating (“DLR”), power flow control (“PFC”), and energy storage technologies. Over the medium and long-term horizon, the ATWG’s efforts will extend into other areas in response to developments in technology and in accordance with State goals (Table 1). The working group acknowledges commercially available solutions in each of these technological areas which may have the potential, in specific applications, to help unlock additional capacity from T&D infrastructure while maintaining grid reliability. The most significant near-term

¹ Case 20-E-0197, *Research and Development Plan for Advanced Transmission and Distribution Technologies*, Joint Utilities of New York, July 20, 2022.

² Case 20-E-0197, *Order on Power Grid Study Recommendations*, State of New York Public Service Commission, January 20, 2022.

challenges will be assisting utilities in identifying the use cases for these technologies and cost-effective applications, ultimately working to the point that utilities can propose demonstration projects.

The capabilities of the technologies have been demonstrated, and commercially available products indicate the potential for adoption in targeted applications. However, experience has shown that comparing the performance and functionality of different technologies and configurations can be challenging. Some technologies are better suited to specific applications where they are cost-effective. We see this challenge in DLR, PFC, and energy storage technologies.

Since these technologies can increase the capacity and utilization of existing T&D infrastructure, they may be considered alternatives or complementary to investments in new infrastructure. Existing planning, investment, market, and recovery models may need to be adjusted to evaluate the use of these new technologies.

Table 1. Objectives

New York State Objectives	ATWG Objectives
<ul style="list-style-type: none"> • Develop and integrate large-scale renewable energy. • Maximize existing transmission capacity by reducing or eliminating T&D capacity bottlenecks that limit the generation and use of renewable energy. • Increase T&D system utilization and throughput (reduce congestion). 	<ul style="list-style-type: none"> • Encourage a streamlined approach to technology adoption. This includes understanding the functionality and capabilities of each technology and how best to apply different solutions. • Support the evaluation and comparison of different technologies and solutions, providing guidance for developing the CGPP, and identify projects to propose through the utility planning processes and capital deliver plans. • Facilitate information sharing, collaboration, and standardization among New York stakeholders that reduces duplication of effort and accelerates learning and deployment. • Align with the Coordinated Grid Planning Process (“CGPP”) and its recommendations.

2 ACTIVITIES AND MILESTONES IN 2022

In 2022 the ATWG focused on the following activities:

- Development of the R&D Plan filed in July;
- Establishing a governance program for the ATWG;
- Supporting the Joint Utilities in developing the Coordinated Grid Planning Process Proposal; and
- Initiating the Energy Storage Task Force to support near-term activities.

2.1 R&D Plan for Transmission & Distribution Technologies

ATWG's R&D Plan focused on two near-term goals:

1. Establishing a sustainable working group and T&D program; and
2. Identifying and removing barriers to deploying three high-priority technologies previously specified by the ATWG and emphasized by the Commission (energy storage for T&D applications, dynamic line rating technologies, and power flow control technologies).

The R&D plan provided details on a technology scouting approach used successfully by utilities and research organizations in New York and elsewhere. This approach includes technology surveying and screening, technical and economic assessment, and identifying locations where sufficiently mature technologies could be deployed for demonstration or early adoption. In some cases, technology adoption can be accelerated by developing standardized tools and techniques for evaluating the suitability and sharing information on best practices and cost-effective use cases.

Several parties submitted comments on the R&D plan.³ Feedback touched on topics including:

- Expanding the scope of working group participation and representation;
- Increasing opportunities for stakeholder engagement;
- Accelerating deployment of commercially available technologies where possible; and
- Ensuring that advanced technologies are cost-effective and beneficial for electricity customers and New York stakeholders.

The ATWG will work to address these issues in the coming year as it works toward meeting its program goals.

³ Commenters included Ecogy Energy, Multiple Intervenors, NY-BEST, NYSEIA, and Transource.

2.2 ATWG Governance

The R&D Plan described the organization and governance envisioned for the ATWG. On November 30, 2022, the ATWG voted to approve a document that sets forth the Mission, Governance, and Operations of the ATWG (“Governance”). The ATWG’s Governance is modeled on other technically focused working groups in New York State, such as the Interconnection Technical Working Group.

