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OCTOBER 24, 2019

Emera Maine's Local System Plan – Bangor Hydro District
Needs Assessment/Potential Solutions
Local Planning Advisory Committee Meeting

Emera Maine Representative:
Jeffrey Fenn, P.E., LR/SGC Engineering LLC

Purpose of Local System Plan (LSP)

- Per Appendix 1 of Attachment K of the ISO-New England OATT – The LSP is an annual report that:
  - Describes non-PTF transmission system reliability needs
  - Reflects
    - Local system planning studies
    - Proposed solutions
  - Identifies
    - Local planning process
    - Criteria, Data and Assumptions
  - Gives opportunity for input
    - Local needs and solutions
    - Public Policy needs

LSP Communication

- LSP is communicated via Transmission Owners Planning Advisory Committee (TOPAC) meeting following an ISO-New England PAC meeting
- The material is posted prior to the TOPAC meeting (via the ISO-New England PAC posting system)
- Transmission Customers and Stakeholders have 30 days after TOPAC presentation to provide written comments for consideration by Emera Maine

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LSP Communication (continued)

- Emera Maine Contact:
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- EM LSP is located at:
  http://www.emeramaine.com/about-us/transmission-development/local-system-plan.aspx

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Local System Planning Process

The process is "Needs Assessment" followed by Solutions Proposals

- Local system needs can result from:
  - Load growth
  - Sub-area reliability assessments
  - Point of delivery request from customers
  - Generation interconnection requests (in accordance with appropriate generator interconnection procedures)
  - Public Policy Requirements
  - Asset Condition
- Local System Plan consists of:
  - Summary of needs assessment results
  - Listing of criteria, data and study assumptions
  - Identification of proposed alternatives
  - Solution study results and selection of preferred alternative

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Criteria, Data, and Assumptions

- Loads are based on the New England specific area as provided in the ISO-New England MOD case, Emera Maine specific forecasts and local customer needs are used to refine this
- Studies use relevant assumptions regarding transmission, generation and demand resources found in the latest ISO-New England Regional System Plan
- Criteria follows ISO-New England as well as TPL criteria or local planning criteria as appropriate – Local criteria listed at the end of this presentation

LSP Project List

- The LSP project list is a cumulative listing of proposed transmission solutions intended to meet local needs
- Similar to the ISO-New England PTF RSP, the LSP contains the status of each project
  - **Concept** – Project is under consideration as a solution to a partial needs assessment
  - **Proposed** – Needs assessment completed and project proposed as a solution, but not formally budgeted
  - **Planned** – Formally budgeted and, if necessary, PPA/I.3.9 approved by ISO-New England
  - **Under Construction** – Significant engineering and internal approvals in process and project is being implemented
  - **In-Service** – Project used and useful

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LSP – Concept

Need	Needs Assessment	Service Area	Name	Potential Solutions	In-Service Need
Reliability	Condition	Eastern	Line 1 Partial Targeted Rebuild Part 4 (Lucerne to Nicolin)	Targeted Rebuild of Line 1	2021
Reliability	Condition	Bangor	Tibbetts St 907 Breaker Replacement	Replace 907 Breaker	2021
Reliability	Condition	Washington County	Line 23 Targeted Rebuild – Roadside	Targeted Rebuild	2021
Reliability	Condition	Washington County	Scotts Hill Rd 410 Breaker Replacement	Replace 410 Breaker	2021
Reliability	Condition	Northern	Stanford 8310 Breaker Replacement	Replace 8310 Breaker	2021

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LSP – Proposed

Need	Needs Assessment	Service Area	Project Name	Solution	Project In-Service
Reliability	Condition	Bangor	Line 80 Partial 46kV Rebuild Part 3 (Enfield ROW)	Line 80 Partial 46kV Targeted Rebuild	12/2021
Reliability	Condition	Washington County	Line 20 Rebuild/Relocate - Whiting	Rebuild L20 out of ROW	12/2020
Reliability	Reliability	Eastern	Line 10 Feed Reconfigure Brooksville/ Blue Hill	Reconfigure how L10 feeds Brooksville and Blue Hill to improve reliability	12/2020
Reliability	Reliability	Washington County	Line 13 Reliability Improvement	Automate switching to improve contingency response time	12/2020
Reliability	Condition	Washington County	Harrington T1L Breaker Replacement	Replace Harrington T1L breaker	12/2020
Reliability	Condition	Northern	Lincoln 8502 Breaker Replacement	Replace Lincoln 8502 breaker	12/2020

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LSP – Planned

Need	Needs Assessment	Service Area	Project Name	Solution	Project In-Service
Reliability	Condition	Northern	Stanford Capacitor Circuit Sw.	Replace Existing Circuit Switch	12/2020
Reliability	Transmission Capacity	Bangor	Tibbetts L8 Link	Line 8 Protection Upgrade	12/2020
Reliability	Condition	Washington County	Line 21 Partial Targeted Rebuild Part 2	34.5kV Line 21 partial rebuild	12/2020
Reliability	Condition	Eastern	Line 1 Partial Targeted Rebuild Part 3 (Nicolin to Boggy)	Targeted Rebuild of Line 1	12/2020

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LSP – Under Construction

Need	Project In-Service	Service Area	Project Name
Reliability	11/2019	Eastern	Relocate Chester T1 to replace Boggy T1
Reliability	12/2019	System Wide	Numerous 34.5kV & 46kV Transmission Targeted Rebuilds
Reliability	12/2019	Washington County	T3L WCS Breaker replacement
Reliability	12/2019	Eastern	Youngs Corner Sw. Station
Reliability	10/2019	Northern	L84 Rebuild Part 3
Reliability	10/2019	Northern	Lincoln Capacitor Circuit Sw.
Reliability	12/2019	Northern	Lincoln 8702 Breaker Replacement
Reliability	12/2019	Northern	L86 Partial Rebuild

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LSP – In-Service

Need	Project In-Service	Service Area	Project Name
Reliability	12/2018	Northern	Chester 46kV T2L Breaker
Reliability	12/2018	System Wide	Numerous 34.5kV and 46kV Transmission Targeted Rebuilds (2018 phase)
Reliability	9/2019	Bangor	Line 80 Partial 46kV Rebuild Part 2
Reliability	9/2019	Bangor/Eastern	Line 1 Partial Rebuild Part 2
Reliability	9/2019	Washington County	L21 Rebuild
Reliability	9/2019	Northern	Line 84 Rebuild Part 2

