JOINT UTILITIES
OF NEW YORK

2026 Call for Advanced Technology Concept Papers

Proposals Due: Friday September 4, 2026, by 5:00 p.m. Eastern Time

The Advanced Technology Working Group (ATWG) seeks concept papers for innovative and commercially viable grid-enhancing technologies that can contribute to improving and modernizing the New York electricity grid, with particular interest in technology opportunities that build on experience gained through recent deployments of advanced solutions throughout New York State. [1]

Background

The ATWG was established following the New York Public Service Commission's January 20, 2022 *Order on Power Grid Study Recommendations* in Case 20-E-0197 directing the Joint Utilities (JU) and New York Department of Public Service Staff to establish a working group.

The goal of the ATWG is to help ensure that the electric transmission and distribution systems in New York can support the achievement of Climate Leadership and Community Protection Act (CLCPA) goals and to ensure that the necessary policies, procedures, and standards exist to address technical, process, regulatory, and economic concerns related to modern and innovative technologies.

To this end, the ATWG works to accelerate the deployment of emerging and advanced technologies and to understand their functionalities and cost-effectiveness as transmission and distribution solutions. While the scope of this solicitation is wide enough to consider both T&D technologies, a particular emphasis in this call for papers is placed on technologies that can be used for long-term transmission planning ahead of the next cycle of the Coordinated Grid Planning Process (CGPP), which is expected to begin in approximately June of 2027. The CGPP is a comprehensive statewide process to develop portfolios of least-cost solutions to support state policy goals and provides one of the next major opportunities for advanced technologies to be commonly evaluated across the Joint Utilities.

Scope

The ATWG welcomes submissions that introduce novel approaches or applications, including technologies in late stages of development. For this solicitation, "novel" may include (but is not limited to):

- Technologies or use cases with clear potential to reduce system or lifecycle costs relative to traditional solutions;
- New or breakthrough technologies, or materially differentiated applications of existing technologies;
- Applications leveraging advanced analytics, including artificial intelligence (AI) and machine learning (ML);
- Solutions designed for accelerated deployment and ease of implementation, including minimal siting, permitting, or integration complexity; and/or
- Technologies with low or negligible ongoing operations and maintenance (O&M) requirements.

The ATWG is seeking papers describing (but not limited to):

Proposed technologies should support the development and deployment of solutions that: provide bridge-to-wire, accelerate the time to power customers, enhance the reliability, security, and efficiency of the New York electric grid; facilitate integration of clean and renewable energy; reduce costs for consumers and stakeholders; and advance grid technology and innovation. Technologies should also demonstrate the ability to create or increase system "headroom" for clean energy generation.

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[1] The Joint Utilities describe pilots and demonstration projects involving advanced transmission technologies in the Advanced Technology Working Group's 2025 Annual Report, which is available here: https://tinyurl.com/yc67z8wy

Headroom refers to the grid's projected capability to support additional clean energy resources before thermal or voltage constraints are encountered. It includes:

- Capacity headroom – additional renewable generation capacity (MW) that can be supported by the existing grid or enabled incrementally by new transmission or distribution investments; and
- Energy headroom – additional energy (MWh) deliverable without curtailment over a defined operating period, accounting for variable output.

*Specific definitions and use cases technologies may be able to address include those described in **Attachment B**.*

Requested solution designs:

- Enhance transmission grid (≥100 kV) performance;
- Address large-scale grid needs associated with substantial capacity additions;
- Can be paired with traditional solutions to flexibly and incrementally add system capacity;
- Have demonstrated deployment experience and real operating data; and
- Have a reasonable amount of cost data available.

Technologies of interest may include:

- Power quality and system stability (e.g., grid-forming inverters, harmonic detection, and protection); High-speed Q-priority inverter response to mitigate voltage sags during faults.
- Advanced protection (e.g., advanced relays, Fault Location, Isolation, and Service Restoration (FLISR), early fault detection, predictive maintenance); Utilization of travelling waves to establish baseline circuit health and identify system equipment conditions by exception.
- Energy storage for transmission purposes (e.g., long-duration energy storage, technologies to enhance system inertia and fault current levels (active and synthetic), mobile energy storage, compact and safe designs for urban areas, fire detection/suppression);
- Grid services such as congestion relief, curtailment mitigation, peak shaving, and voltage support. These technologies may include bridge-to-wires solutions, demand management/peak reduction solutions, and repurposing or second-life use cases for energy storage assets;
- Compact tower designs;
- Solutions that provide adequate protection for the following challenges associated with a high saturation of inverter-based (IBR) generation:
    - <u>Protection Operability Concerns</u>: High saturation of inverter-based generation combined with retirement of synchronous generation creates protection operability concerns on the electric system;
        - Parts of the New York electric system may be seeing differing levels of risk of protection mis-operations now and in the future due to this combination and existing system conditions;
    - <u>Quantifying Risk:</u> Modeling-based screening developed within the industry can be useful to identify areas of the system where conditions may impact relay operability, but the risk is challenging to quantify in real time;
    - <u>Understanding Emerging Solutions:</u> Building new synchronous sources at substations is an established solution; however, emerging solutions (e.g., differential protection, advanced relays) may also address this challenge; and

    - The NY Joint Utilities are interested in understanding potential solutions, plans for advances in this technology, and associated costs.

To further clarify the intent of this solicitation, the ATWG notes that certain types of proposals may fall outside the scope of interest. E.g.:

- Dynamic Line Rating (DLR) examples:

  For DLR the NY utilities are interested in concept papers that discuss novel and new approaches to DLR. Proven DLR technologies that have been on the market and widely deployed over the years in the US and outside the US; such as sensors-based technology /network, are no longer considered novel. However, and as examples only, computational and/or AI based algorithms to predict in real time the available capacity of a transmission line may be considered novel. Of interest could be algorithms that may take into consideration the characteristics of conductors, real-time local weather (e.g., wind velocity, temperature, solar irradiance) in the vicinity of the transmission circuit, the terrain in which the transmission line traverses, and current vegetation status.

  Another example of novel approaches to DLR could be approaches that quantify the risks of varying the capacity of a conductor and the probability of these risks taking place based on the electrical and environmental operating conditions at any given time.

  Investigate using the real-time monitored information from DLR (and weather sources) to actively control power flow control devices, variable impedance transformers, inverter based resources, adaptive relays, and similar equipment to optimize system power transfer and protection.