ATWG members include investor-owned utilities, power authorities, grid operators, NYSERDA, and the Department of Public Service. EPRI serves as a technical consulting member of the ATWG. The ATWG intends to establish task forces to explore specific types of barriers, technologies, or R&D questions. Task forces will likely include experts from non-member organizations.

Table 2. ATWG membership

Sector	Organizations
Investor-Owned Utilities	<ul style="list-style-type: none"> • Avangrid (NYSEG and RG&E) • Central Hudson Gas & Electric (Central Hudson) • Con Edison (CECONY and ORU) • National Grid
Power Authorities and Grid Operators	<ul style="list-style-type: none"> • LIPA / PSEG-LI • NYPA • NYISO
New York State Entities	<ul style="list-style-type: none"> • Department of Public Service • NYSERDA
Technical Consultants	<ul style="list-style-type: none"> • Electric Power Research Institute (EPRI)

2.3 CGPP Coordination

During the third quarter of 2022, the ATWG provided input for the development of the Coordinated Grid Planning Process (“CGPP”) Proposal by the New York Utilities.⁴ The ATWG will support the CGPP throughout the planning cycle, particularly during the local assessments in CGPP Stage 3 (Figure 1).⁵ ATWG activities will include, but are not limited to, technology scouting for advanced T&D technologies and applications of those technologies. For example, as the CGPP looks at system constraints that affect renewable energy integration, the ATWG will examine the ability of available technologies to do the following: (1) address the identified constraints (2) specify what parameters apply for addressing the problem (3) determine how size and performance will be evaluated (4) establish the efficacy and cost-effectiveness of various solutions. The ATWG will also help

⁴ Case 20-E-0197, *Coordinated Grid Planning Process Proposal*, the New York Utilities, December 27, 2022.

⁵ Id. p. 4.

develop tools and methodologies to evaluate and apply advanced technologies as part of potential non-wires alternative solutions.

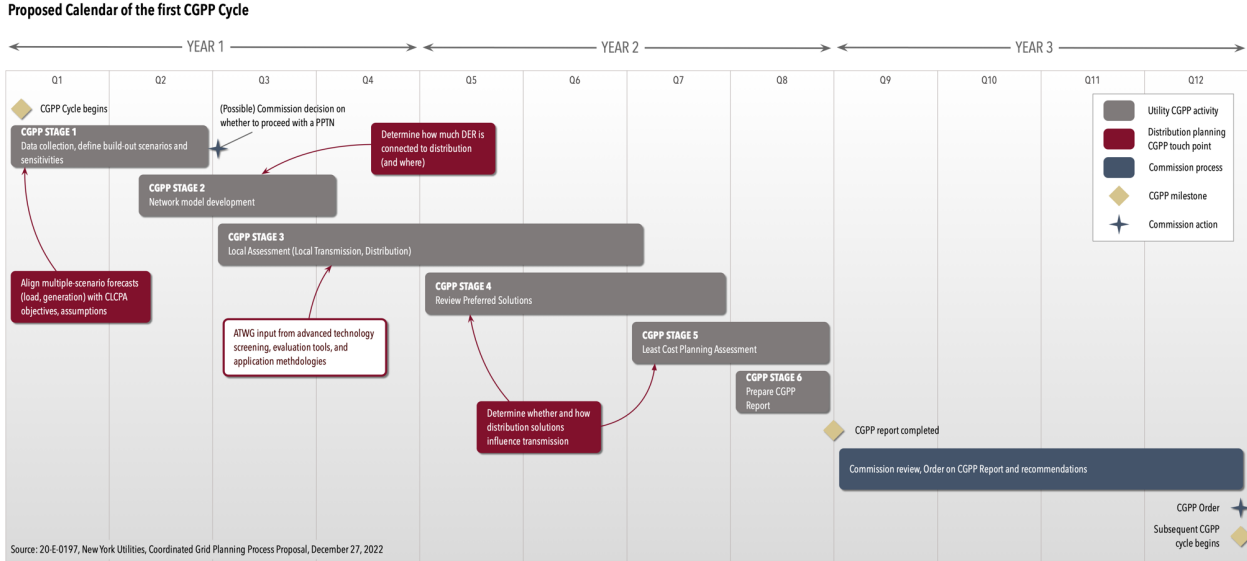


Figure 1. ATWG input to the CGPP. (See Appendix A for a larger version of the diagram.)

