

Local System Plan Bangor Hydro District

Needs Assessment/Potential Solutions
Local Planning Advisory Committee Meeting
November 15, 2023

Versant Power Representative
Jeffrey Fenn, P.E. Fennco, 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 Versant Power

LSP Communication (continued)

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- VP LSP is located at:

https://www.versantpower.com/media/64515/LSP_SOR.pdf

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

Criteria, Data, and Assumptions

- Loads are based on the New England specific area as provided in the ISO-New England MOD case, Versant Power 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. Most projects are 34.5 or 46kV, while others may be non PTF 115kV.
- 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

LSP – Concept

#	Needs Assessment	Service Area	Project Name	Solution	Project In-Service
143I	Reliability Improvement	Bangor	BIA Install MO Switches on 7905 and 7503	Add motor operators and SCADA to improve area reliability	2026
215J	Asset Condition	Bangor	Hogan Rd Breaker Replacement	Replace 7102 and 7202 breaker due to condition	2026
218Q	Asset Condition	Bangor	Graham Breaker Replacement	Replace T9L breaker due to condition	2027
228Z	Asset Condition	Bangor	L74 Rebuild P5	Continue to rebuild L74 based on asset condition	2026

LSP – Proposed

#	Needs Assessment	Service Area	Project Name	Solution	Project In-Service
208H	Asset Condition	Northern	Stanford Sub Relay Replacement	Replace Relays to improve area protection	2025
185Z	Reliability Improvement	Bangor	L9 Fault Detection and SCADA Control	Add SCADA to L9 as needed to improve area reliability	2025
465E	Reliability Improvement	Eastern	Mill St Sub Motor Operator Addition to 1203 and 1207	Add Motor Operators to switches to improve ability to switch	2025
207H	Asset Condition	Washington County	WCS T3 Replacement	Replace T3 based on test results	2025
214K	Asset Condition	Washington County	WCS Relay Replacement	Replace Relays to improve area protection	2025
Varies	Asset Condition	Northern	L61, L83 P2	Targeted Rebuild	2025
Varies	Asset Condition	Bangor	L7 RR Track ROW, L9 Mardens ROW, L74 P4, L77, L78	Targeted Rebuild	2025
Varies	Asset Condition	Eastern	L13 Loop and Franklin Sub Flop Over, L24, L29 ROW Rebuild	Targeted Rebuild and flop over addition	2025

LSP – Planned

#	Needs Assessment	Service Area	Project Name	Solution	Project In-Service
2010	Asset Condition	Northern	Stanford Cap Breaker	Add Capacitor Breaker at Stanford Sub	7/2024
215G	Asset Condition	Eastern	Ellsworth Falls Breaker Replacement	Replace Breaker T2H	12/2024
143W	Asset Condition	Northern	Chester 9001 Breaker	Replace breaker	6/2024
182J, 182M	Reliability Improvement	Northern	Lincoln L85 VT additions	Add line VTs	12/2024
226H	Reliability Improvement	Bangor	UMaine/L7 Protection Package	Improve protection on L7	2/2024
231F	Reliability Improvement	Bangor	Fiber to Tibbets St and Hampden	Add Fiber communications to Tibbets and Hampden to improve area protection	7/2024
144V	Reliability	Eastern	Ellsworth Falls T2 Protection Upgrade	Replace relays to improve transformer protection	4/2024

LSP – Planned

#	Needs Assessment	Service Area	Project Name	Solution	Project In-Service
186N	Reliability	Eastern	L28 SCADA Control	Add SCADA to L28 to improve ability to switch	9/2024
381E	Reliability	Eastern	Ellsworth Falls 1/10 MO Sw	Add motor operator to existing switch to improve response time	3/2024
186J	Reliability	Washington County	Auto Flop Over for L19 and L20	Set up area for automatic restoration	4/2024
Varies	Asset Condition	Northern	L83 P2, L88, L89, L83, L84 P2	Targeted Rebuild of various Lines	Varies
Varies	Asset Condition	Bangor	L4, L73, L73 Tap, L74 Tap, L75, L80 P2	Targeted Rebuild of various Lines	Varies
Varies	Asset Condition	Eastern	L14, L15 Crossarm P3, L40 P2, MDI Loop L32	Targeted Rebuild of various Lines	Varies
Varies	Asset Condition	Washington County	L17 P2, L19 Crossarm P7, L19 Regulator	Targeted Rebuild of various Line and replacement of regulators based on condition	Varies

LSP – Under Construction

#	Project In-Service	Service Area	Project Name
182J, 182M	12/2023	Northern	Lincoln L83 and 87 VT additions
119D	3/2024	Bangor	Hermon Breaker and Protection Upgrade
1500	6/2024	Bangor	L7 UMaine 46kV Breaker Addition
186P	12/2023	Bangor	Tibbetts St L76 Relay Replacement
527E	7/2024	Bangor	Bradley Sw Station
905E	4/2026	Bangor	Graham T6-8 Replacement with T10
920E	12/2025	Bangor	Orono T4 and T4H Replacement