Submission Requirements

Submissions should address the following:

1. **Description:** Provide a detailed description of the proposed technology or solution, including its technical specifications and functionality. The description should identify the use cases and potential grid services the technology or solution could provide. Standard metrics for grid services such as MW and MVAR are encouraged. Finally, the description should also address technology maturity, deployment readiness, and potential challenges for deployment in New York.
2. **Headroom Benefits:** Clearly describe how the proposed technology increases system "headroom" (as defined above), including:
   - The grid constraints addressed (thermal, voltage, and/or congestion-related);
   - Whether capacity headroom, energy headroom, or both are impacted; and
   - The expected magnitude (or range) of improvement (MW and/or MWh), based on power flow analysis or demonstrated deployment.
3. **Deployment Experience:** Demonstrate the technology's deployment record in New York, or in other jurisdictions. Include details on the locations, project sizes, cost, and performance data, if available.
4. **Potential Deployment Timeline:** Outline a preliminary plan for implementing the technology within the New York grid, including potential timelines, partnerships, and regulatory considerations.
5. **Cost Data:** Provide a typical cost range that facilitates solution comparison, preferably in \$/MW and/or \$/MW-yr (for storage technologies, cost ranges should include both \$/MW and \$/MWh). The range should reflect installed capital cost and annual O&M costs.
6. It is recognized that advanced technologies in a nascent state of development and deployment makes estimating costs challenging. Furthermore, innovative technologies may have shorter

economic lives than traditional solutions. However, this information is crucial for assessing a technology's potential to help meet the State's clean energy goals.

7. **Potential Benefits:** Describe and quantify the technology's potential benefits for the New York electricity grid, including its impact on reliability, efficiency, renewable energy integration, cost reduction, and other relevant factors.
8. **Power Flow Modeling:** Describe how the technology is typically represented in commercially available power system tools (e.g., PSS®E and PSCAD) to assess its benefits and impacts, along with any specific requirements or limitations such as the need for transient or dynamic stability analyses.

Concept Paper Template

The Concept Paper Template in Attachment A should be used to prepare Concept Paper submissions.

Submission Deadline

Submissions must be made electronically to ATWG@ceadvisors.com by **September 4, 2026, at 5:00 p.m. ET.**

Review Criteria

Submissions will be reviewed based on the following screening criteria:

- Alignment with the stated scope.
- Technical feasibility of the proposed technology.
- Commercial maturity and the technology's ability to be deployed in New York.
- Demonstrated record of deployment with performance data.
- Availability and transparency of cost information.

Progression of Next Steps (following Submission of Concept Papers)

Parties may be invited to discuss their proposals in more detail with the ATWG.

- Selected respondents may be invited to participate in technical discussions or workshops with the ATWG and Joint Utilities to further evaluate feasibility, applicability, and system impacts.
- The ATWG may request additional information, including refined cost data, modeling assumptions, or site-specific use cases, to support comparative assessment.
- Promising concepts may be considered for pilot or demonstration opportunities in coordination with utility programs or external funding sources discussed below.

Funding Opportunity

NYSERDA Funding Opportunities (Program Opportunity Notices – PON 6149[2])

Technologies may also be considered for support through funding opportunities administered by the New York State Energy Research and Development Authority (NYSERDA). Concept papers would need to be submitted through both processes: to the ATWG in response to this Call for Papers and to NYSERDA through the applicable PON process.

Questions

All questions about this Call for Advanced Technology Concept Papers should be directed to ATWG@ceadvisors.com.

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[2] PON 6149 - Grid Modernization Grid Enhancing Technologies.

CONCEPT PAPER TEMPLATE INSTRUCTIONS

CONTENT REQUIREMENTS:

(1) The Concept Paper template below should be used to prepare Concept Papers.

(2) Applicants should review their Concept Paper prior to submitting the proposal to ensure its accuracy.

(3) Confidential, proprietary, or privileged information should be indicated by including the following in the footer of every page: "Contains Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure." In addition, every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

(4) Delete these template instructions before submitting Concept Papers.

FORMAT REQUIREMENTS:

(1) Concept Papers must be submitted in Adobe PDF format, be written in English, use black 11-point Times New Roman font, use 8.5 inch by 11-inch paper, be single-spaced, and have margins no less than 1 inch.

(2) Concept Papers, including graphics, figures, and tables, shall not exceed six (6) pages in length.

Attachment A – Concept Paper Template

PROJECT TITLE (250 characters or less)

Principal Contact, Lead Organization, Address, City, State, Zip, Email

1. OVERVIEW

Summary	Write a summary (1-3 sentences) that describes the proposed technology or concept and its potential impact on improving and modernizing the New York electricity grid. Include an assessment of the technology maturity, preferably using the Technology Readiness Level (TRL) scale.
Deployment Experience	Provide the technology's deployment record in New York or other U.S. jurisdictions. Include details on the location, project size, and performance data (if available).
Potential Deployment Timeline	Provide a preliminary plan for implementing the technology within the New York grid, including potential timelines (in months), project phases, partnerships, and regulatory considerations.
Cost Data	Provide a typical cost range that facilitates solution comparison, preferably in $/MW and/or $/MW-yr. The range should reflect installed capital cost and annual O&M costs.
Headroom Benefits	Describe how the technology can be used to increase system headroom. Ideally, one of the use cases in Attachment B would be addressed.
Other Potential Benefits	Describe and quantify any other potential benefits of the technology for the New York electricity grid, including its impact on reliability, efficiency, renewable energy integration, cost reduction, and other relevant factors.
Power Flow Modeling	Describe how the technology is represented using commercially available power system tools (e.g., PSS®E and PSCAD) to assess its benefits and impacts, along with any specific requirements or limitations such as the need for transient or dynamic stability analyses.

2. CONCEPT – limited to six (6) pages, no attachments, following this suggested outline.

I. Description

Describe the grid modernization problem and proposed technology or solution.

- What grid needs or opportunities are the proposed technology addressing?
- Assess the significance of this proposal to the State of New York?
- How does the proposed technology address the need or opportunity, and in what ways is it an advancement over existing or competitive solutions?
- What are the technical specifications, functionality, and use cases?
- How mature is the proposed technology? If possible, please provide an assessment of the technology maturity using the TRL scale.
- Is the proposed technology leveraging existing federal / state research priorities and funding? If so, please provide relevant details.
- In what ways does the proposed technology or solution align with the scope stated in the Call for Advanced Technology Concept Papers?

II. Deployment Experience

Provide the technology's deployment record in New York or other U.S. jurisdictions

- Has the proposed technology been deployed in the State of New York or other U.S. jurisdictions?
- If so, please provide details on the location, project size, cost, and performance data (if available), and an overall assessment of the project results.

III. Potential Deployment Timeline

Provide an outline for implementing the technology within the New York electricity grid.

- How long will it take to bring the technology into service within New York (in months), starting from conception to deployment?
- Identify the stakeholders who may be involved during the deployment of the proposed technology. Do any partnerships need to be formed? Does the project need to interface with the grid operator, government agencies, or other authorities?
- What are the regulatory considerations associated with deploying the proposed technology?
- Please provide a potential deployment timeline that includes the phases and duration associated with the project (e.g., Project conception and planning, regulatory approval and permitting, construction and implementation, operation and maintenance, decommissioning)
- How widely and rapidly can the proposed technology be deployed in New York and elsewhere?
- What is the estimated useful life of the proposed technology?
- What are the steps needed to decommission the technology/project?