2.4 Energy Storage Task Force

Energy storage supporting electric T&D is one of three technology focus areas of the ATWG. After filing the R&D plan, the ATWG explored ways that utilities could use energy storage in applications that could enhance the reliability and market efficiency of the New York State grid while supporting the clean energy resources needed to meet CLCPA goals. The ATWG began this effort by compiling a set of over 40 potential use cases from NYSERDA, the Utilities, and EPRI, organized across four domains and eight service categories. The goal of this work was to establish an initial landscape of grid needs where energy storage could offer potential solutions.

Shortly after compiling the preliminary list of use cases, the ATWG was approached to support a study to estimate energy storage potential for utility T&D applications in New York State. This work's importance and preliminary exploration of energy storage use cases prompted the ATWG to establish the Energy Storage Task Force ("ESTF"). The initial priority for the ESTF has been to develop a request for proposals ("RFP") for conducting an Energy Storage Potential Study focused on T&D applications that support the New York system. The ATWG anticipates that in 2023 the ESTF will continue to work in other areas to support the deployment of energy storage in New York.

3 PROGRAM PLAN FOR 2023

This section summarizes critical activities for the ATWG in 2023. We anticipate that the activities will continue beyond 2023.

3.1 Energy Storage Task Force

3.1.1 *Initiate an Energy Storage Potential Study*

In 2023 the ESTF will finalize the scope of work for an RFP initiating an ATWG-sponsored Energy Storage Potential Study. This RFP will outline how the study will explore potential energy storage applications to develop T&D use cases that support the New York system, including core technologies, configurations, sizing, and market considerations. It will also identify stacked benefits for storage projects and multi-use systems, estimate the installed capacity potential for each use case, and reference existing projects including those outside of New York to capture best practices.

In developing the RFP and conducting the Energy Storage Potential Study, the ESTF will consider the information contained in documents such as the recently released *New York's 6 GW Energy Storage Roadmap*⁶ and *Storage as Transmission Market Study*.⁷

3.1.2 *Develop a Set of Common T&D Planning Tools*

The ESTF will also work in 2023 to develop a common set of planning tools and assumptions for T&D systems that is unified around common principles to facilitate the effective integration of advanced technologies. This effort will be initially informed through input gathered from ESTF members and from other stakeholders as needed. The group will then work to identify critical processes and tools central to a unified approach to planning.

These tools may include the Distributed Energy Resource Value Estimation Tool (“DER-VET”) and Benefit Cost Analyses (“BCA”), an evaluation of approaches to charging/discharging and electromagnetic transient (“EMT”) modeling for inverter-based resources, utilizing existing modeling abilities from the NYPA Advanced Grid Innovation Laboratory for Energy (“AGILE”) lab, and others as a starting point. The proposed common planning toolset may also be informed by input from EPRI T&D groups and collaboration with CGPP team members.

3.1.3 *Develop an Economic Analysis Methodology*

T&D planning engineers will benefit from having a methodology to evaluate the economics of energy storage in various use cases and configurations. To complement the T&D planning procedure developed in 3.1.2, the ESTF will also work to develop a supporting economic analysis methodology. This will include surveying the latest estimates for

⁶ 18-E-0130, New York State Department of Public Service and New York State Energy Research and Development Authority, *New York's 6 GW Energy Storage Roadmap*, December 28, 2022.

⁷ New York Battery and Energy Storage Technology Consortium, *Storage as Transmission Market Study: White Paper on Value and Opportunity for Storage as Transmission in New York*, January 9, 2023.

different energy storage technology costs, deployment costs, and O&M costs. The ESTF will leverage cost estimate ranges using information from sources such as the New York Battery and Energy Storage Technology Consortium (“NY-BEST”), technology developers, and utilities. We will seek to create parametric cost estimate ranges using metrics such as cost per kW, cost per MWh, or cost per installation for addressing use cases.