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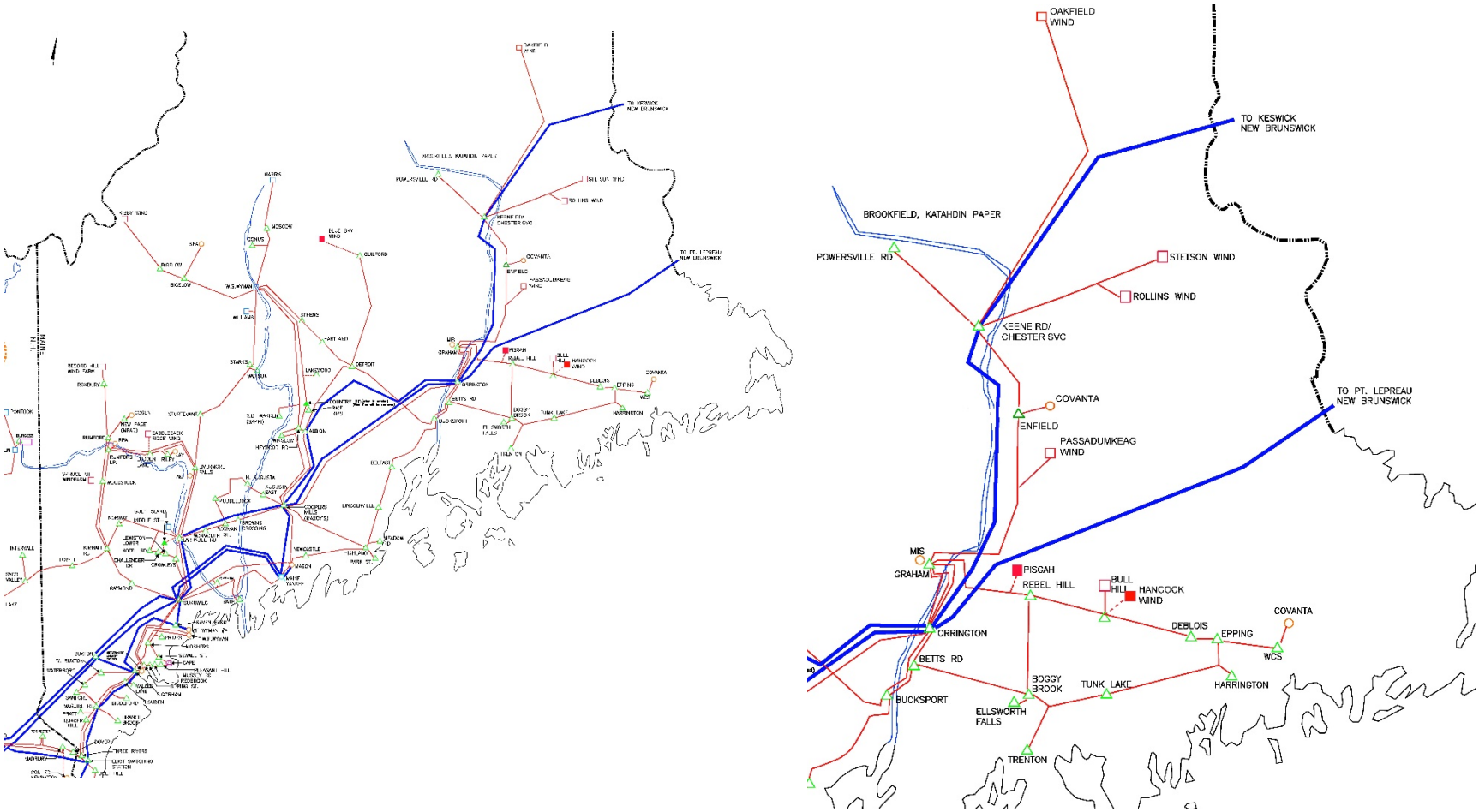
Maine and Emera Maine – Bangor Hydro District - Major Transmission System



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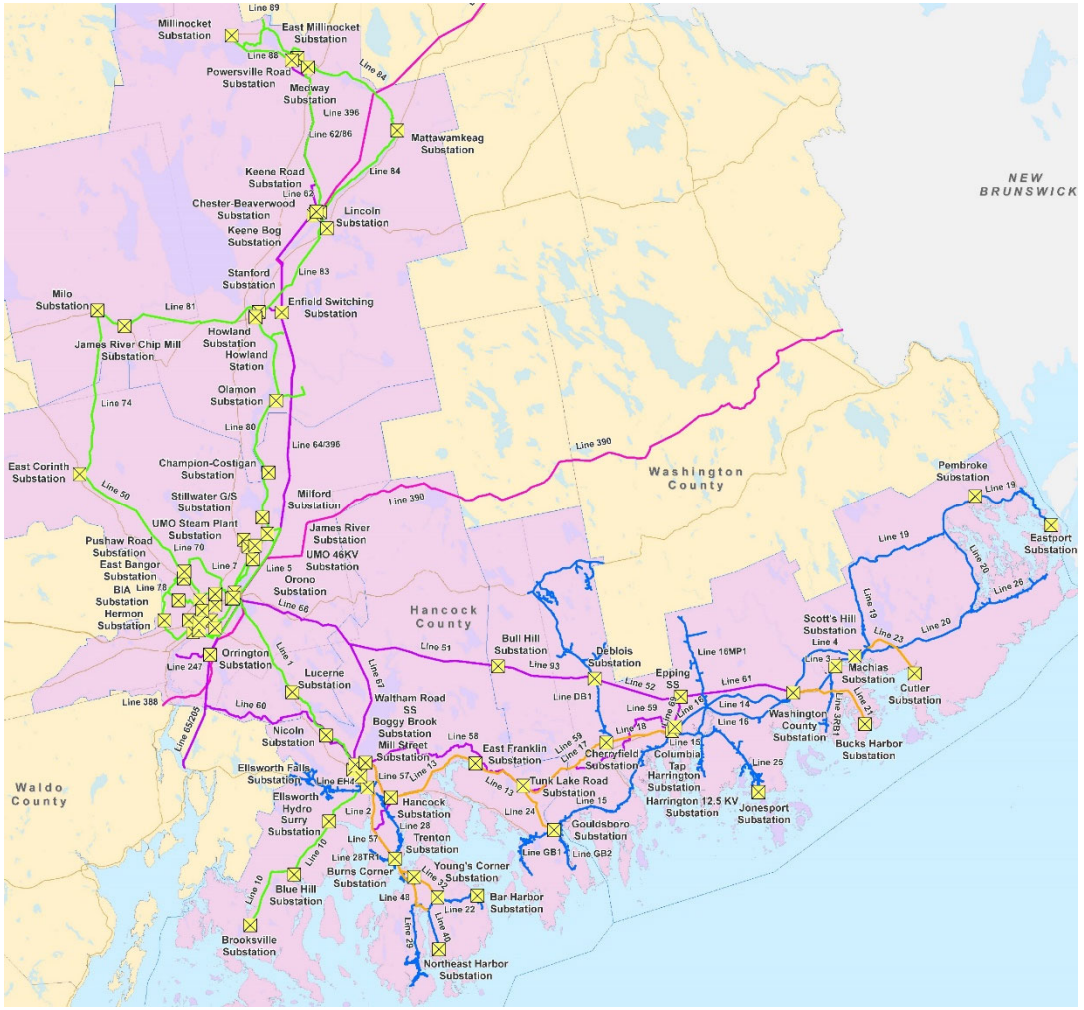
Emera Maine Bangor Hydro District Detailed System