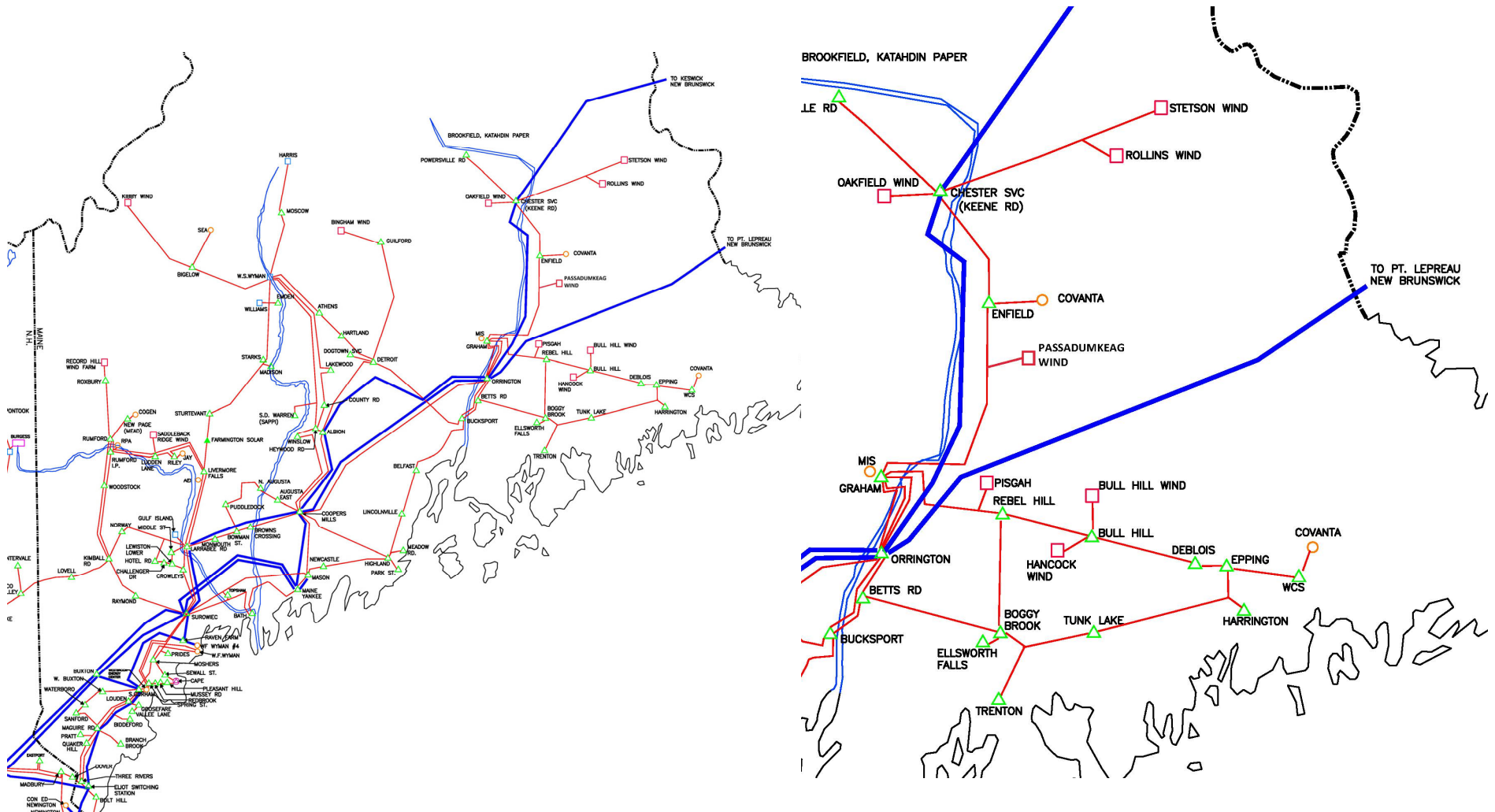
LSP – Under Construction

#	Project In-Service	Service Area	Project Name
935E	12/2023	Eastern	Ellsworth Falls 33T Breaker Replacement
151R	12/2023	Eastern	Lucerne Sub Auto Restoration
143V	12/2023	Washington County	Cherryfield Sub M/O and SCADA
208G	8/2024	Washington County	Scotts Hill Rd Relay Replacement
921E	12/2023	Washington County	WCS UP6 Breaker Replacement
441E	7/2024	Washington County	Machias Substation
Varies	Varies	Varies	L19 Crossarm P6, L81 River Crossing, L2 Rebuild P2, L63 Rebuild, L25 Reconductor P2, MDI Loop L48, MDI Loop L40, L13, L28, Targeted Rebuild

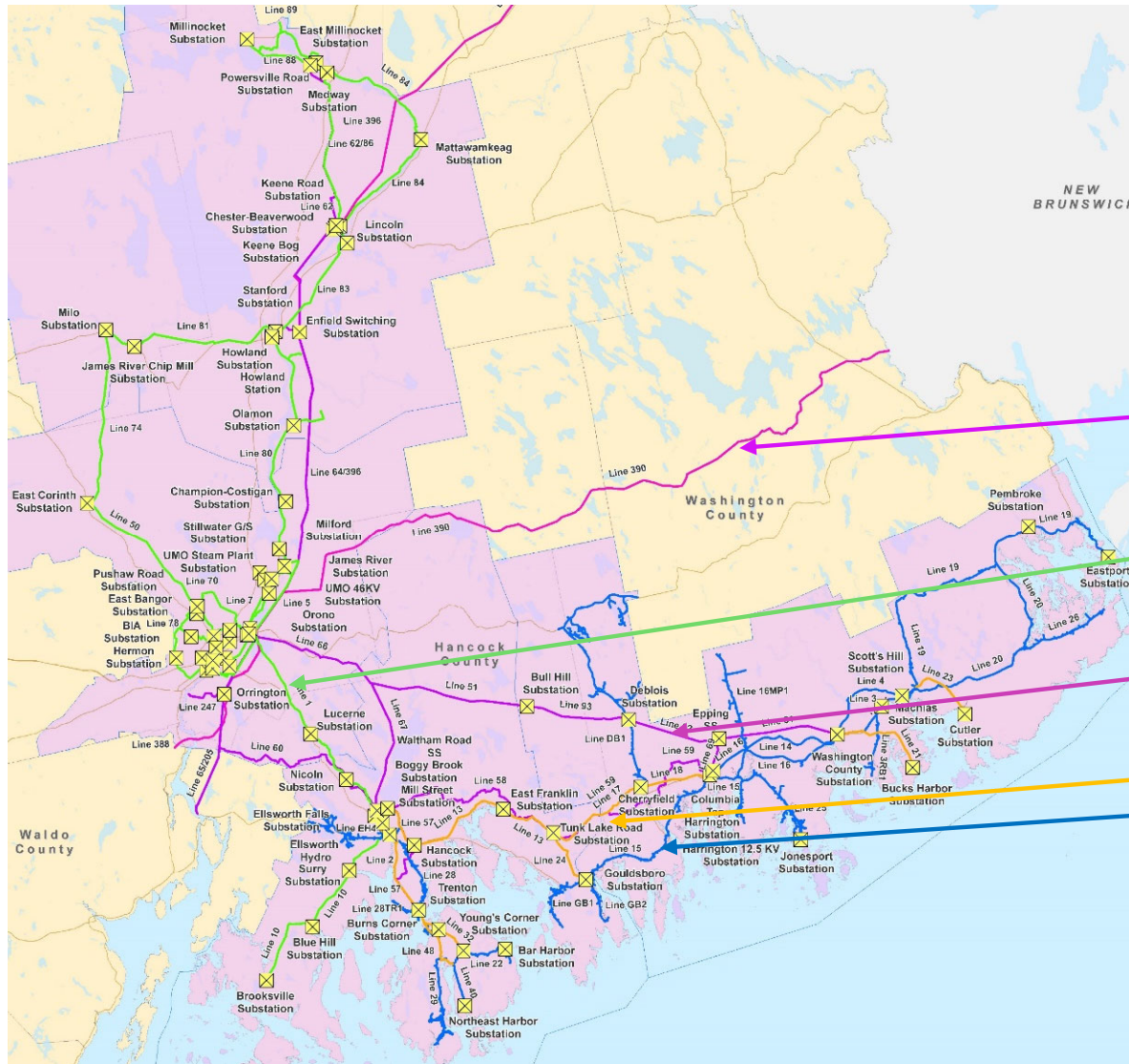
LSP – In-Service

Project In-Service	Service Area	Project Name
10/2023	Eastern	Ellsworth Falls T1H addition and protection
10/2023	Bangor	Tibbetts St Control Building Expansion, L8 & 9 Relay replacement
3/2023	Bangor	Medway Cap Breaker Replacement
7/2023	Eastern	Ellsworth Falls T3 Replacement
Varies	Bangor	L1 Lucern to Nicolin, L1 P2, L5 P1&P2, L9 Green Pt Rd, L74 P1&P2, L71/72 P1&P2 Targeted Rebuilds
Varies	Eastern	L2, L10 EF to Grant St., L12, L21 P4, L22 ROW, Targeted Rebuilds
Varies	Northern	L80 P2 Targeted, L84 ROW Rebuild,
Varies	Washington County	L15 Crossarm P4, L20 P2 Targeted Rebuild, L20 ROW to road (Whiting)

