

Initial Assessment of Advanced Technology Concept Papers

Submitted by the Advanced Technology Working Group

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Introduction

On January 20, 2022, the New York Public Service Commission (Commission) issued its Order on Power Grid Study Recommendations (20-E-0197), directing the Joint Utilities (JU) and Commission Staff to establish a working group to evaluate, test, and accelerate the deployment of advanced transmission and distribution technologies and submit a research plan and progress report on those efforts. In response to the Order, the Advanced Technologies Working Group (ATWG)¹ was organized to serve in the designated capacity.

The ATWG filed a Research and Development (R&D) Plan in July 2022 and a revised plan in March 2024. The R&D Plan outlines three related activities for developing advanced T&D technologies and accelerating their deployment in New York. These include R&D program planning and management, technology scouting and assessments, and technology transfer activities.

The technology scouting and assessment process follows a three-stage approach, which begins with the development of survey and screening criteria consistent with the ATWG's objectives to develop and deploy technologies that:

- (a) alleviate T&D system bottlenecks to allow for better deliverability of renewable energy,*
- (b) unbottle constrained resources to allow more renewable hydro and/or wind imports and reduce system congestion,*
- (c) optimize the utilization of existing transmission capacity and rights-of-way, and*
- (d) increase circuit load factor.²*

On January 19, 2024, the Commission issued its Order³ that directed the ATWG to broaden the range of technologies under review that would inform the solutions available to utility planners engaged with the Coordinated Grid Planning Process (CGPP). Among other things, the ATWG was directed to conduct an open call for stakeholders to submit advanced technology concept papers ("Concept Papers" or "Papers") ahead of the May 2, 2024, technical conference and to file its initial assessment of the submissions within 60 days of the conference's conclusion. The Order further specified that the call should only be extended to technologies that are not already under consideration by the ATWG, that have been deployed in New York or other United States jurisdictions, and for which cost estimates are available.

¹ ATWG membership includes representatives from New York's investor-owned utilities, power authorities, the New York ISO, NYSERDA, and the Department of Public Service, as specified in the ATWG's Research and Development Plan for Advanced Transmission and Distribution Technologies, March 19, 2024, p. 4.

² Case 20-E-0197, *Order on Power Grid Study Recommendations*, p.34.

³ Case 20-E-0197, *Order Establishing Procedures for the Advanced Transmission Technologies Working Group*, January 19, 2024.

Analysis

Initial review

As part of the request for Concept Papers, the ATWG provided potential respondents with a scope and submission requirements designed to elicit information that would allow the ATWG to evaluate submissions consistently. The scope and requirements were also aimed at helping group the Concept Papers into categories or themes that will enable the ATWG to incorporate the ideas into existing or new focus areas.

Table 1. Summary of the Scope and Submission Requirements included in the Call for Advanced Technology Concept Papers.

ATWG Advanced Technology Objectives	Concept Paper Submission Requirements
<ul style="list-style-type: none"> • Provide functionality that increases the deliverability of renewable energy and increases the utilization of existing delivery capacity and rights-of-way. • Enhance the reliability, security, and efficiency of the New York electricity grid. • Reduce costs for consumers and stakeholders. 	<ul style="list-style-type: none"> • A detailed description of the technology or solution, including potential use cases and grid services that the technology may support. • Specific examples of where the technology or solution has been deployed. • An outline or preliminary plan for implementing the technology or solution within the New York electricity grid. • To the extent possible, provide cost data that can facilitate comparisons with existing and alternative solutions. • Specific benefits that the technology supports, either directly or indirectly.

The ATWG received fifteen Concept Papers covering a range of technologies. All fifteen were responsive to the solicitation and were reviewed. This Initial Assessment of the Concept Papers covers the ATWG’s evaluation and identifies potential technology focus areas for further review.

Focus areas

The ATWG has used focus areas to organize its work. This helps us consider how various technologies can help build the grid capabilities that will enable New York to meet its CLCPA objectives. Since 2022, we have worked on technologies to support Dynamic Line Ratings, Power Flow Control technologies, and Energy Storage for Transmission and Distribution. Our process has included the development of use cases, potential studies, and creating guides to assist planners as they consider advanced technologies as solutions in the CGPP.