IV. Cost Data

Provide a typical cost range that facilitates solution comparison.

- What is the typical range for the installed capital costs and annual operations and maintenance costs of the proposed technology, preferably in $/MW and/or $/MW-year?
- How might these cost ranges change over time?

V. Potential Benefits

Describe the potential benefits and impacts for the New York electricity grid.

- How does deployment of the proposed technology support the CLCPA goals and grid modernization goals in the State of New York?
- How can the proposed technology improve grid reliability, energy efficiency, renewable energy integration, and environmental protection, reduce costs, and contribute to economic growth in New York? How significant are these impacts?

VI. Power Flow Modeling

Describe how the technology is typically represented in power system tools.

- What commercially available tools are compatible with the technology, and how is the technology modeled?
- What study types are required to capture impacts and benefits? Under what operating conditions or grid events are each study types necessary?
- What modeling assumptions and limitations apply?

- How does the model interface with system operations?

Attachment B - Example Headroom Needs

For one or more of the following examples, please describe how your technology could be used to resolve the constraints and/or increase the system headroom (increase the output of the generators specified in the diagrams). Typically, detailed power flow models are used to perform these calculations. If power flow modeling data or expertise is not available, simplified descriptions and assumptions should be made to approximate how your technology could be used to increase headroom.

What is headroom and how are we defining it?

Within this document, the term "*headroom*" refers to the grid's projected capability to support additional clean energy resources before thermal or voltage constraints are encountered. Headroom may be quantified in the following ways:

1. The electric grid facilities which support the transfer of energy are rated based on power flow capacity or the allowable maximum level of use. Hence, the typical limiting condition for additional renewable generation is the rating of specific electric facilities, such as overhead and underground lines, transformers, and terminal equipment. **Existing headroom** describes the amount of new renewable generation that can be supported by existing facilities**. Incremental headroom** describes the additional amount of new (or curtailed existing) renewable generation that a new LT&D investment can support.
2. From an installed resource "rating" perspective, headroom can be measured in terms of the MW of new renewable generation capacity that can be supported by the existing grid or the additional new (or constrained existing) renewable generation capacity that can be accommodated by an upgrade project. For the purpose of this discussion, the MW headroom (existing or incremental) is referred to as the **Capacity Headroom**.
3. Renewable resources, such as solar and wind generators, provide variable renewable energy (VRE) whose total output in MWh varies over the course of days and months and may vary from year to year. It is important to measure this energy in order to track the State's progress towards CLCPA targets. The available energy from a VRE may be limited or curtailed due to the same set of potential limiting conditions that determine Capacity Headroom but, unlike capacity, which is evaluated based on points of maximum system use conditions, energy requires a view of potential curtailments over the course of an entire operating period, such as the entire year. Existing and incremental renewable energy headroom, in this respect, is the MWh amount of additional renewable generation that can be supported without curtailment by the existing grid and incrementally after an upgrade project is placed into service. For the purpose of this discussion, the MWh headroom (existing or incremental) is referred to as **Energy Headroom**.

How is headroom being calculated?

The best way to describe how headroom is being calculated is to show a simplified example. In this example we will show the Capacity Headroom result.

In the figure below we see a six (6) bus subsystem with three (3) generators. One generator is an existing generator in the NYISO queue. This generator will be set to 100% of its nameplate. By doing this, we make sure that we are accounting for its full capability when calculating the remaining headroom in the area. In addition, we have selected two (2) "proxy" generator locations at stations C and D and arbitrarily set their max nameplate output to 500 MW. This does not mean that the proxy generation will reach that point.

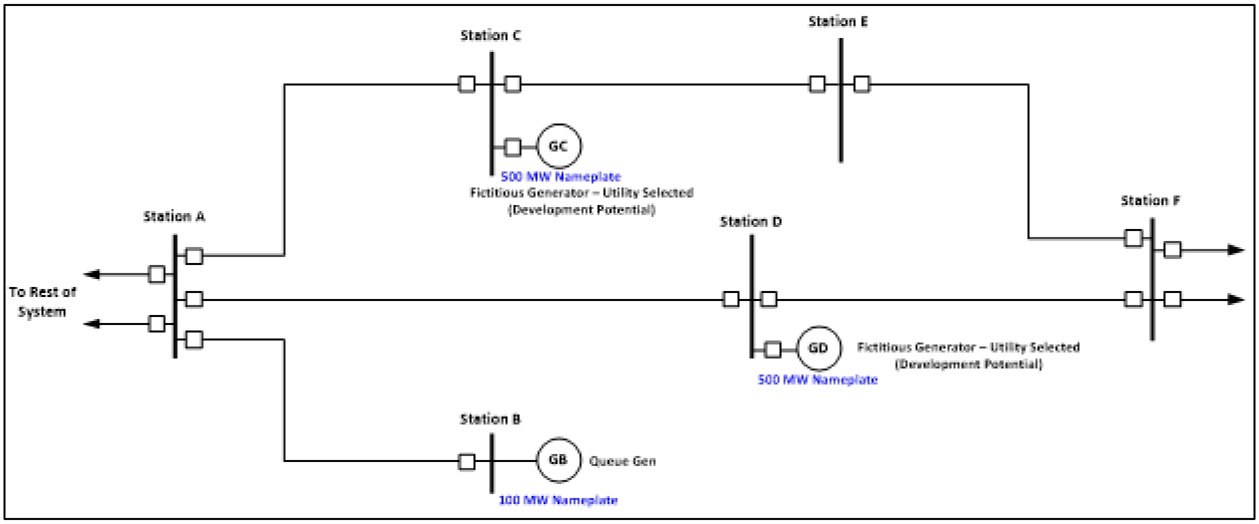

Figure 1 - Example System with Proxy Generation

Next, we optimize the proxy generation output to produce no violations for any N-1 contingency. N-1 is used because it is assumed that any generation that could cause a constraint during N-1-1 could be curtailed between contingencies. In the figure below the loss of the Line between Station A and Station D is the most constraining contingency. In this scenario we see that the optimal remaining headroom is the sum of the proxy generation nameplate: 300 MW.