Maine and Versant Power – Bangor Hydro District - Major Transmission System



Versant Power Bangor Hydro District Detailed System



Voltage Color Code

345kV

46kV

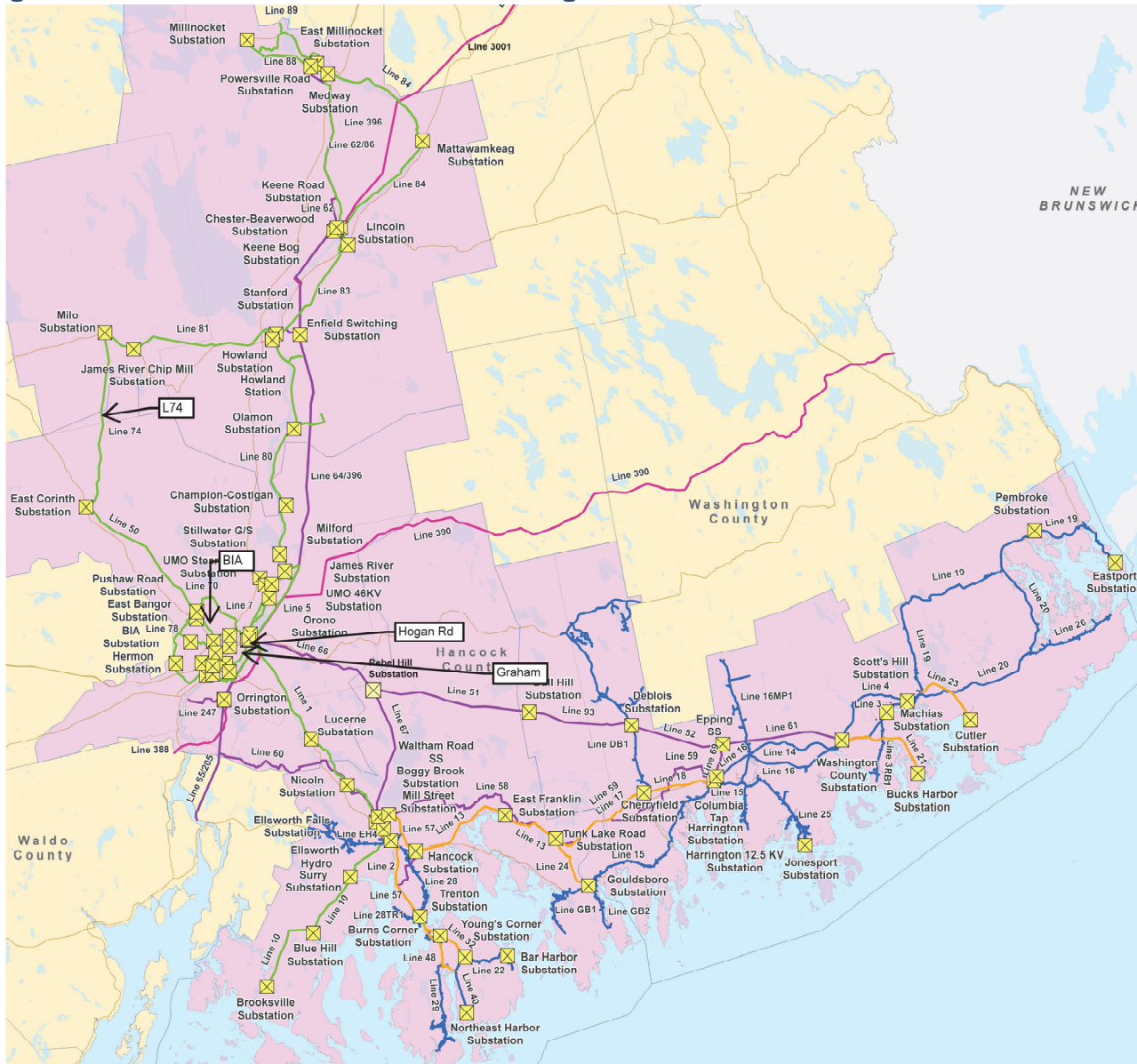
115kV

34.5kV

Descriptions - Concept

- BIA Install MO Switches on 7905 and 7503 – Replace 46kV line switches 7905 and 7503 with new ones that have motor operators and SCADA control
- Hogan Rd Breaker Replacement – Replace 46kV 7102 and 7202 breakers due to vintage and condition
- Graham Breaker Replacement – Replace T9L breaker due to condition
- Line 74 Rebuild Part 5 – Continue to rebuild 46kV L74 based on asset condition