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Descriptions - Concept

- Line 1 Targeted Rebuild Part 4 – 46kV Targeted rebuild from Lucerne to Nicolin based on structure condition.
- Tibbetts St. 907 Breaker Replacement – 46kV substation breaker due to be replaced based on condition
- Line 23 Targeted Rebuild – 34.5kV roadside structure replacement based on condition
- Scotts Hill Rd 410 Breaker Replacement – 34.5kV substation breaker replaced based on condition
- Stanford 8310 Breaker Replacement - 46kV substation breaker replaced based on condition

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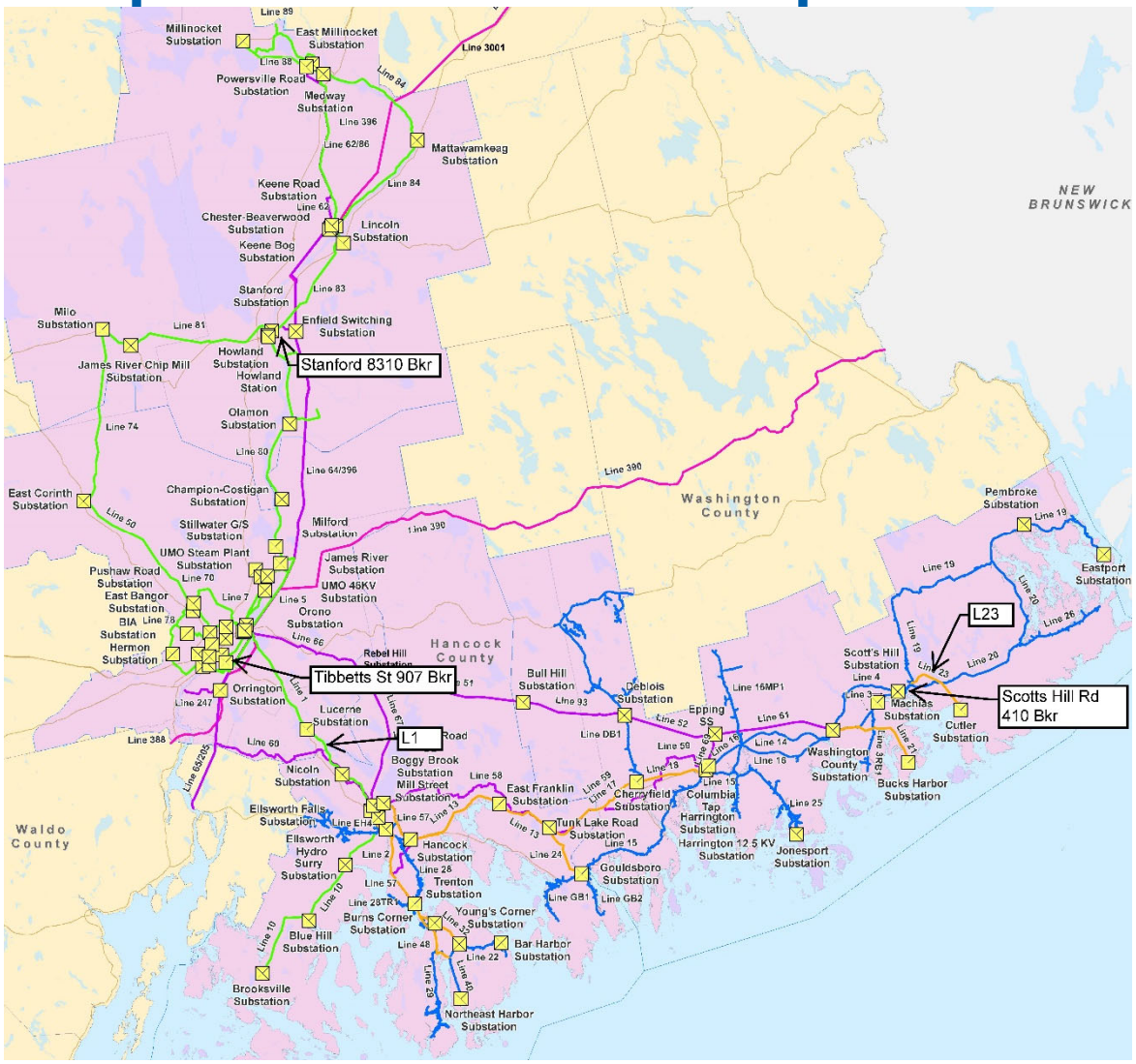
Descriptions - Concept



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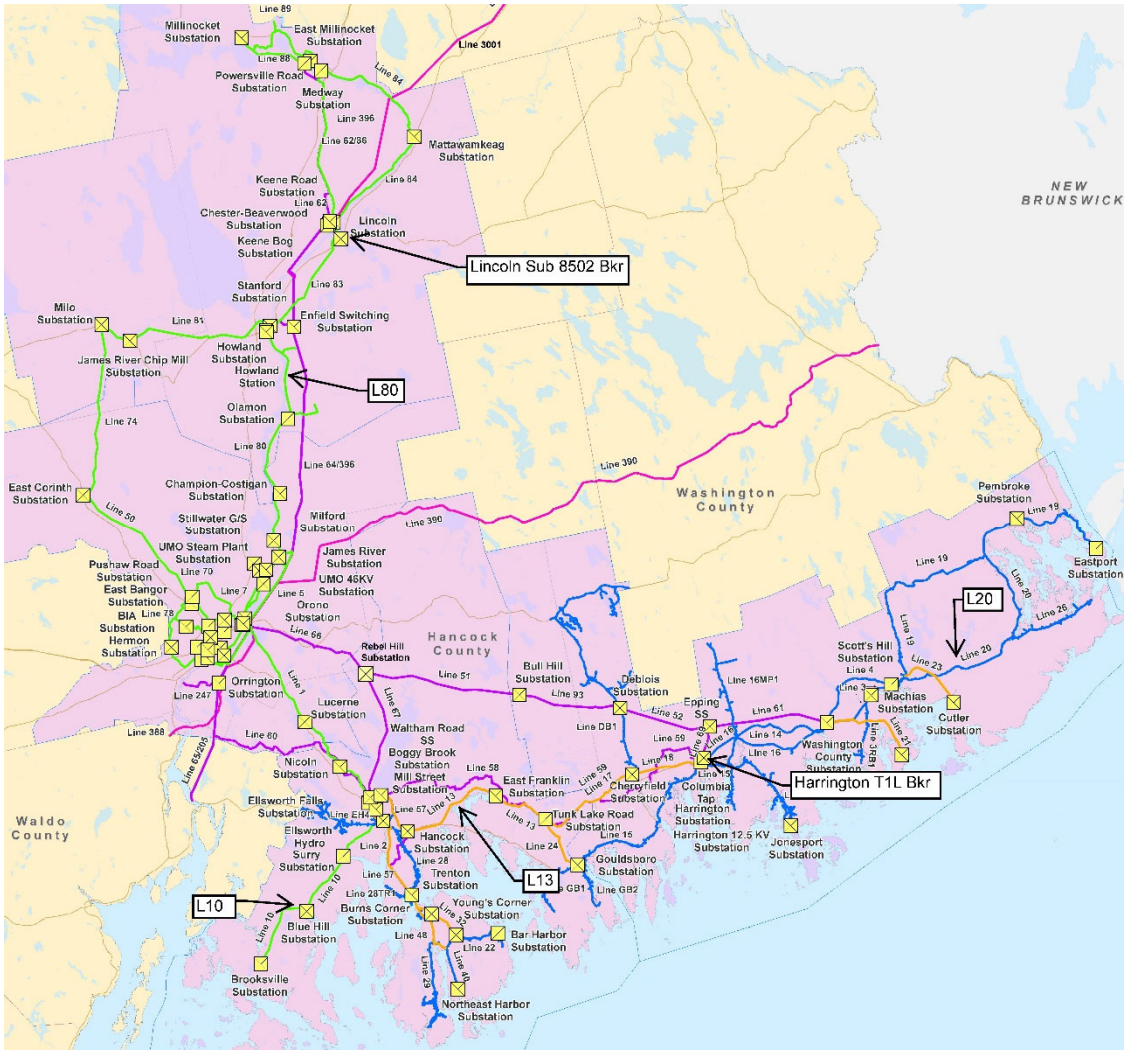
Project Descriptions – Proposed