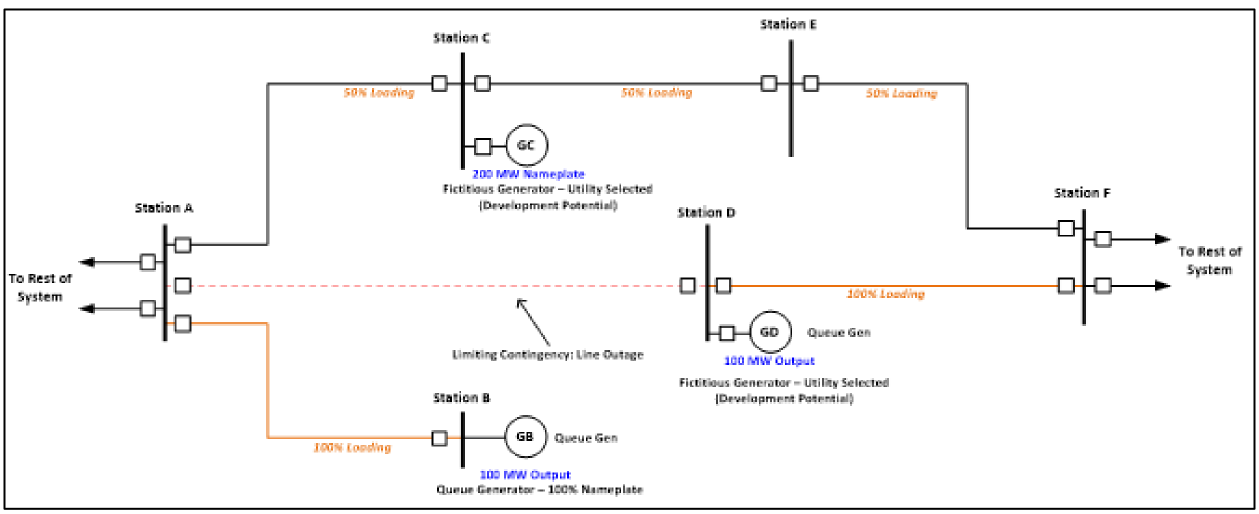

Figure 2 - Example System Pre-Project Headroom

The next step is to determine the effect of a project on the are headroom. In the figure below we can see that an addition of a line between Station D and Station F improves the headroom by 100 MW, for a total of 400 MW of capacity headroom, post-project.

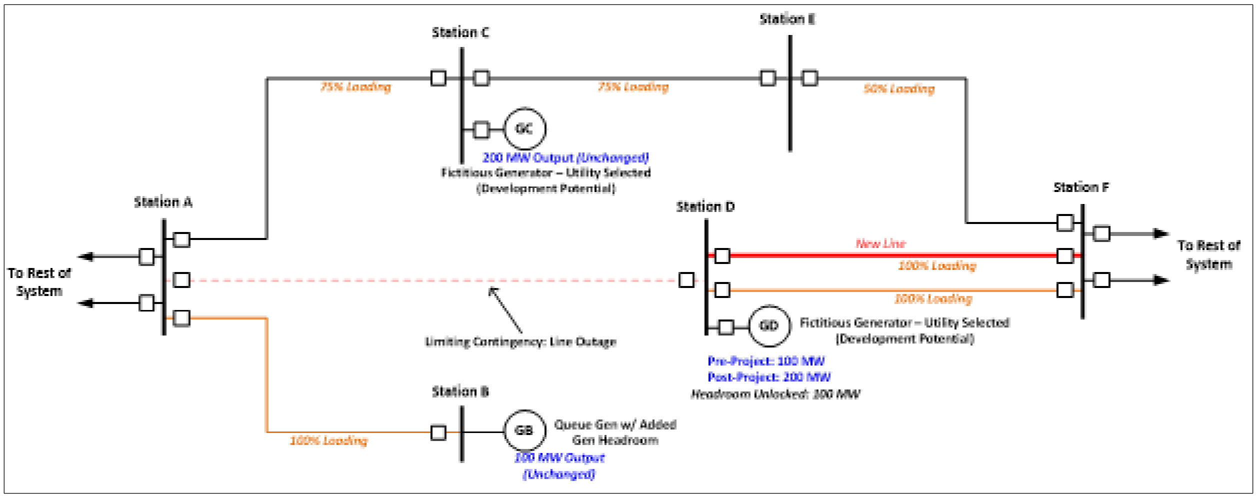

Figure 3 - Example System Post-Project Headroom

Example 1: High Renewable Penetration Region – Concept Overview

Regional Description

The defined study area includes approximately 500+ MW of existing utility-scale renewable generation interconnected across multiple voltage levels (e.g., 230 kV, 115 kV, and sub-transmission networks). A primary bulk transmission corridor serves as the backbone for energy transfer through the region, with renewable generation interconnected at multiple points along this path. A significant portion of this generation is wind-based, contributing several hundred megawatts to overall system output.

Power flows in the region generally originate from one direction of the bulk transmission system and are delivered via a combination of high-voltage transmission corridors and lower-voltage tie lines. Due to the low load in this region, excess generation is normally exported to the broader bulk transmission system, especially during light load and shoulder load periods.

The area is predominantly rural to semi-rural, characterized by long transmission lines and a layered network consisting of high-voltage transmission feeding an underlying sub-transmission system. This topology can create limitations in transfer capability and operational flexibility under high renewable output conditions.

Identified Deliverability Needs

System studies indicate that the pre-upgrade transmission network exhibits *significant thermal and voltage constraint***s** under high renewable generation scenarios, particularly during light load periods. Without mitigation, these limitations would necessitate *substantial curtailment of new and existing renewable resources*.

Deliverability constraints are observed under both of the following:

- Normal (N-0) operating conditions
- Contingency (N-1) conditions

The primary driver of these constraints is insufficient transmission capacity to export a large volume of proposed renewable generation (on the order of ~2,000 MW) interconnected across multiple voltage levels.

Key Limiting Conditions

- Renewable generation buildout results in severe thermal overloads during Normal (N-0) conditions on the Bulk and Local transmission systems during light load periods, requiring significant curtailment
- Loss of critical bulk transmission paths forces power onto lower-voltage networks, which are not designed to accommodate such flows resulting in multiple severe constraining conditions including:
    - Thermal overloads exceeding short term emergency ratings (150% to 200%)
    - Elevated risk of cascading outages
    - Voltage instability or collapse at key substations

These conditions are most severe following specific contingency events that reduce bulk transfer capability, and shift flows onto already constrained local infrastructure.