3.2 Technology Scouting and Assessment

Scouting and assessment of technology began in Q3 2022 through the review of energy storage for T&D services by the ESTF. That effort will continue into 2023 in parallel with the ATWG’s evaluation of DLR and PFC technologies. Technology scouting and assessment for DLR and PFC technologies will proceed in three distinct stages:

- Stage 1 - Understand the technology landscape and the best opportunities to advance Grid Enhancing Technologies (“GETs”) in each focus area (DLR and PFC)
- Stage 2 - Identify the most technically and economically feasible solutions
- Stage 3 - Identify high-value locations in which priority solutions can be demonstrated

3.2.1 Dynamic Line Ratings

In December 2021, the Federal Energy Regulatory Commission (“FERC”) issued Order 881, mandating the implementation ambient adjusted hourly ratings (“AAR”) for the Bulk Electric System, with the intent to continue exploring DLR to increase grid efficiencies. These efforts have increased the industry’s focus on potential DLR methods. Under FERC Order 881, New York utilities must implement AAR by July 2025.

When evaluating new DLR applications, the ATWG will consider an approach for analyzing DLR’s incremental costs and benefits over AAR for specific projects. This will help identify opportunities where DLR could offer higher value for T&D systems and customers. In this effort, the ATWG will look first to reference ongoing pilot projects that showcase the functional capabilities of both technologies as a means of understanding opportunities for growth in New York State, including the following:

- Avangrid DLR Challenge, in coordination with NYSERDA, evaluating transmission lines in the New York Southern Tier region.
- Central Hudson DLR evaluation project of a radial transmission line in collaboration with EPRI using an optical camera to evaluate the impact of a DLR system on the line rating.
- NYPA exploration of direct SAG measurements with results transmitted to the data center. Additional Wind-Vision pilot in coordination with NYSERDA exploring congestion challenges.
- National Grid will install eight DLR monitors on two lines and eighteen DLR monitors on a third line, including any work required for access, the necessary

modifications to integrate the line ratings into the EMS, and five years of service with LineAware and LineVision.⁸

- Con Edison and LIPA/ PSEG LI applications of DLR technology on underground transmission.

Initiate a DLR Task Force

The ATWG will create a task force charged with evaluating DLR technology. This task force will function like the Energy Storage Task Force, and initially focus on two activities:

- Explore the adoption of a dynamic line rating methodology for New York operations and the feasibility of applying a methodology to long-term planning.
 - The ATWG will explore a new rating methodology that considers DLR as a component of line design and operational processes that can work with other technologies. The potential capacity these improved line ratings can provide will influence line designs, asset maintenance, and repairment cycles.⁹
 - The ATWG will assess existing line rating techniques, including data, risk, and operations.
- Develop a BCA to support the dynamic line ratings methodology.
 - BCA testing should be conducted consistent with proposed transmission-related guidelines for CLCPA projects, pending commission guidance.¹⁰

The DLR Task Force will perform an economic and technical assessment of various DLR technologies. The assessment will likely focus on an area where data is readily available for historical line ratings, capacity, weather, and nearby generation sources by fuel type. The assessment will compare AAR and DLR performance, with input from testing completed at the EPRI High Voltage Laboratory¹¹ and existing utility or laboratory pilots. The technologies examined for the study will reflect vendor landscape information from EPRI.¹²

The DLR Task Force will develop a detailed work plan with a timeline in Q2 2023. The plan will be reviewed with stakeholders in subsequent program review meetings.

3.2.2 Power Flow Control Technologies

In evaluating PFC technologies, the ATWG intends to (1) focus on applying available technology solutions for specific problems; and (2) use research to accelerate the

⁸ National Grid project will install eight (8) DLR monitors from LineVision on the Laona - Moon Rd LN173 and Moon Rd - Falconer LN175 lines in New York, including any work required for access. This project will also include the necessary modifications to integrate the line ratings into EMS. National Grid project will install eighteen (18) DLR monitors from LineVision on the McIntyre - Colton #8 line in New York, including any work required for access. This includes five (5) years of service with LineAware and LineRate systems from LineVision.