- Line 80 Partial Targeted Rebuild Part 3 – 46kV line section (Enfield ROW) rebuild due to condition
- Line 20 Rebuild/Relocate – 34.5kV line rebuild around Whiting, relocating part from ROW to road side due to condition and improved restoration time
- Line 10 Feed Reconfigure Brooksville/ Blue Hill – Reconfigure 46kV line and how it feeds these substations – reliability
- Line 13 Reliability Improvement – Automatic 34.5kV line switching to improve contingency response time
- Harrington T1L Breaker Replacement – 34.5kV substation breaker due to condition
- Lincoln 8502 Breaker Replacement – 46kV substation breaker replaced based on condition

Project Descriptions - Proposed



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Project Descriptions – Planned

- Stanford Capacitor Circuit Sw. Replacement – 46kV substation capacitor bank where the circuit switcher has become unreliable
- Tibbetts Line 8 Link – 46kV Tibbetts St Substation. Reconfigure substation and related protection to allow line normally connected – to improve system reliability
- Line 21 Partial Targeted Rebuild Part 2 – 34.5kV line targeted rebuild due to condition
- Line 1 Partial Targeted Rebuild Phase 3 – 46kV line targeted rebuild (Nicolin to Boggy)

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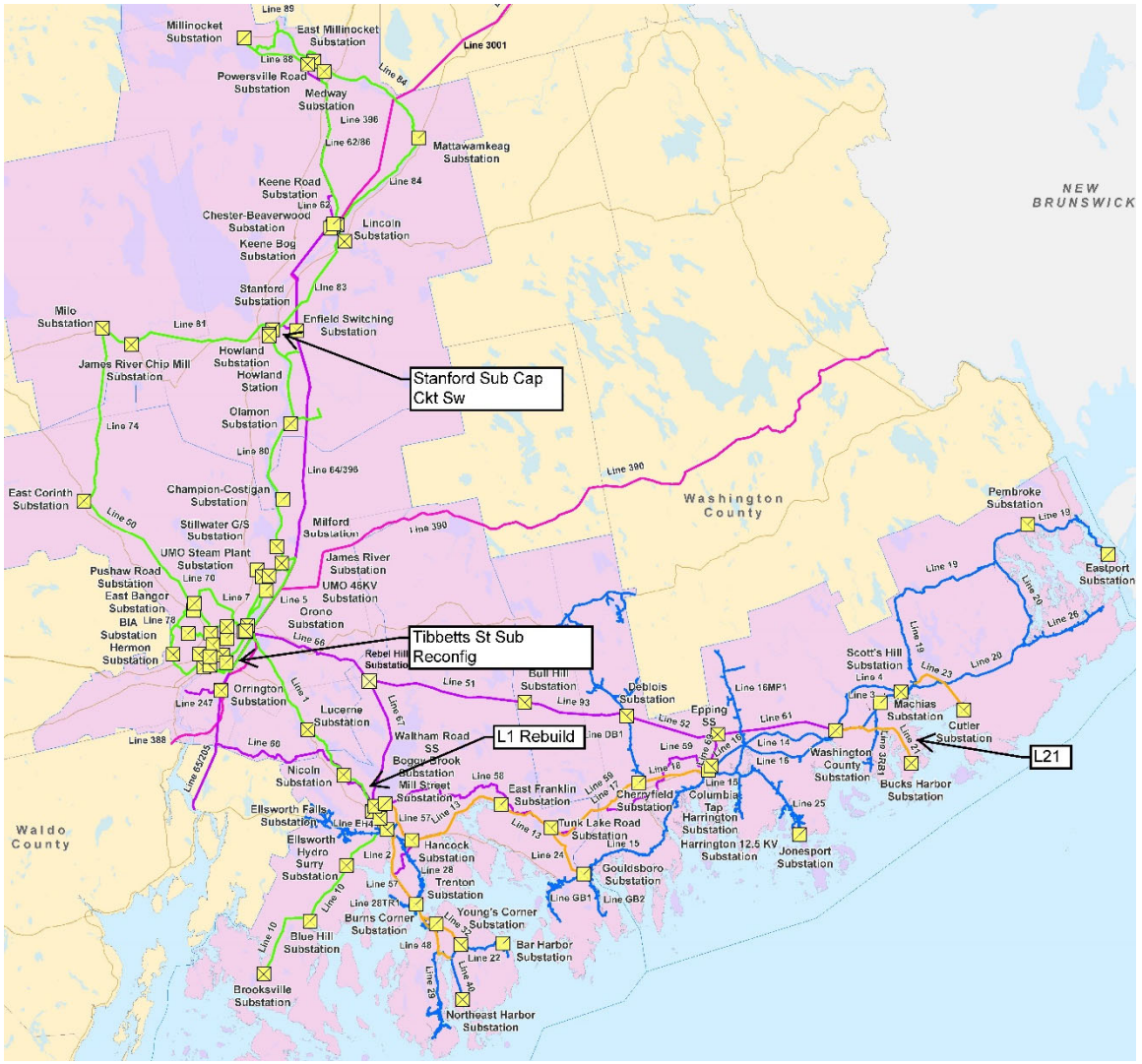
Project Descriptions - Planned