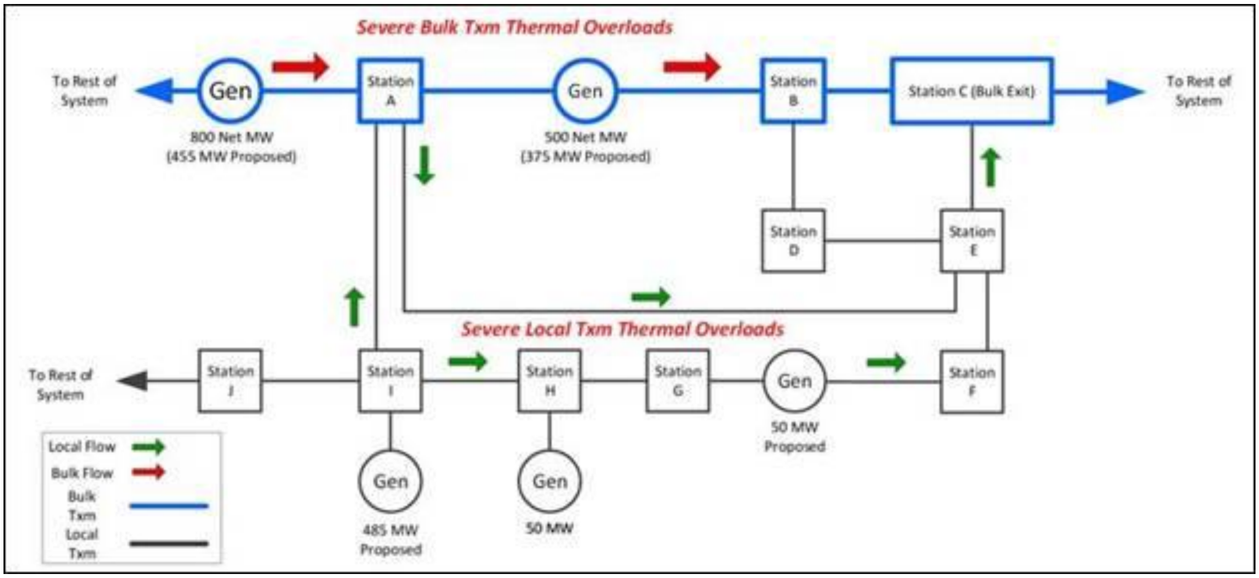

Figure 4 – Illustrative Depiction of N-0 Constraints

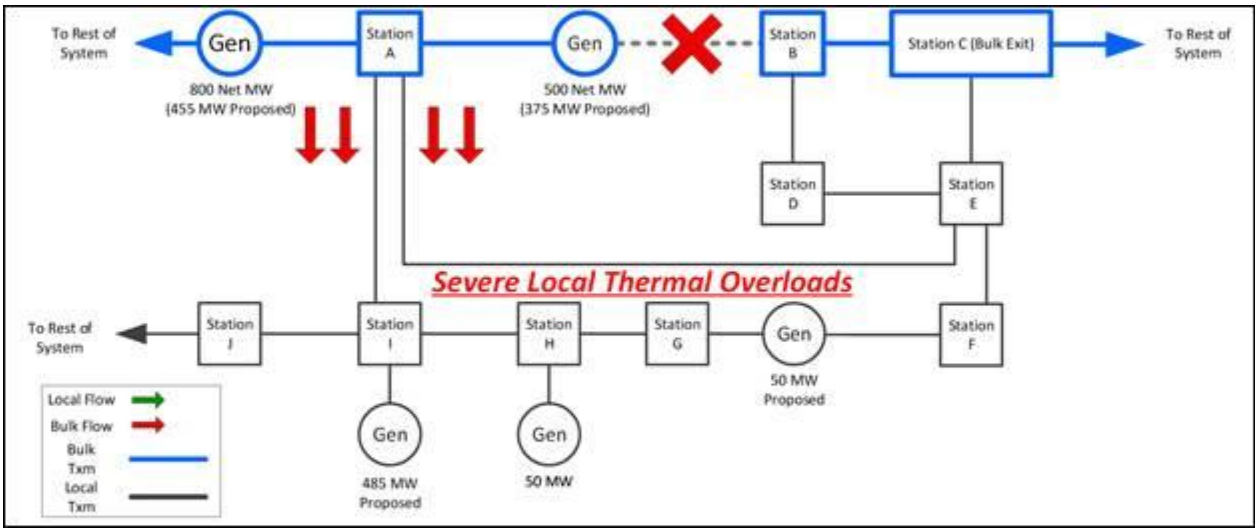

Figure 5 – Illustrative Depiction of N-1 Constraints

Traditional Solution Approaches

Conventional transmission planning identified two primary categories of solutions to address these constraints:

Reinforcement Approach

Upgrade existing transmission infrastructure to increase its capacity and improve performance.

- **Description**: Reconductoring, uprating equipment, and substation modifications
- **Estimated Capacity Headroom Increase**: ~1,800–2,100 MW

Expansion Approach

Develop new high-voltage transmission pathways to relieve congestion and improve deliverability.

- **Description**: Construction of new bulk transmission lines (e.g., 345 kV class) to bypass constrained corridors
- **Estimated Capacity Headroom Increase**: ~1,400–2,000 MW

Example 2: Local Transmission Pocket with Two Bulk Exits – Concept Overview

Regional Description

The defined study area includes approximately 250 MW of existing or proposed utility-scale renewable generation interconnected across the 115 kV and sub-transmission networks, with additional generation proposed on 345kV lines traversing the area. Numerous potential generator interconnection points exist on the local 115 kV network in areas which do not directly connect to the bulk system. Generation connected at these locations must traverse multiple legacy 115kV elements before reaching bulk export paths or load centers.

The area consists of small load pockets formed by cities and towns surrounded by vast rural areas traversed by long transmission lines, most of which are in parallel. High voltage transmission feeds the area with transformation at the eastern and western ends of the system. This topology can create limitations in transfer capability under high renewable output conditions.

Identified Headroom Constraints

System studies indicate that the pre-upgrade transmission network exhibits *significant thermal constraints* under high renewable generation scenarios and multiple load levels. Without mitigation, these limitations would necessitate *substantial curtailment of anticipated and existing renewable resources*.

Deliverability constraints are observed under both of the following:

- Normal (N-0) operating conditions
- Contingency (N-1) conditions

The primary driver of these constraints is insufficient transmission capacity to support the large volumes of renewables projected through the capacity expansion modeling performed in the New York Coordinated Grid Planning Process.

Key Limiting Conditions

- Renewable generation buildout results in thermal constraints during Normal (N-0) conditions on the local transmission system during various load levels, limiting the ability to expand generation capacity in the area.
- Loss of critical local transmission paths routes power over alternative lines toward load centers and bulk exits, which can only accommodate moderate increases before becoming a binding constraint