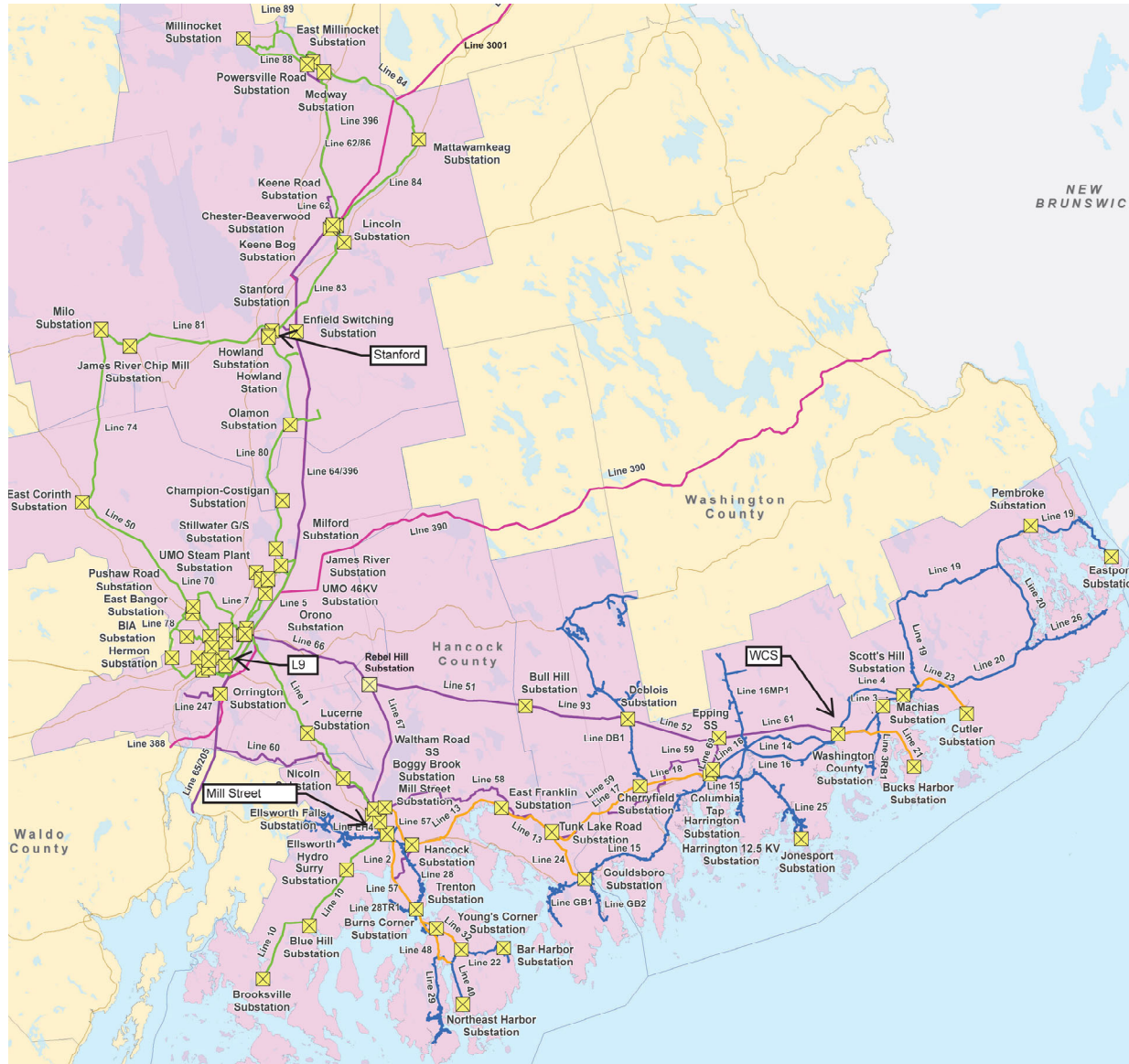
Descriptions - Concept



Descriptions – Proposed

- Stanford Sub Relay Replacement – Replace and upgrade 46kV line protection at Stanford due to vintage and function (L80, L81)
- Line 9 Fault Detection and SCADA Control – Review L9 taps (Green Pt Rd and Eastern Ave) for opportunities to add sensors for determining fault location and enabling rapid restoration of service via SCADA switching
- Mill St Sub MO addition – Add motor operators to switches 1203 and 1207 to enable more rapid restoration of facility
- WCS T3 Replacement – Replace 115/34.5kV transformer T3 at WCS due to asset condition
- WCS Relay Replacement – Replace 34.5kV relays at WCS due to vintage and functionality (33T, UP6, 401, 301, 2101, 1412, 1615)
- Misc. Northern Area Line Rebuilds – 46kV targeted line rebuild due to asset condition (L61, L83 P2)
- Misc. Bangor Area Line Rebuilds – 46kV targeted line rebuild due to asset condition (L7 RR track ROW, L9 Mardens ROW, L74 P4, L77, L78)
- Misc. Eastern Area Line Rebuilds – 34.5kV targeted line rebuild due to asset condition (L13 Loop and Franklins Sub Flop Over, L24, L29 ROW Rebuild)

Project Descriptions - Proposed



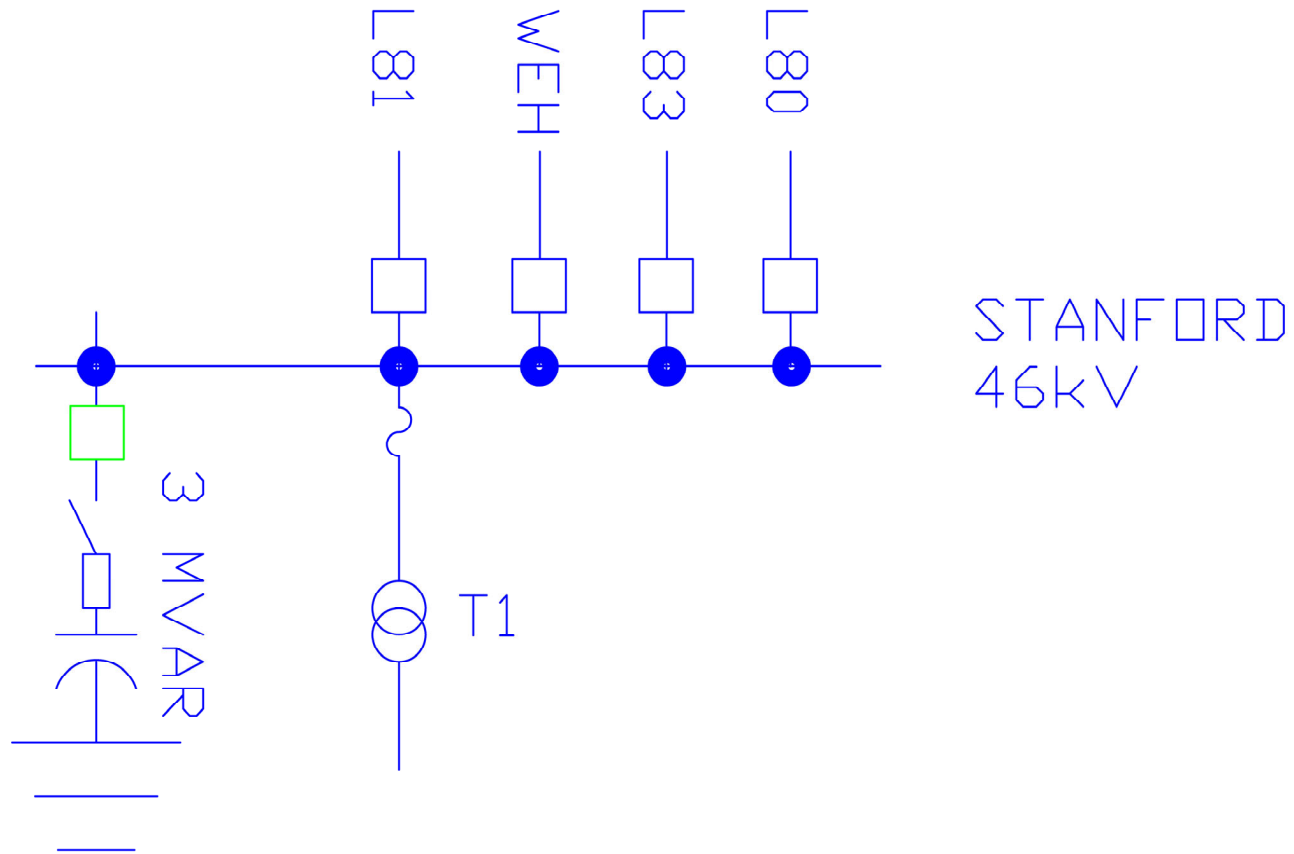
Project Descriptions – Planned

- Stanford Cap Breaker – Add 46kV capacitor breaker at Stanford
- Ellsworth Falls Breaker Replacement – Replace T2H switch with breaker
- Chester 9001 Breaker Replacement – Replace 9001 breaker due to asset condition
- Lincoln L85 VT Additions – Add VTs to Line 85 to improve area operations and protection
- UMaine/L7 Protection Package – Add line protection relays to the UMaine sub for L7 protection
- Fiber to Tibbets St and Hampden Subs – Add communications to these two facilities to enable better line end to end protection
- Ellsworth Falls T2 Protection Upgrade – Replace T2 relays to improve transformer protection