During our 2023 Fall Planning Meeting, the ATWG explored additional areas that might support needed capabilities and functionality for the New York grid. These areas, which were first identified

in the *Utility Transmission and Distribution Investment Working Group Report*⁴, included, but were not limited to:

- Advanced conductors;
- Advanced protection for Inverter Based Resources (IBRs);
- Advanced system planning tools;
- Compact line designs;
- Distributed Energy Resources Management Systems (DERMS); and
- Improved operator situational awareness.

We saw that various Concept Papers described technologies with similar functionality. Furthermore, we recognized that many papers fit within potential focus areas that the ATWG had identified as priorities. Figure 1 illustrates the initial grouping of the Concept Papers.

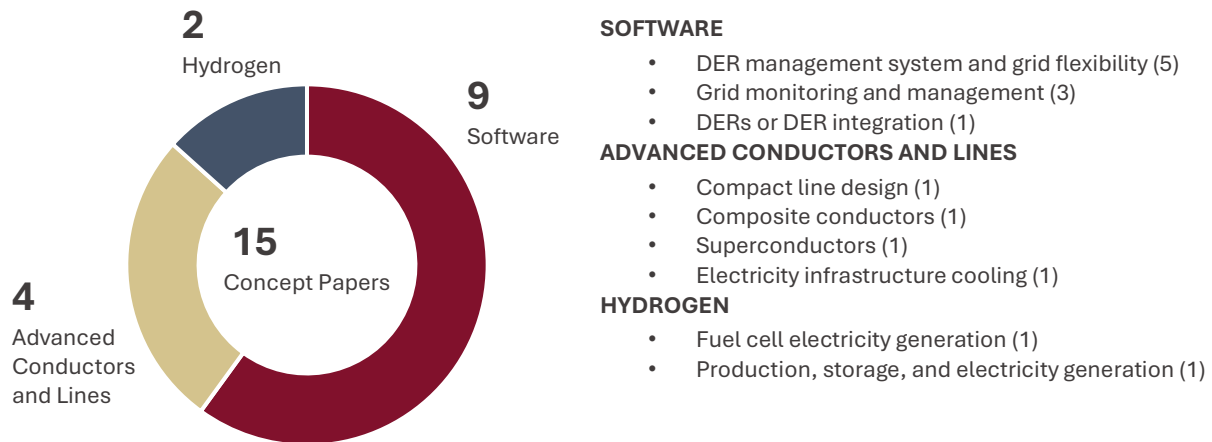


Figure 1. Initial organization of the Concept Papers.

The ATWG further organized the Concept Papers into four groups to facilitate closer examination. These are:

- Advanced Conductors and Lines
- Distributed Energy Resource Management Systems (DERMS)
- Grid Monitoring and Management
- Hydrogen

The ATWG will determine how best to work in each area in the coming months. In some cases, we may leverage our existing task forces; in others, we may find it better to start new ones. The following sections describe each area and the potential next steps.

⁴ *Utility Transmission and Distribution Investment Working Group Report*, Joint Utilities of New York, November 2, 2020.

Advanced Conductors and Lines

The ATWG received four Concept Papers proposing technologies that aim to optimize existing transmission capacity and rights-of-way through improvements to conductor and line infrastructure. These proposals include compact tower design, advanced conductors, superconducting transmission lines, and electricity infrastructure cooling. Benefits highlighted by these proposals include increased capacity factor, reduced line losses, longer equipment lifespan, and a smaller physical footprint for the transmission system.

Advanced conductors and lines present an opportunity to address existing grid bottlenecks that constrain the deliverability of renewable energy generation while reducing the need for new or expanded transmission corridors. Concept Paper submissions suggest that integrating these technologies could also reduce transmission capital, operations, and maintenance costs.

The deployment readiness of technologies for advanced conductors and lines varies. Some are commercially available, while others will soon be deployed in initial demonstration projects. The ATWG is interested in better understanding the readiness of these offerings and any barriers that may hinder their deployment as a tool to support the achievement of statewide goals. The ATWG plans to explore advanced conductors and lines as a technology area that can better utilize existing transmission capacity and rights-of-way.

Distributed Energy Resource Management System (DERMS)

A DERMS is a software-based platform to manage distributed energy resources (DERs) such as rooftop solar panels and battery energy storage systems. With the increasing adoption of DERs in New York, DERMS will play a crucial role in grid management by balancing supply and demand while facilitating the provision of grid services.