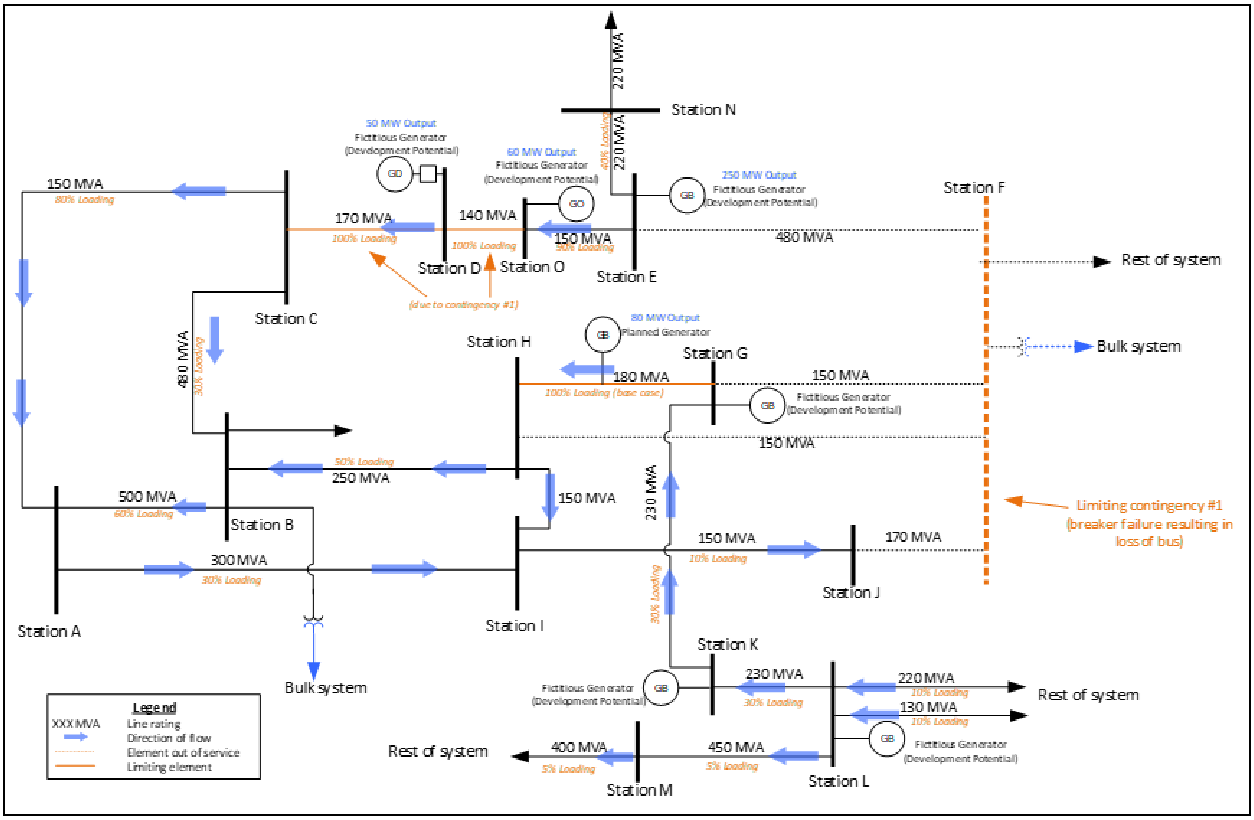

Figure 6 – Example 2 Headroom Limitations

Traditional Solution Approaches

Conventional transmission planning identified various upgrades to fortify the transmission system in this area, such as reconductoring lines with larger conductors, replacing limiting substation terminal equipment, and, in some cases, grid enhancing technologies.

Order of Magnitude Capacity Increase: ~100-300 MW

Example 3: Radial Transmission Pocket with High Renewable Potential – Concept Overview

Regional Description

The defined study area is predominately rural and includes approximately 20+ MW of existing or proposed DER on the underlying sub-transmission and distribution system. The 115 kV system in this area is radially connected to the wider grid through a long transmission line. The area in the general vicinity of the terminal substation has considerable potential for low-cost renewable generation. The underlying sub-transmission system in this area is connected to two other distant 115 kV sources, but the lower voltage system lacks the ability to safely transfer power to those exits and onto the wider grid, leaving the radial 115 kV line as the sole option for exporting any new large-scale generation from the area.

Identified Headroom Constraints

System studies indicate that the pre-upgrade transmission line exhibits *significant thermal constraints* under high renewable generation scenarios and multiple load levels. Without mitigation, these limitations would necessitate *substantial curtailment of anticipated renewable resources*.

Deliverability constraints are observed under both of the following:

- Normal (N-0) operating conditions
- Contingency (N-1) conditions

The primary driver of these constraints is insufficient transmission capacity and redundancy to support the large volumes of renewables projected through the capacity expansion modeling performed in the New York Coordinated Grid Planning Process.

Key Limiting Conditions

- Renewable generation buildout results in thermal constraints during Normal (N-0) conditions on the local transmission system during various load levels, limiting the ability to expand generation capacity in the area.
- Loss of the radial transmission feed to the area forces power onto the weak underlying sub-transmission system, causing overloads and voltage violations

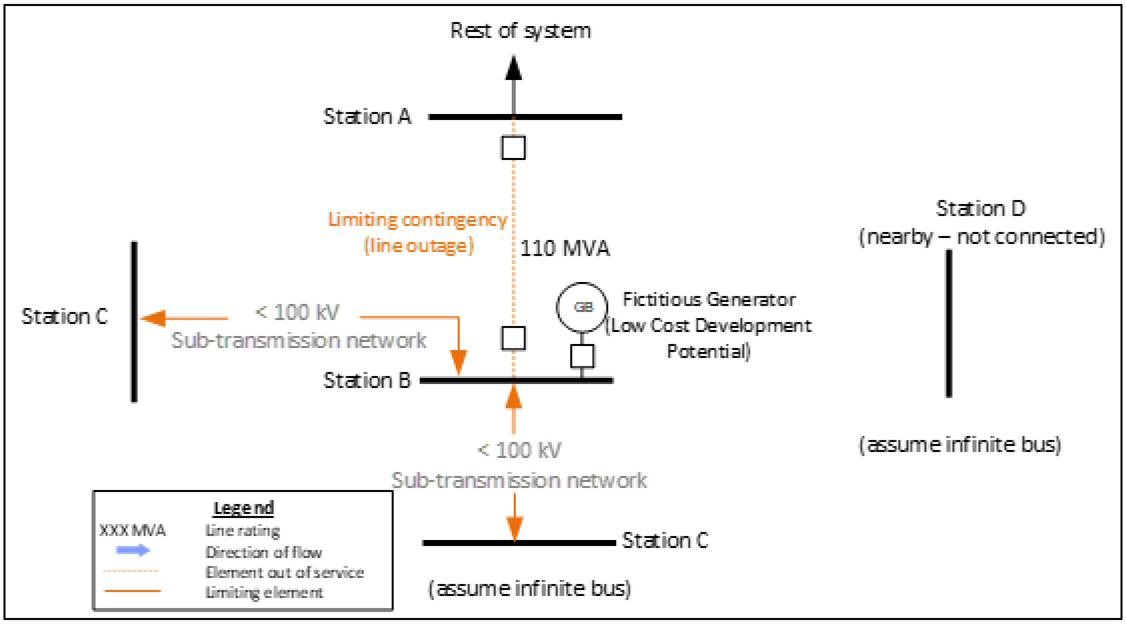

Figure 7 – Example 3 Headroom Limitations

Traditional Solution Approaches

Conventional transmission planning identified various upgrades to fortify the transmission system in this area, such as reconductoring lines with larger conductors, adding additional 115 kV connections to the wider grid, and rebuilding or expanding substations.

Order of Magnitude Capacity Increase:

- ~500 MW assuming the rest of the system is an infinite bus
- ~100-200 MW accounting for constraints outside of the study pocket

Example 4: Part Radial, Part Networked Pocket with Multiple Binding Constraints – Concept Overview

Regional Description

The defined study area is defined by small load pockets formed by cities and towns surrounded by vast rural areas traversed by long transmission lines, serving approximately 200+ MW of existing or proposed renewable generation on the local transmission system. The local system in this region is served by three 115kV connections to a neighboring area as well as a connection to the bulk system. The area is minimally networked, with most stations fed from either a single source, or only two sources. The substations with the highest potential for cheap renewable generation are mainly these minimally networked stations, with the few networked stations having somewhat reduced renewable potential. This topology has limited ability to reliably export new generation.