⁹ New York State Utility Transmission and Distribution Investment Working Group, *Advanced Technologies Working Group Report*, October 29, 2020, p. 6-13.

¹⁰ Id. 8-2.

¹¹ Id. pp. 6-9 and 6-10.

¹² Id. p. 6-11.

development of less proven or emerging technologies. Ongoing work by NYSERDA and EPRI can be leveraged for this purpose in combination with the following ongoing utility pilot programs:

- Phase Angle Regulator (“PAR”) technology is currently being used by several utilities in New York state.
- Central Hudson is currently conducting a pilot test of SmartValve technology and anticipates commercial deployment in 2023.
- NYSEG is working to deploy and pilot a Switched Source Tie Controller on its distribution system

Initiate a PFC Task Force

The ATWG will create a task force charged with evaluating PFC technology. This task force will function like the Energy Storage Task Force and DLR Task Force, and initially focus on two activities:

1. A comprehensive study will be conducted to evaluate potential impacts from large-scale power flow control utilization and the systems needed to ensure that the operations of PFC devices will be well coordinated.¹³
2. BCA testing will be completed consistent with proposed transmission-related guidelines for CLCPA projects, pending commission guidance.¹⁴

The PFC Task Force will develop a detailed work plan with a timeline in Q2 2023. The plan will be reviewed with stakeholders in subsequent program review meetings.

3.3 Stakeholder Engagement

The ATWG is committed to collaborating with community and industry representatives to evaluate and deploy advanced technologies on the New York electric T&D systems. In 2023 the ATWG will work to address feedback received in response to the R&D Plan related to representation and expanded participation by stakeholders. The ATWG will host open sessions to share R&D activities and insights and solicit industry participant feedback. We plan to hold two types of stakeholder meetings in the coming year.

Spring Technical Conference

The ATWG intends to hold a technical conference in March or April 2023. This session will bring together community and industry representatives to review high-priority technologies and discuss barriers to deployment. This conference will encourage information sharing and invite stakeholder input to shape ATWG’s work in 2023.

¹³ Id. p. 1-11.

¹⁴ Id. p. 8-2.

Periodic Stakeholder Sessions

The ATWG intends to hold periodic stakeholder sessions to solicit input from stakeholders and provide program updates. These meetings will likely occur twice yearly and be conducted through an accessible web-based or hybrid platform. Between stakeholder sessions, the ATWG will establish an open channel for engagement and coordination to promote the working group's efforts and benefit from public collaboration and support.

3.4 Funding

In its July 2022 R&D Plan the ATWG identified funding to support activities related to program support, studies and analysis, and laboratory testing as needed. The ATWG will work with its three Task Forces to identify specific programming needs (Table 1).

Activity Type	Examples	Timeframe	Preliminary Budget
Program Support	<ul style="list-style-type: none"> Program administration, facilitation, and reporting Develop guidance documentation Technology Scouting and Assessments as identified by the ATWG or its Task Forces 	2023 - 2026	\$2 million (NYSERDA) ¹⁵
Studies and Analysis	<ul style="list-style-type: none"> Energy Storage Potential Study and related analyses System modeling 	2023 - 2026	
Laboratory Testing	<ul style="list-style-type: none"> Use of NYPA Advanced Grid Innovation Laboratory for Energy (AGILE) University or national laboratory testing 	2023 - 2026	
Demonstration Projects	<ul style="list-style-type: none"> Long-term energy storage demonstration Thermal energy storage demonstration 	2023 - 2026	\$15 million (NYSERDA) ¹⁶

In-kind contributions from individual utilities may be provided as part of program activities and demonstrations. The ATWG will also work with its member organizations to pursue outside funding.

¹⁵ NYSERDA has estimated program support funding at \$2 million through 2026.

¹⁶ NYSERDA has estimated funding for pilot and demonstration projects at \$15 million. These funds may be supplemented by project partners including technology vendors, utilities, or other research organizations.

APPENDIX A – ATWG INPUT TO THE CGPP