IEEE 2030.11, a DERMS guide published by the Institute of Electrical and Electronics Engineers (IEEE) Standards Association (SA), outlines a set of core DERMS functions and related guidance. These core functions include identifying and visualizing DERs, forecasting DER production, monitoring and dispatching real and reactive power loads, providing ancillary services such as voltage and frequency control/support, and aggregating DERs.⁵

The ATWG received five Concept Papers proposing technologies that support the functional capabilities described in the IEEE guide, categorizing them as DERMS. Specifically, the five submissions address real-time monitoring and control of DERs, aggregating DERs, and providing demand response (DR) and market platforms. A DERMS could help balance generation and load, alleviate T&D bottlenecks, reduce congestion, and help deliver renewable energy capacity to load centers.

The ATWG is interested in further exploring how DERMS can contribute to a more reliable and sustainable power grid. Given that DERMS encompasses various features, a detailed evaluation will

⁵ How To Manage Distributed Energy Resources More Effectively, IEEE SA.
(<https://standards.ieee.org/beyond-standards/how-to-manage-distributed-energy-resources-more-effectively/>)

be necessary to identify the specific capabilities and limitations of deploying DERMS in each utility's service area.

Grid Monitoring and Management

Improving situational awareness will help ensure reliability, flexibility, and efficiency as operators manage an increasingly complex grid with more renewable and distributed energy resources. The ATWG received three Concept Papers that describe software technologies that can increase grid visibility, analyze performance, and improve control. Technologies include grid-edge voltage monitoring, measurement of power system inertia, and real-time data analytics.

The ATWG plans to investigate the capabilities and applications of these technologies to understand better how they might support grid operators. We anticipate leveraging our Dynamic Line Rating Task Force as this group has been examining technologies applicable to grid monitoring and management. Initial work may include consultations with technology providers and exploration of use cases that would best support New York's CLCPA goals.

Hydrogen

Hydrogen could play a critical role in helping New York achieve its decarbonization goals. As the hydrogen ecosystem matures, this resource could serve as a grid resource, fuel for dispatchable emission-free resources (DEFERs), or an energy storage medium. In these applications, the use of hydrogen will depend on the location and proximity of its production, delivery, and use.

The Concept Papers received by the ATWG contemplate hydrogen's evolving role. In the near term, the ATWG plans to further evaluate hydrogen within the Energy Storage Task Force.

Next Steps

The call for Advanced Technology Concept Papers increased the ATWG's pipeline for its technology scouting process. We look forward to continuing to evaluate the ideas we received and plan to leverage our working group and task forces as we proceed. Our next steps will be:

- 1) Prioritize the four focus areas based on each area's potential to support the CLCPA and CGPP in the near term, and
- 2) Incorporate the high-priority areas into our ongoing technology scouting and assessment process.

We also anticipate following up on this Initial Assessment as part of stakeholder activities later this year. These include a summer webinar and an end-of-year report summarizing the working group's activities, ongoing technology assessments, and results from relevant studies. We will continue to work closely with NYSERDA to engage the technology stakeholder community in New York.

Appendix

The following is a list of Concept Papers received by the ATWG, in order of the date and time received.

Real Time Inertia Measurement Services, Reactive Technologies.

Hydrogen Fuel Cell Technology Providing Dispatchable Zero-Emissions Electricity, Plug Power.

Voltage Optimization for the Distribution Grid, DVI.

Low Impedance Compact Line Design, BOLD Transmission LLC.

Optimizing The New York Power Grid: A Project for Sustainable Grid Management for Stability and Renewable Integration, SMPnet.

CTC Global ACCC Conductor Concept Paper, CTC Global.

Increased Hosting Capacity Through Flexible Interconnections, Mitsubishi Electric Power Products (Smarter Grid Solutions).

Multi-tier Grid Optimization – Application to Cold Storage Facilities, Energy One Solutions International.

Meltek’s Aggregate Demand Management, Meltek.

Increasing Transformer Reliability and Longevity Through Passive Heat Dissipation, Heat Inverse.

Superconducting Transmission Lines in New York, VEIR.

Statewide DER-Enabled Market Platform for Grid Flexibility, Piclo.

State Estimation and Forecasting with Dynamic Relay Settings for Distribution Protection and Control, Acelerex.

Advancing Grid Modernization & Clean Energy with HYDRO-GEN™, Vivacity Power Inc.

The Intelligent Energy Storage Network for the Built Environment, Novele.