Identified Headroom Constraints

System studies indicate that the pre-upgrade transmission system exhibits *significant thermal constraints* under high renewable generation scenarios and multiple load levels. Without mitigation, these limitations would necessitate *substantial curtailment of anticipated renewable resources*.

Headroom constraints are observed under N-1 conditions.

The primary driver of these constraints is insufficient transmission capacity and redundancy to support the large volumes of renewables projected through the capacity expansion modeling performed in the New York Coordinated Grid Planning Process.

Key Limiting Conditions

- Renewable generation buildout results in thermal constraints during Normal (N-0) conditions on the local transmission system during various load levels, limiting the ability to expand generation capacity in the area.
- Loss of the radial transmission feed to the area forces power onto the weak underlying sub-transmission system, causing overloads and voltage violations

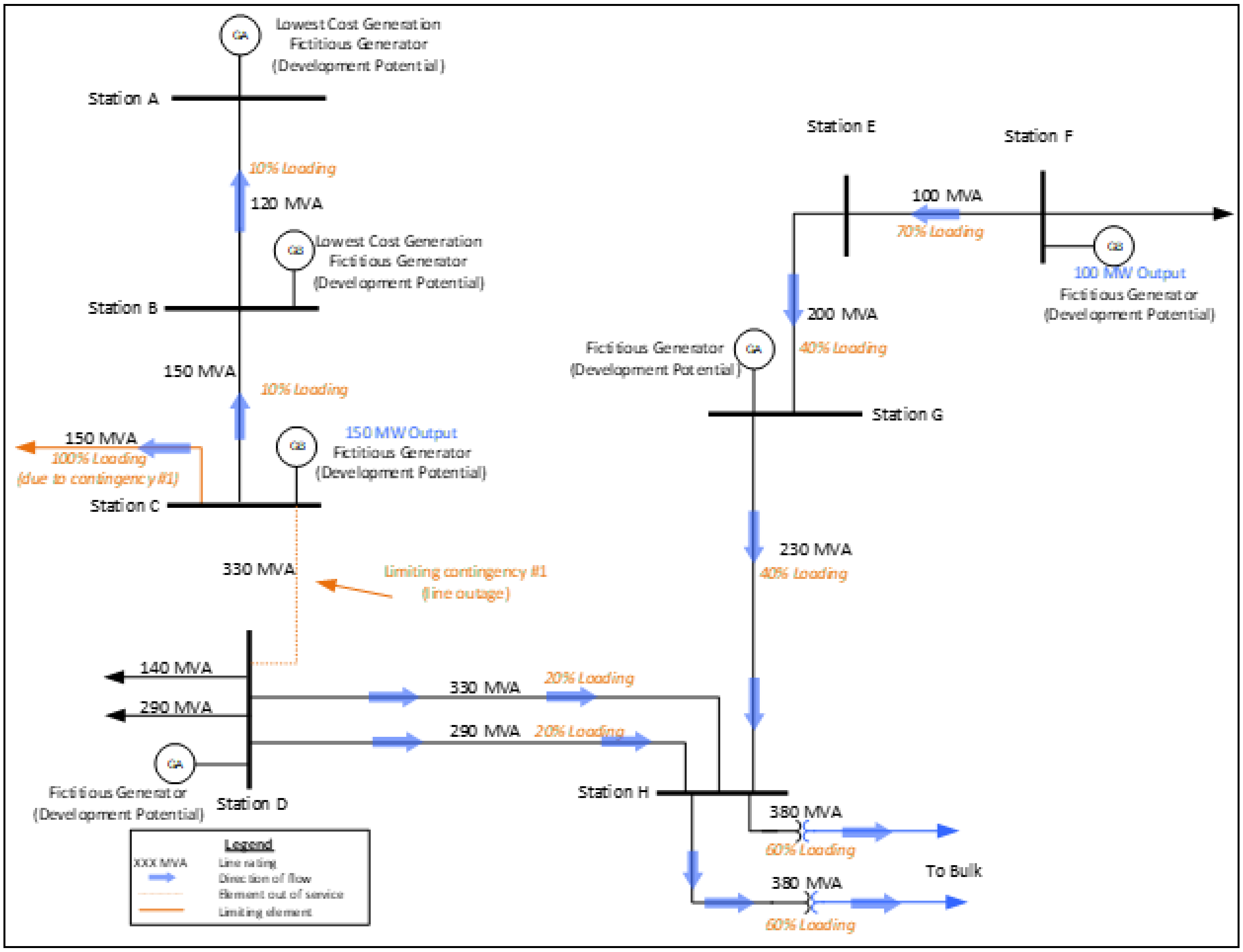

Figure 8 – Example 4 Headroom Limitations: Contingency #1

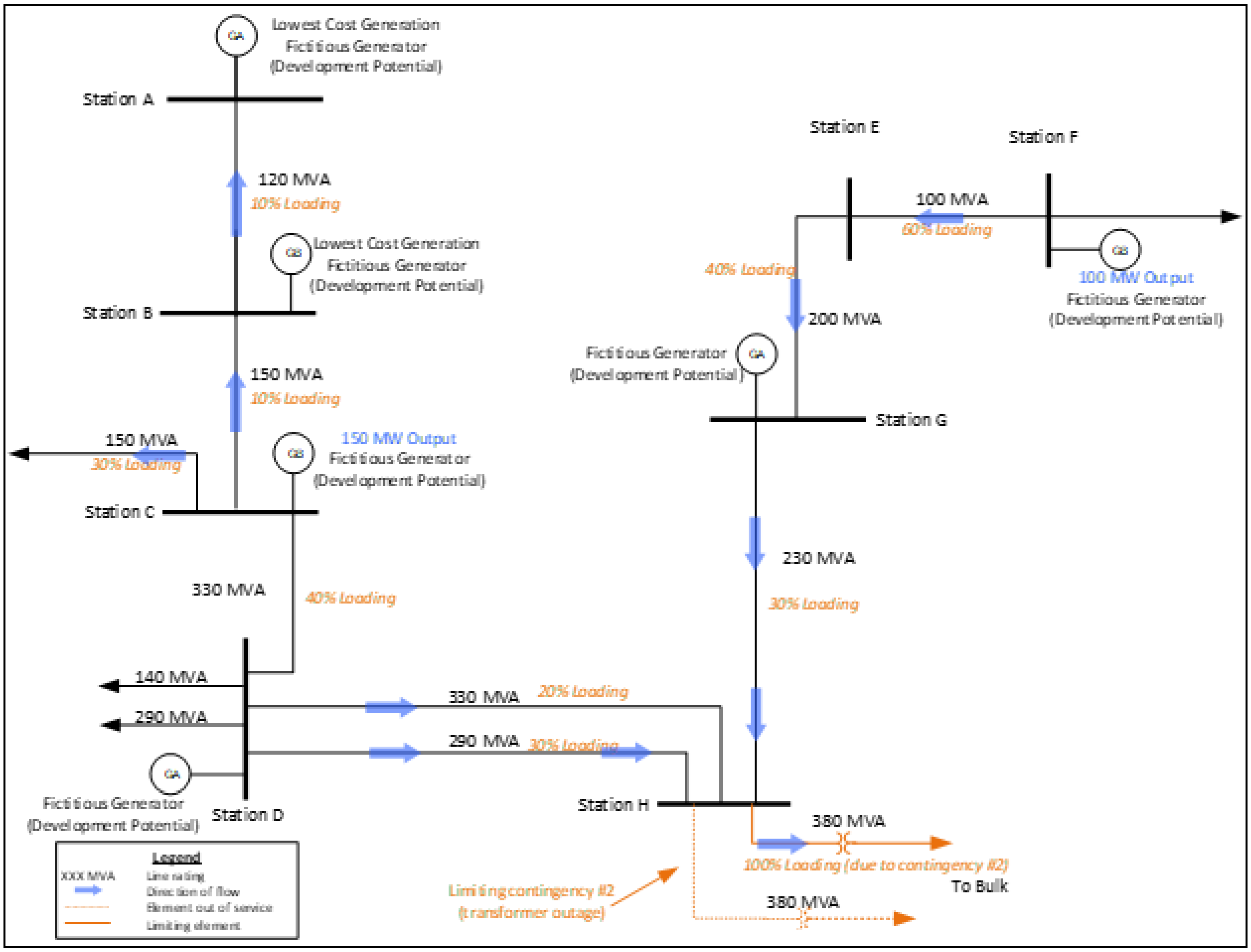

Figure 9 – Example 4 Headroom Limitations: Contingency #2

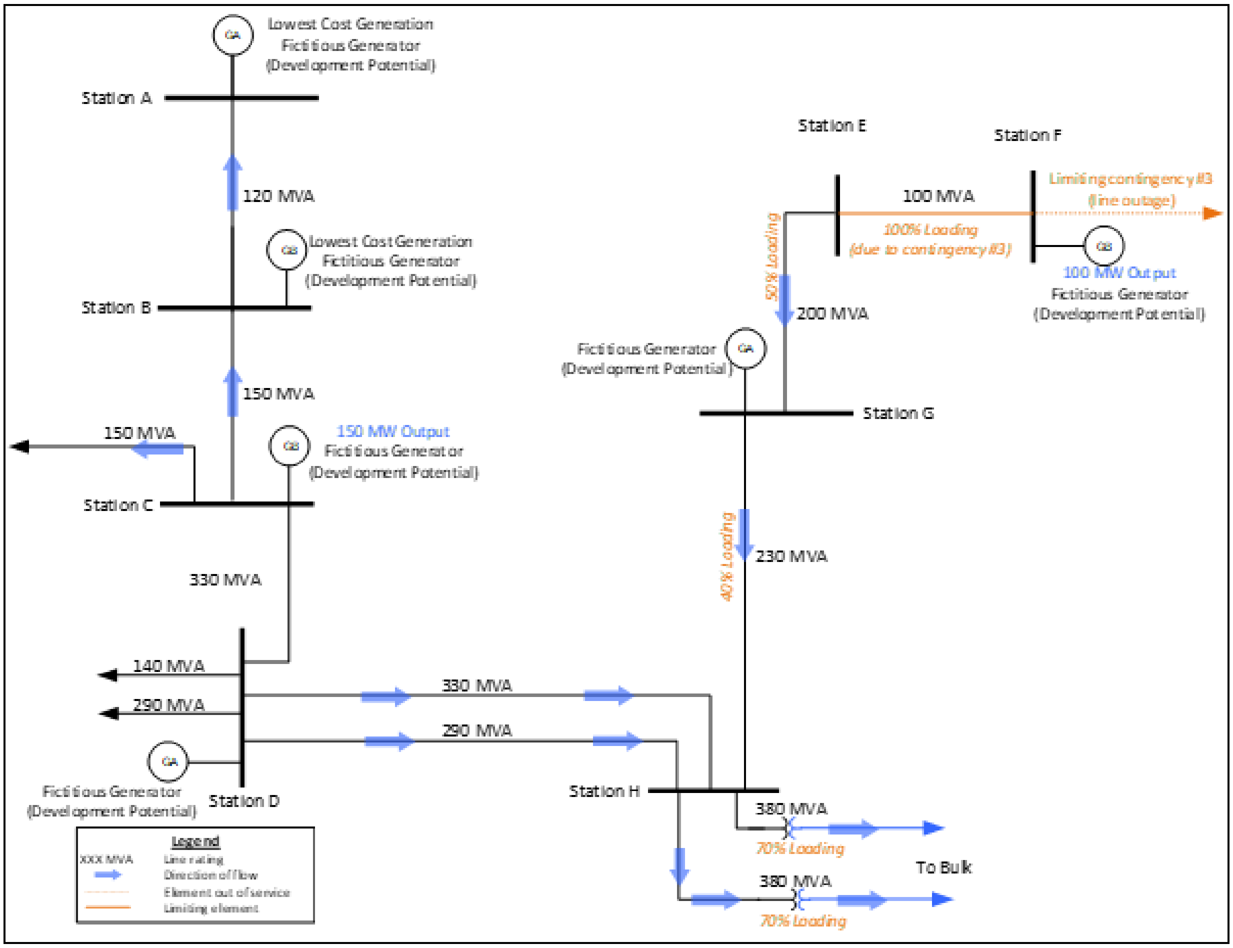

Figure 10 – Example 4 Headroom Limitations: Contingency #3

Traditional Solution Approaches

Conventional transmission planning identified various upgrades to fortify the transmission system in this area, such as reconductoring lines with larger conductors, strengthening the network with additional 115 kV connections between substations, adding a second bulk power source/exit, and associated substation upgrades.

Order of Magnitude Capacity Increase: ~200-400 MW

Opportunity for Grid Enhancing Technologies (GETs)

Given the high cost, long lead times, and siting challenges associated with traditional solutions, these scenarios present opportunities for Grid Enhancing Technologies (GETs) to provide alternative, hybrid, or complementary solutions, provided they can feasibly resolve, defer, or lessen constraints more efficiently than a traditional solution.

Proposal Expectations (Concerning Headroom Benefits)

A successful vendor’s contribution should provide the following information in their concept paper proposals to demonstrate how their technology increases headroom:

1. Provide detailed scope of a potential solution under representative system conditions (N-0 and N-1)

2. MW of generation added at each station specified in the examples above after adding the vendor's solution
3. Clearly state assumptions and limitations of their technology
4. Identify optimal deployment locations and configurations
5. Compare performance relative to traditional solutions