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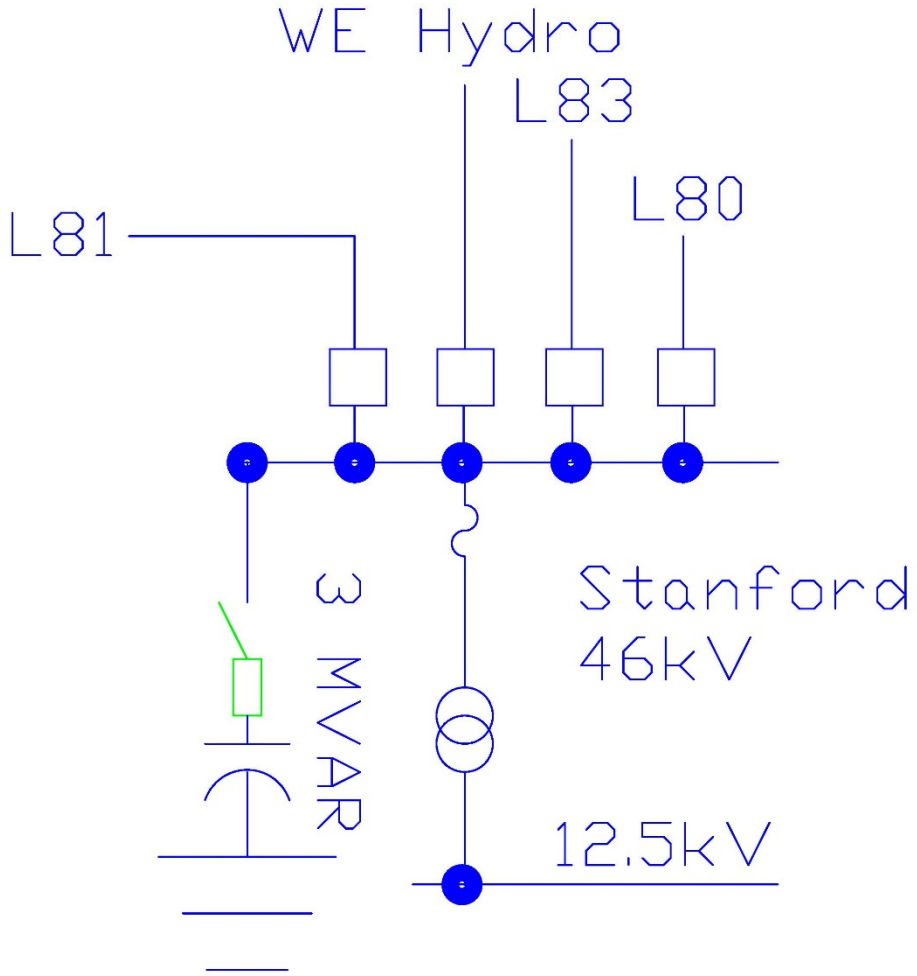
Stanford Cap Ckt Sw Replacement



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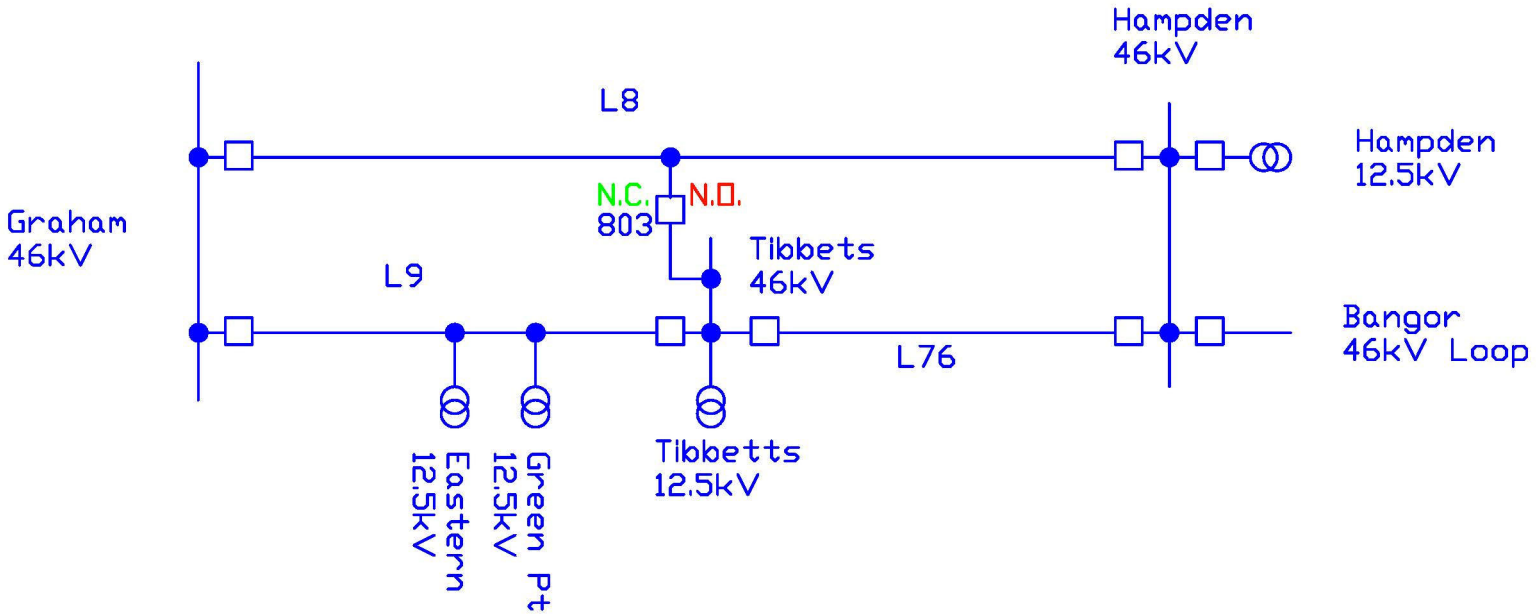
Tibbetts St Line 8 Reconfigure



Update protection on Line 8 and add communications to allow the circuit to operate as three terminal, with Bkr 803 closed.