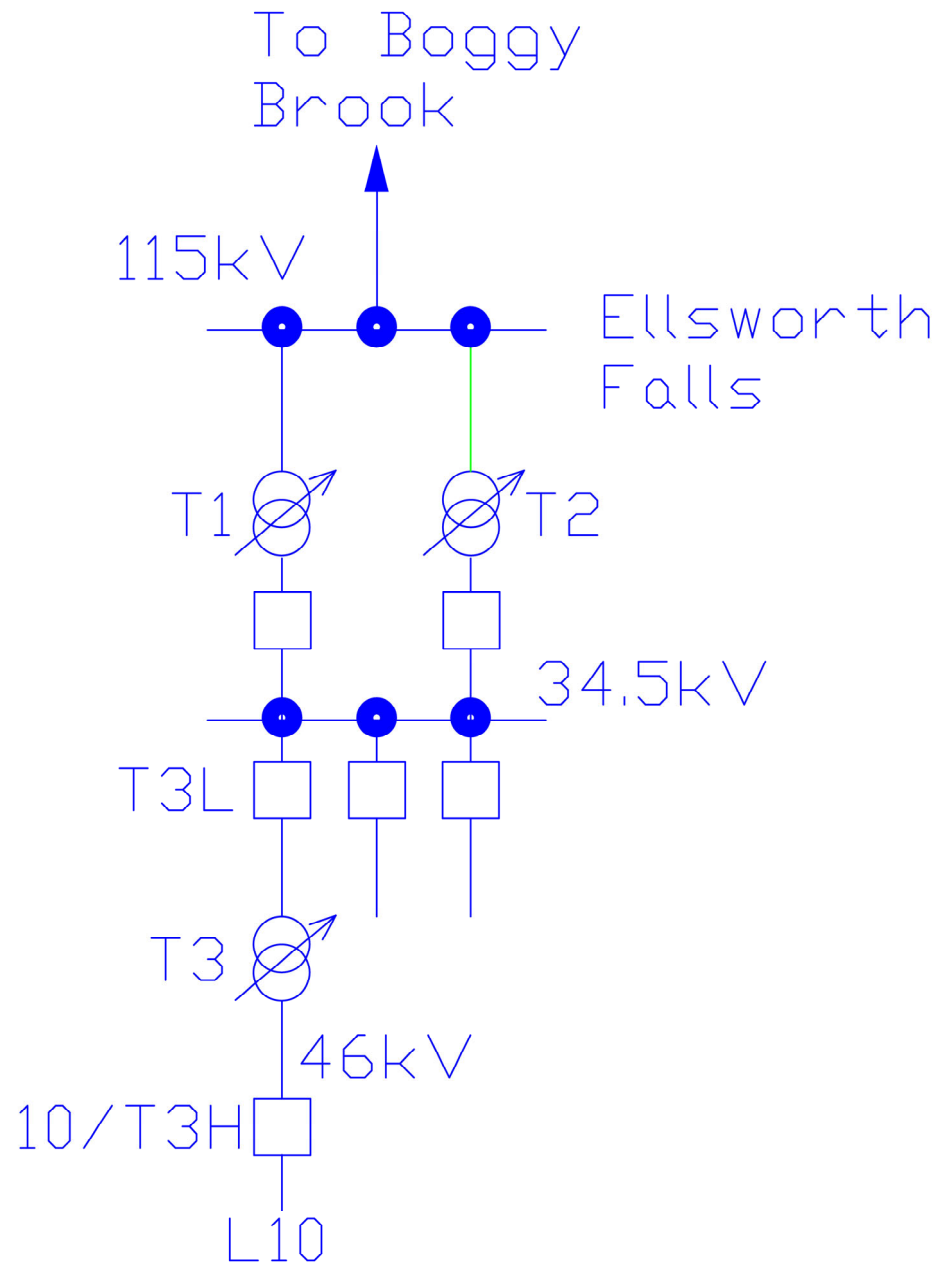
Project Descriptions - Planned



Stanford Cap Breaker Addition

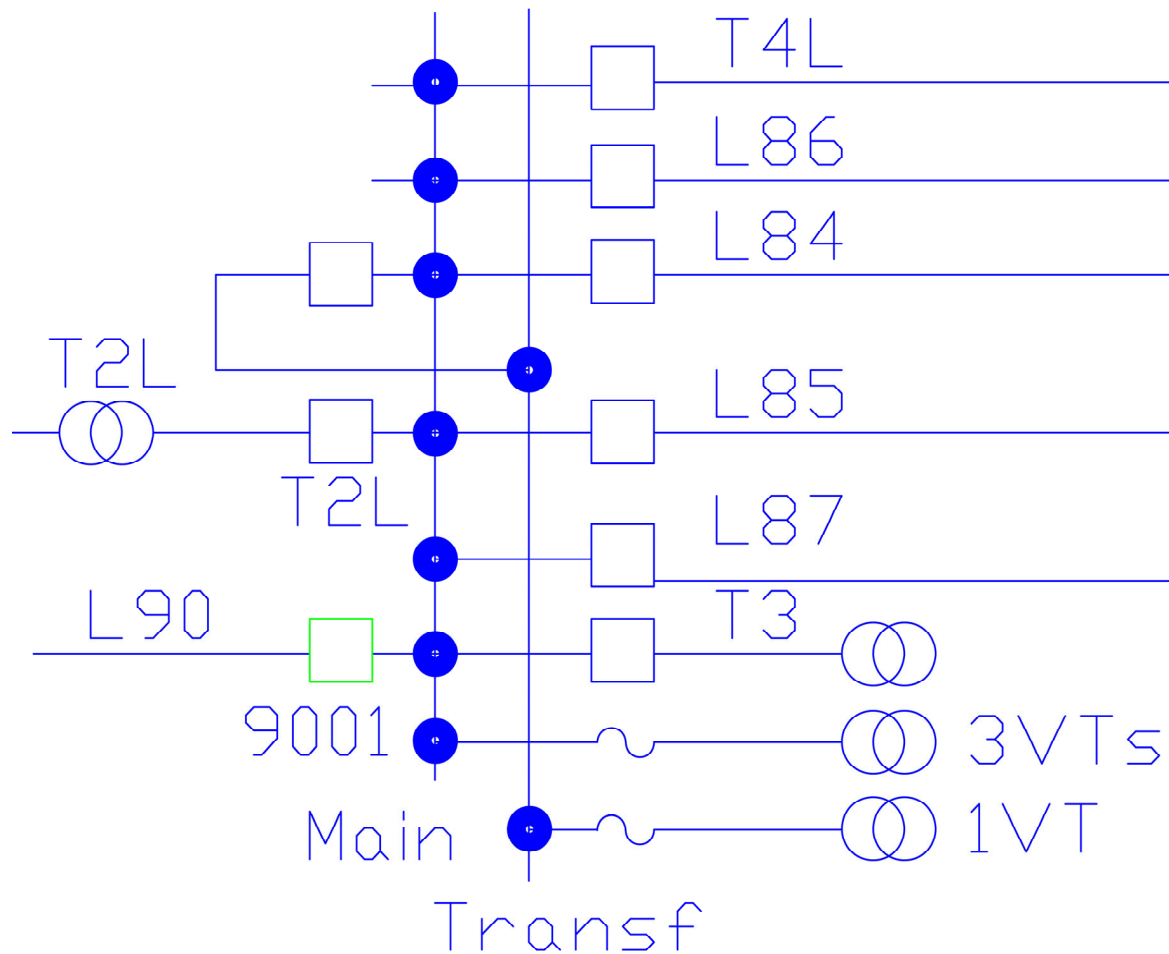


Ellsworth Falls T2H

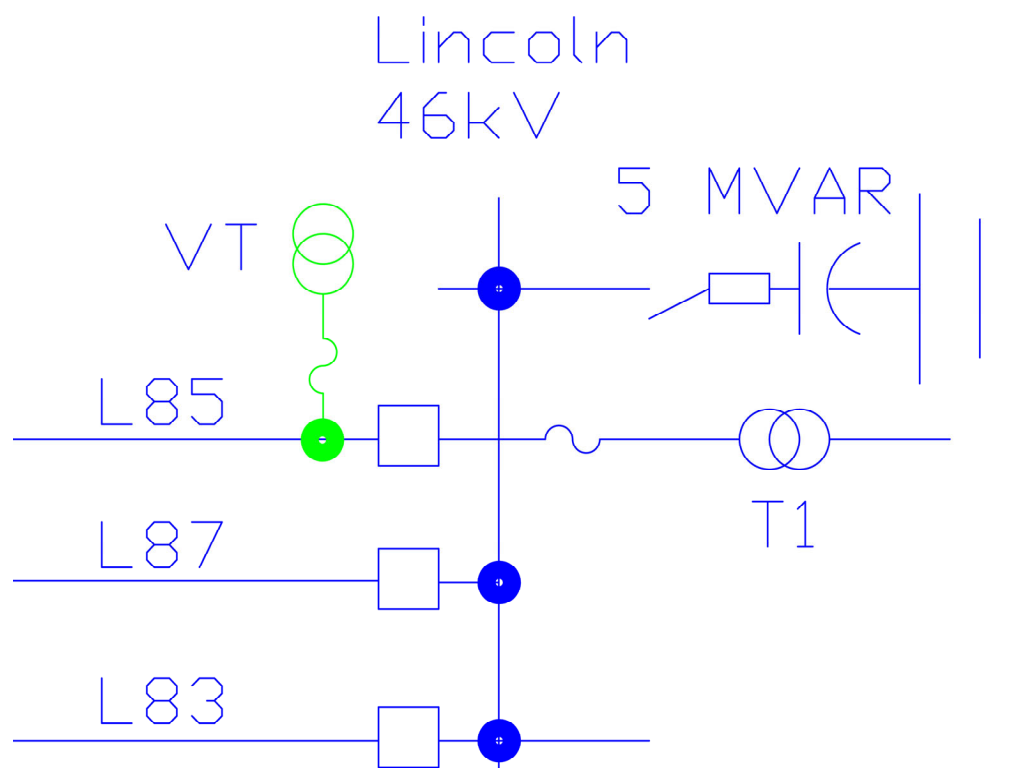


Chester 9001 Breaker

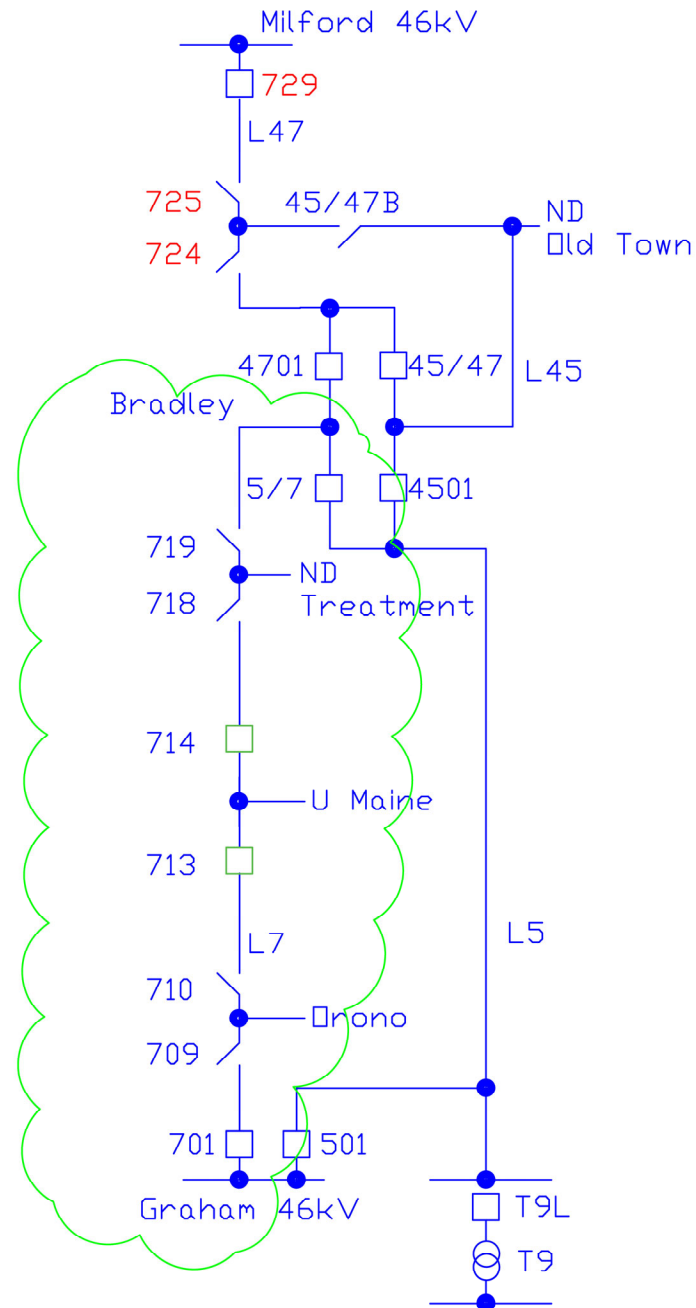
Chester
46kV



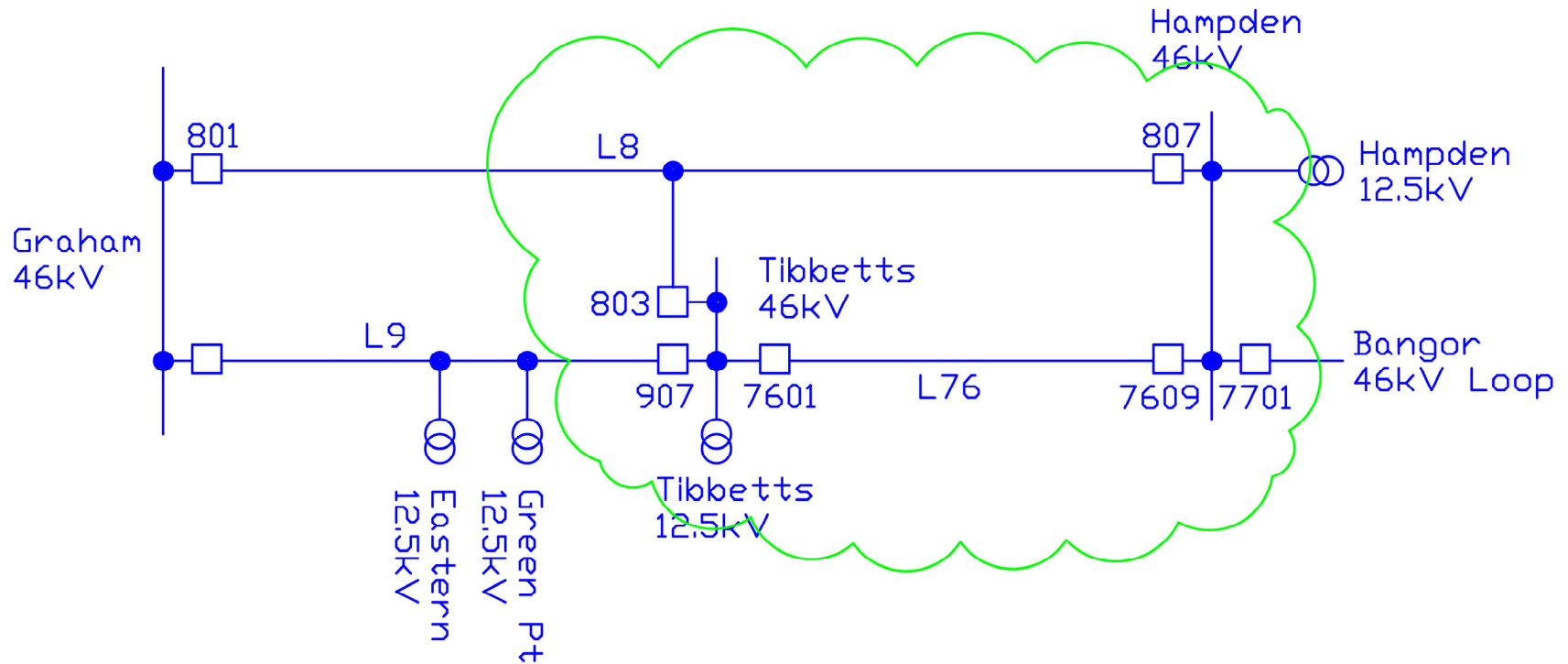
Lincoln L85 VT Addition



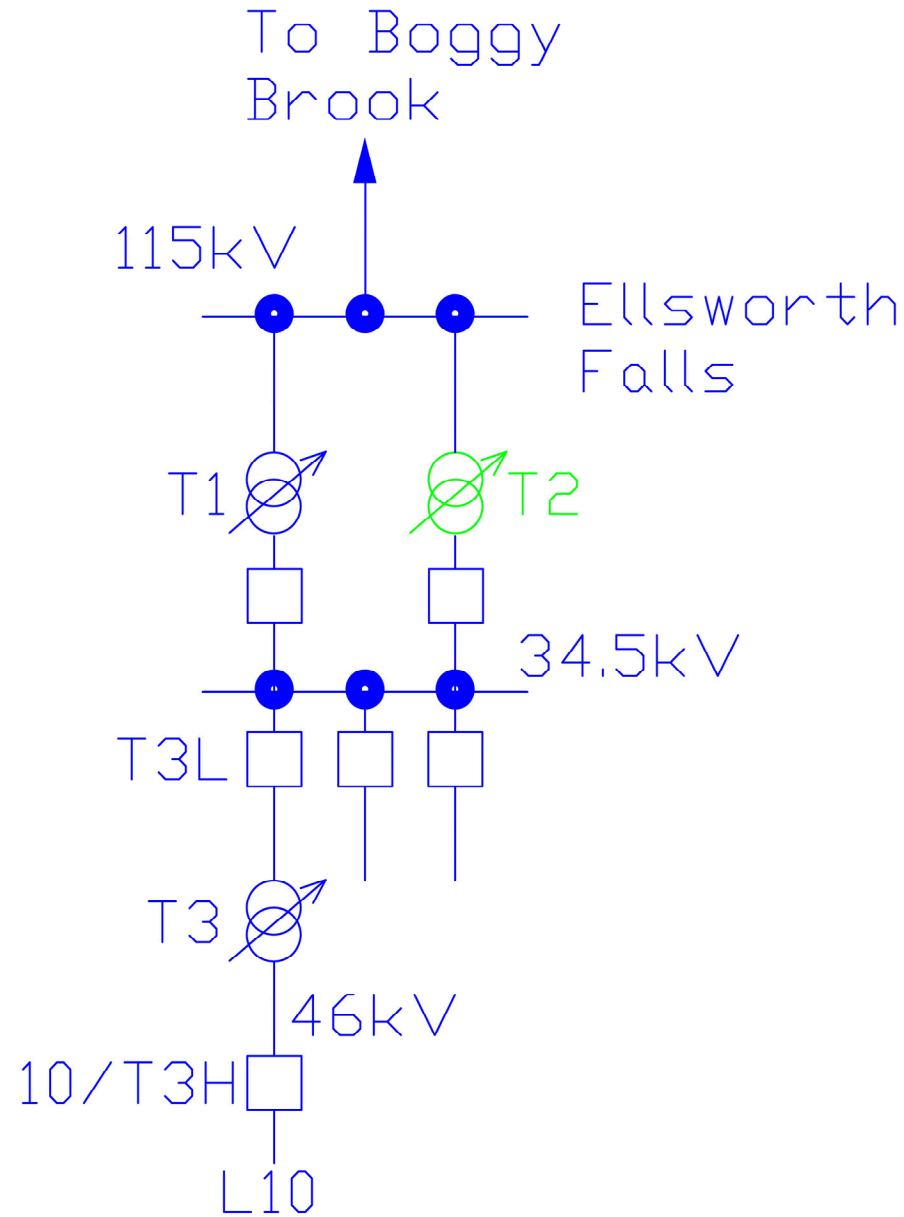
UMaine/L7 Protection



Tibbetts St to Hampden Fiber



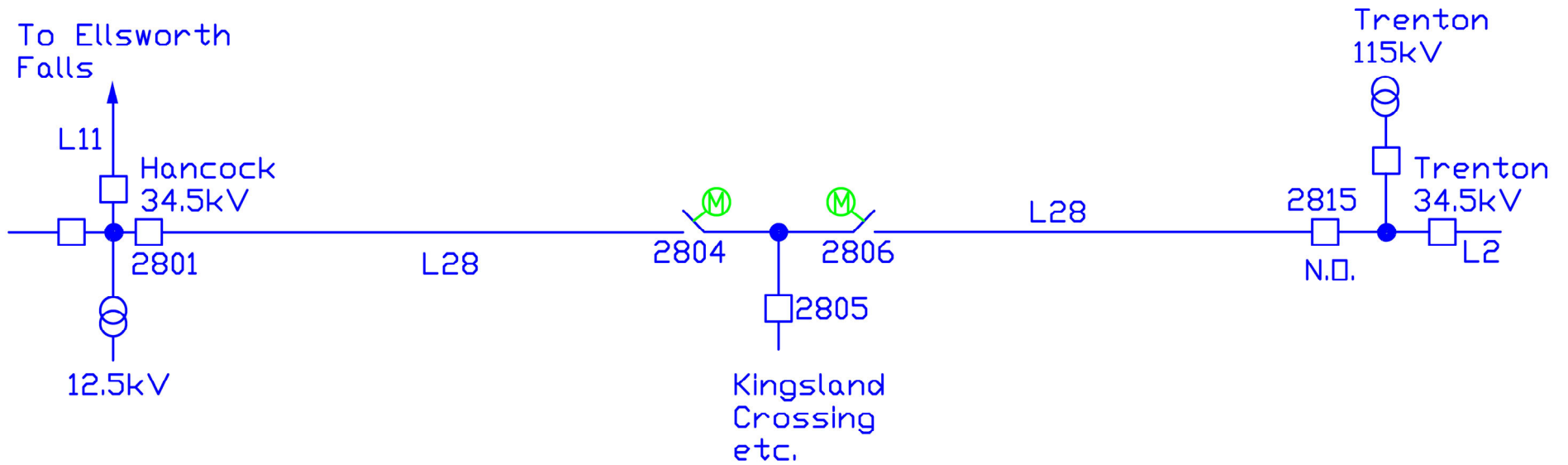
Ellsworth Falls T2 Protection



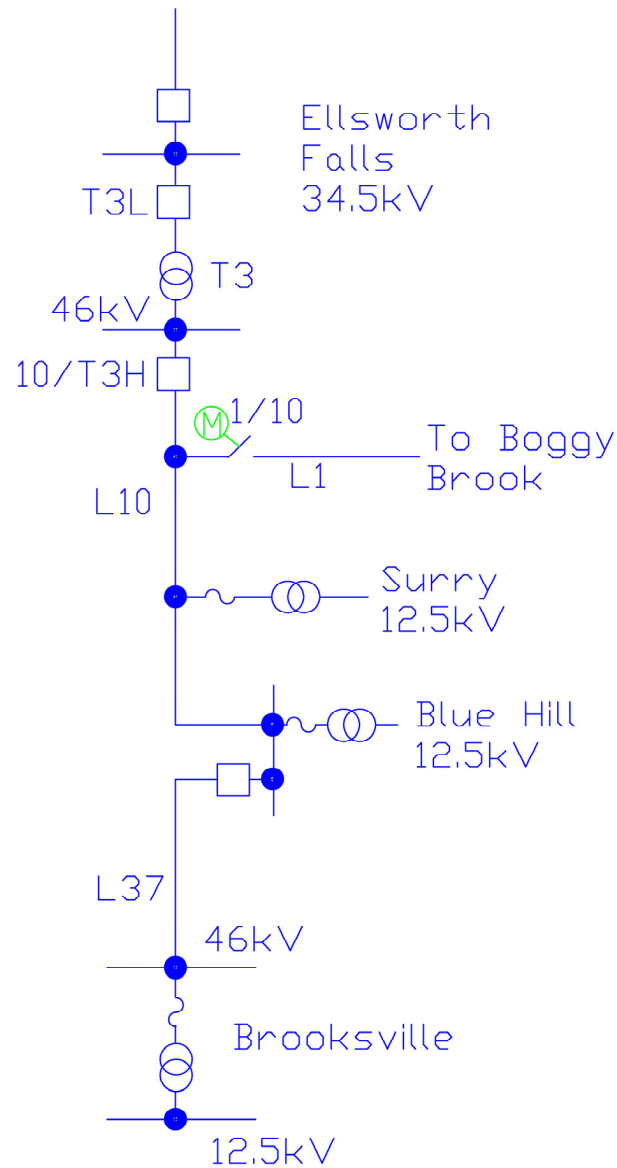
Project Descriptions – Planned

- Line 28 SCADA Control – Replace line switches with motor operated ones with SCADA to better enable fault isolation and restoration
- Ellsworth Falls 1/10 MO Sw. – Add motor operator to 1/10 switch to aid in restoration
- Auto Flop Over for L19 and L20 – Update controls and related materials to enable 19/09 and 19/20 to provide auto flop over to aid in restoration
- Misc. Northern Area Line Rebuilds – Targeted rebuild of L83 P2, L88, L89, L84 P2 due to asset condition
- Misc. Bangor Area Line Rebuilds – Targeted rebuild of L4, L73, L73 Tap, L74 Tap, L75, L80 P2 due to asset condition
- Misc. Eastern Area Line Rebuilds – Targeted rebuild of L14, L15 Crossarm P3, L40 P2, MDI loop L32
- Misc. Washington County Line Rebuilds – Targeted rebuild of L17 P2, L19 Crossarm P7, L19 Regulator