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Project Descriptions – Under Construction

- Relocate Chester T1 to Boggy T1 – Relocate 115/46kV Chester T1 and replace to Boggy Brook T1 to increase capacity
- Numerous 34.5kV and 46kV Transmission Targeted Rebuilds – Numerous local transmission lines need to be partially rebuilt due to condition. Condition is based on regular testing of the structures (Not on map).
- WCS T3L Breaker Replacement – Remove old 34.5kV T1 and T2 and reconfigure. Replace 34.5kV T3L breaker due to condition
- Youngs Corner Switching Station – New switching station to improve reliability of area transmission
- Line 84 Rebuild Part 3 – 46kV Chester to Mattawamkeag due to structure condition

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Project Descriptions – Under Construction

- Lincoln Capacitor Circuit Sw. Replacement – 46kV substation capacitor bank where the circuit switcher has become unreliable
- Lincoln 8702 Breaker Replacement – Replace 46kV breaker 8702 due to condition
- Line 86 Partial Rebuild – 46kV Chester to Medway due to structure condition

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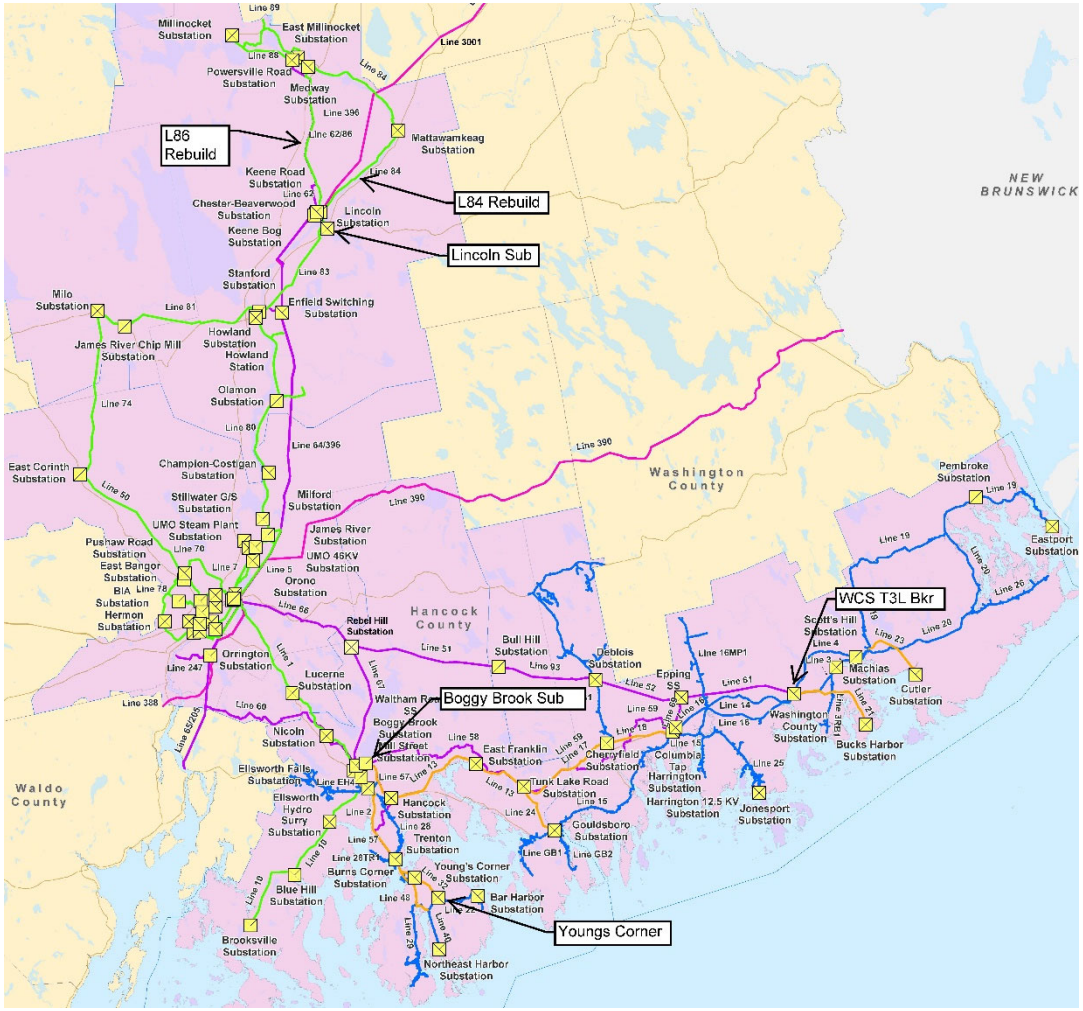
Project Descriptions – Under Construction



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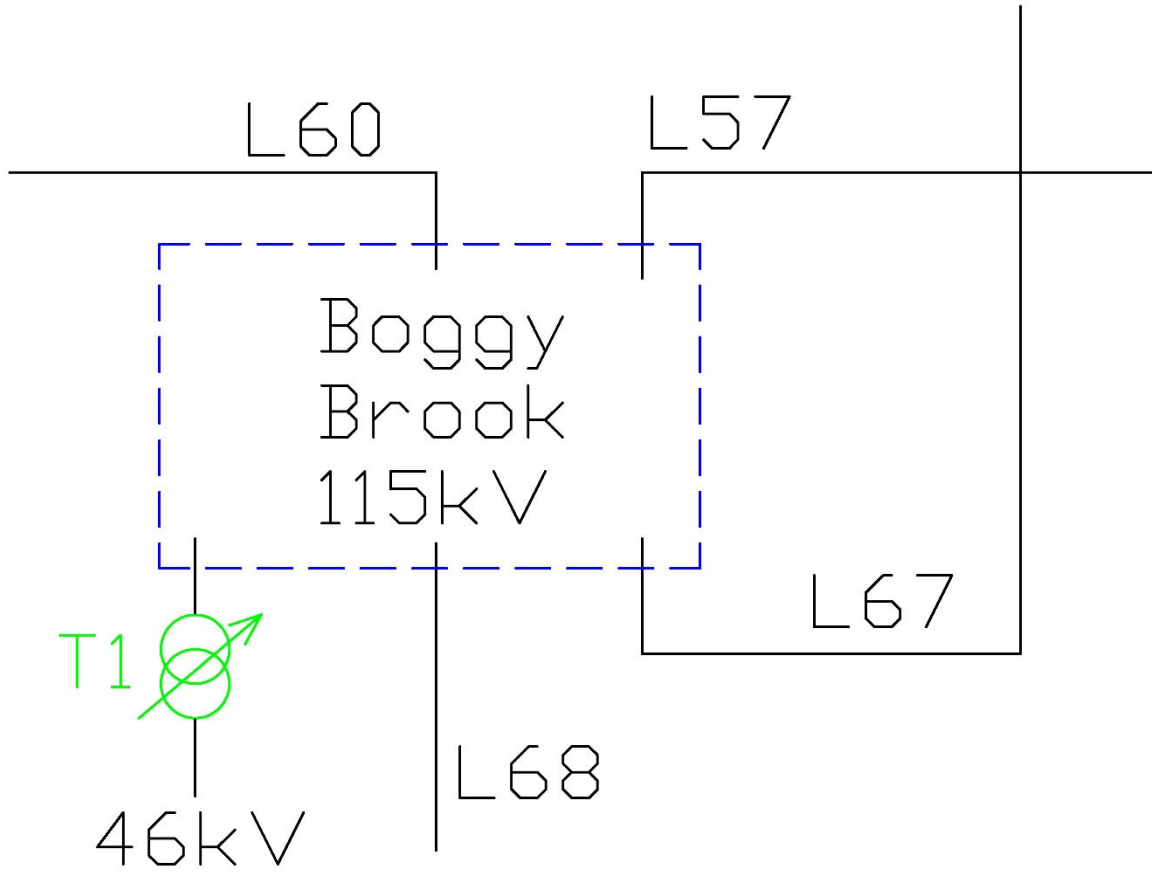
Boggy Brook T1 Change



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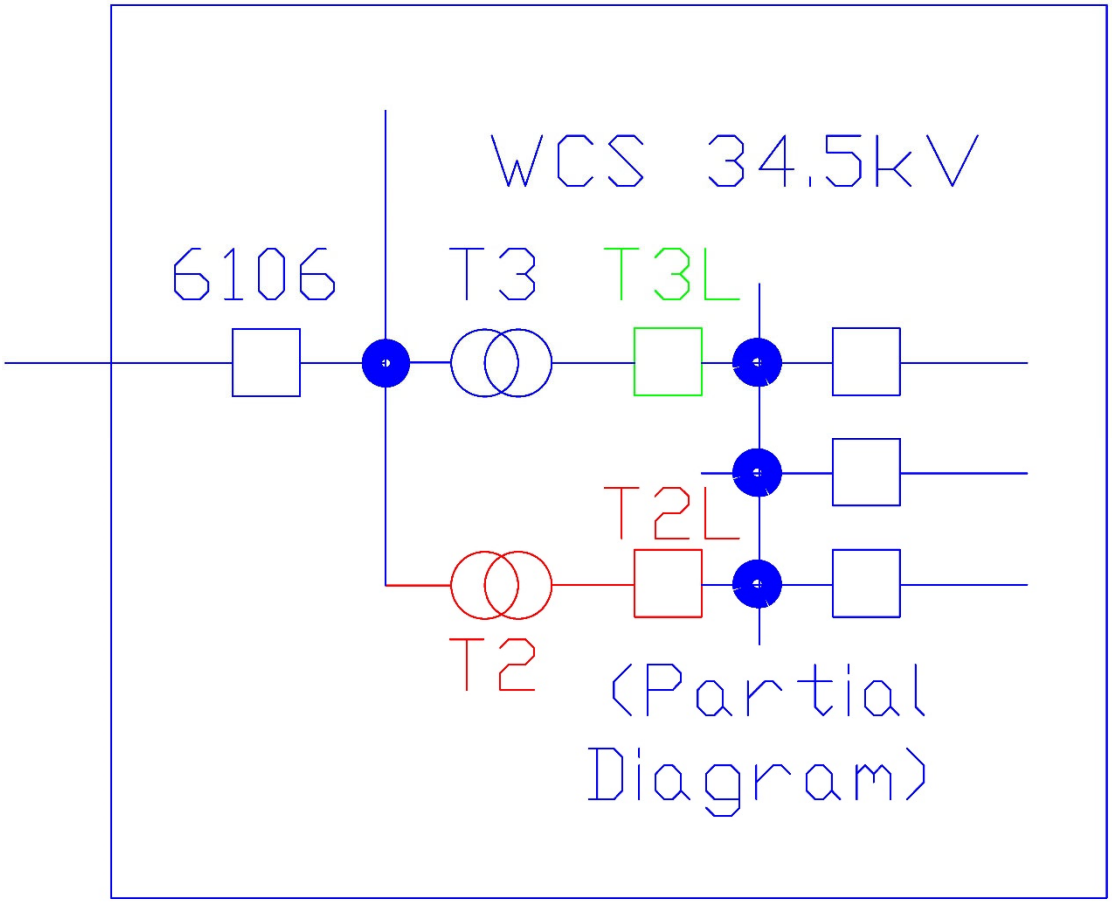
WCS T3L Breaker Replacement



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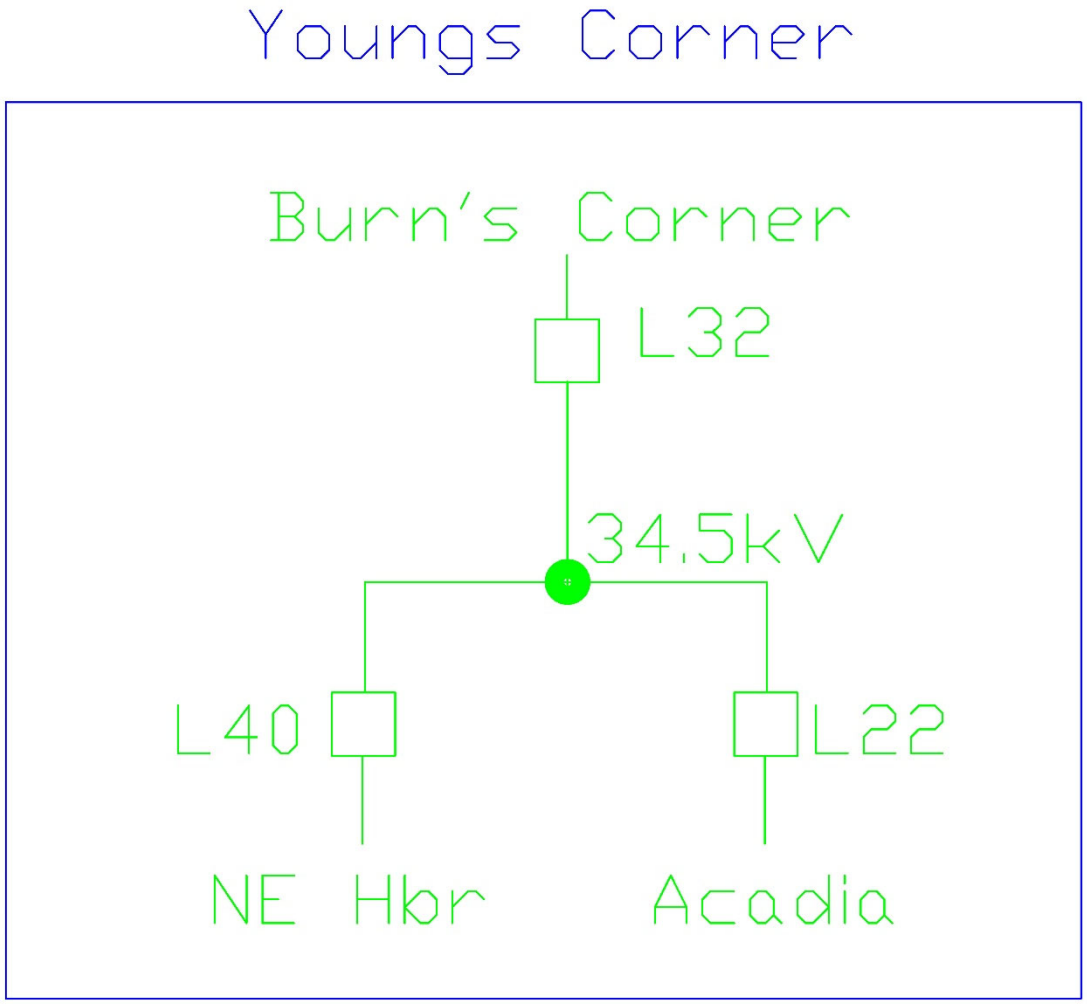
Youngs Corner Switching Station



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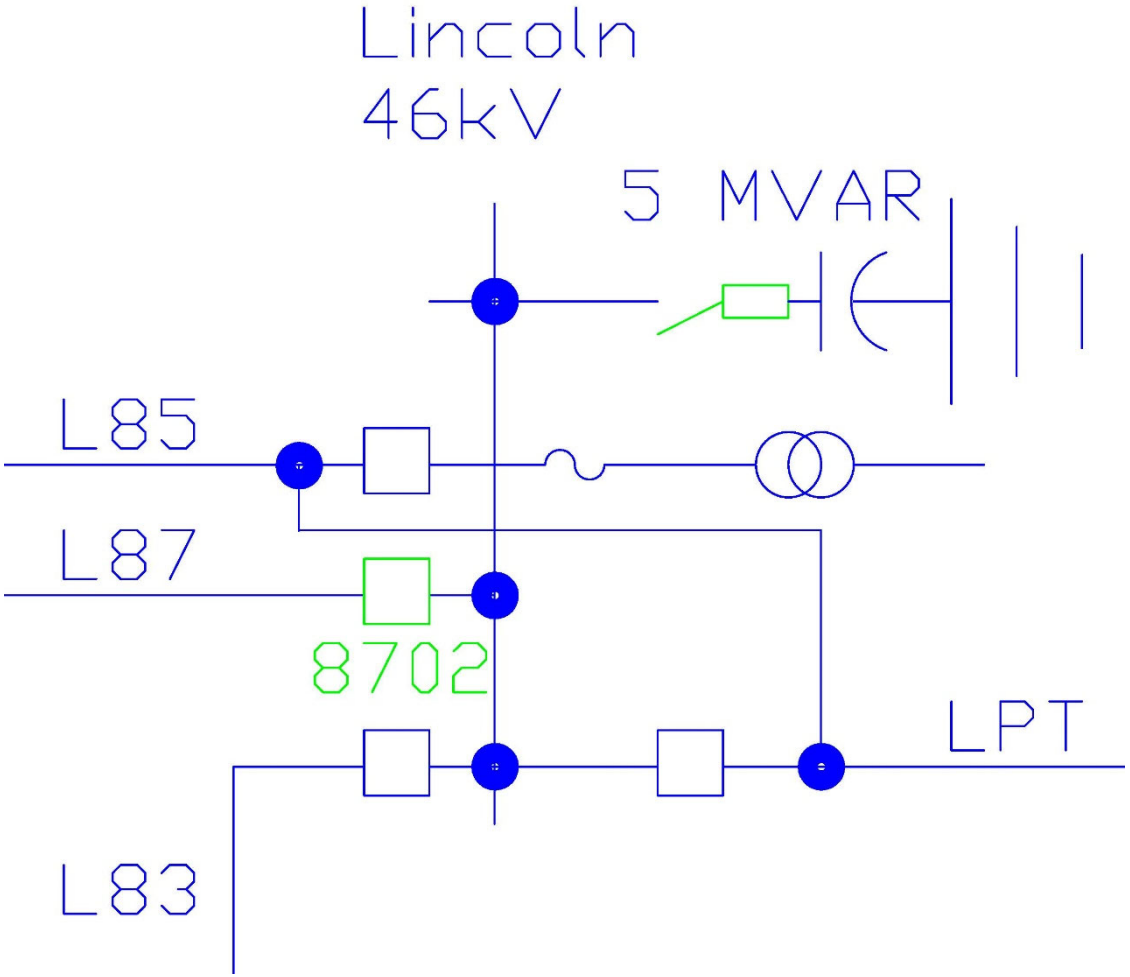
Lincoln Sub



Local System Planning Criteria

Criteria follows ISO-New England as well as TPL criteria or local planning criteria as appropriate

- The transmission system for purposes of this study is defined as those system facilities that are operated at 34.5kV and above and are not considered to be under ISO-NE planning (in general non-PTF).
- The standard of service to be provided dictates the need for changes to the existing system. It is necessary to consider the capability of transmission system elements, possible equipment failures, and the impact of failures on the ability to serve area loads.
- Transmission equipment is designed to operate within certain capabilities. The power that may be transferred over transmission lines depends upon the current carrying capacity of the wire and/or the required clearances of lines above ground. Transformers are limited by their heat dissipation capability. Circuit breakers or switches are designed to sustain a certain continuous amount of current. Also, the operation of customer electrical equipment requires that voltage be maintained within a certain acceptable range. Transmission system facilities are capable of regulating voltage within a limited range by varying reactive power and changing transformer tap settings.

Local System Planning Criteria

- Since all equipment is subject to breakdown, it is necessary to consider the consequence of such failures. One possible outcome could be the overload of other equipment that remains in service. For example, if one of two parallel lines trips, the remaining line may become overloaded. Overload beyond emergency ratings must be avoided due to possible permanent damage to the equipment or for public safety. Another consequence of equipment failure is the loss of power supply to customer load. This could occur with the loss of a radial transmission line or as the result of the cascaded outage of a looped transmission system. The loss of supply is critical to loads such as industrial processing, home heating, and hospitals, and must be considered in the design of the transmission system.

Local System Planning Criteria

CAPACITY CRITERION

- No facility is to be loaded in excess of its normal rating for any expected dispatch of system generation at any load level. For any single contingency, no facility is to be loaded in excess of its normal rating for the following load cycle or in excess of its emergency rating immediately following the contingency. Uneconomic generation dispatch may be utilized to maintain power flows within ratings following a contingency.

VOLTAGE CRITERION

- Transmission system voltages are to be maintained between 95% and 105% of operating base voltage under normal system conditions and for any single contingency. Further, voltages on the regulated side of load serving buses are to be maintained between 100% and 105% of operating base voltage under normal system conditions.

Local System Planning Criteria

LOSS OF LOAD CRITERION

- No loss of load in excess of 25 MW is to occur for any single contingency. Loss of load less than 25 MW should be resupplied within 24 hours, except under very adverse conditions.

MAINTENANCE CRITERION

- Transmission system planned maintenance is to be possible without exceeding normal voltage and capacity limits and without loss of load.

Questions?

End

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