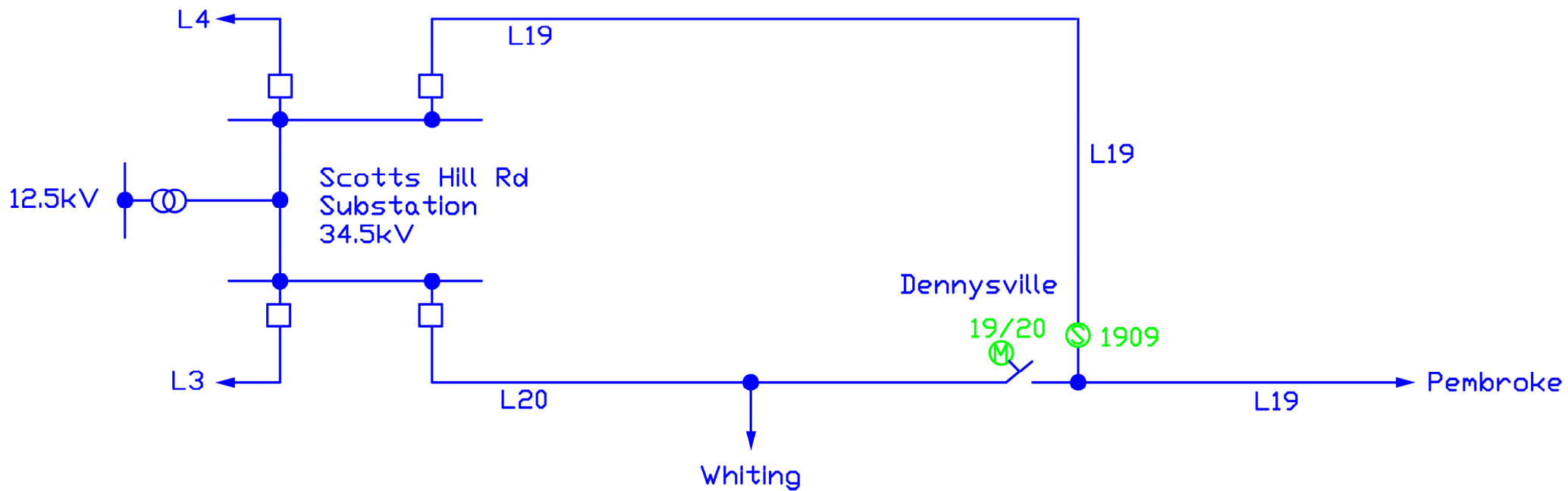
Line 28 SCADA Control



Ellsworth Falls 1/10 Switch Motor Operator



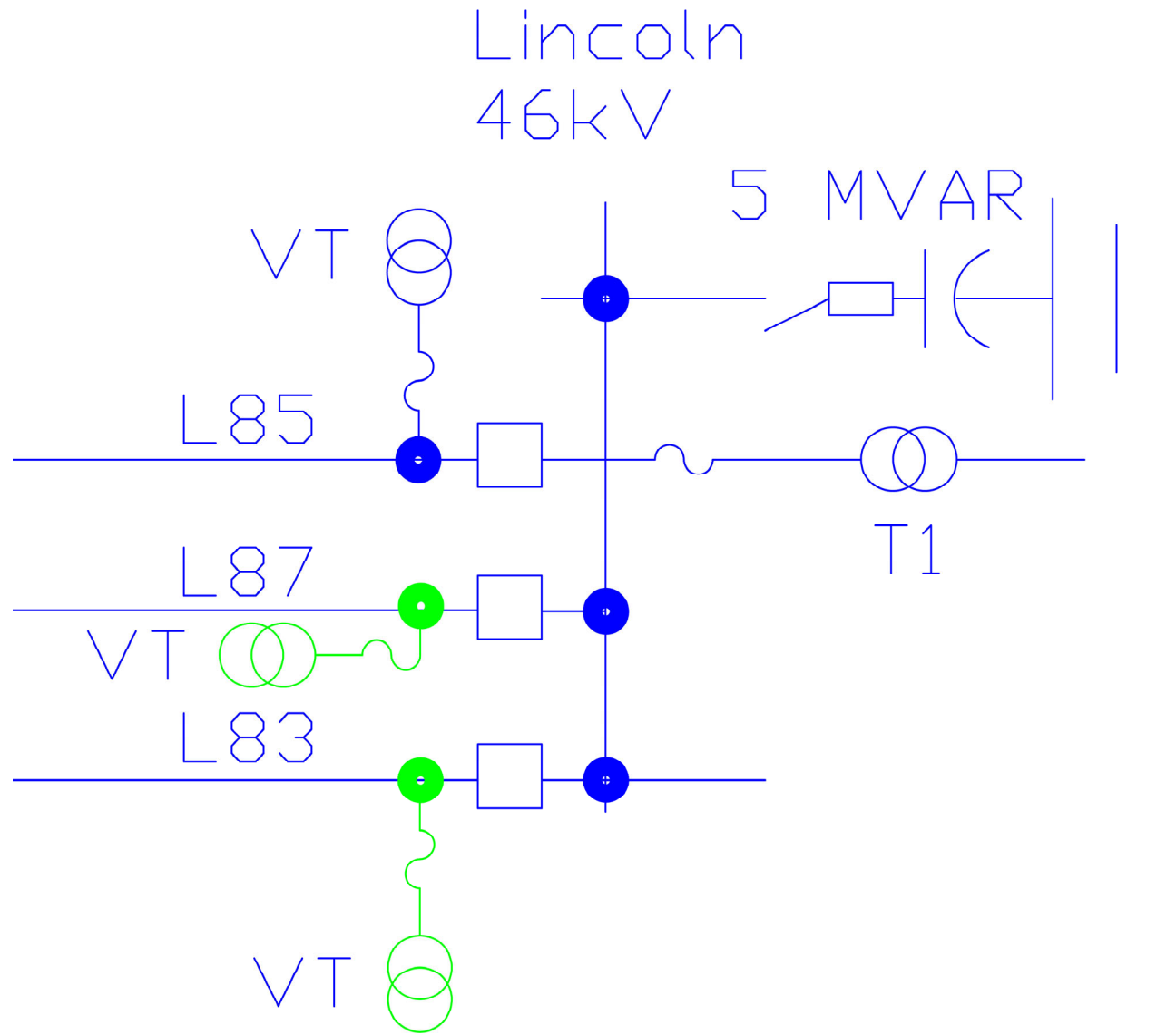
19/20 Auto Flop Over



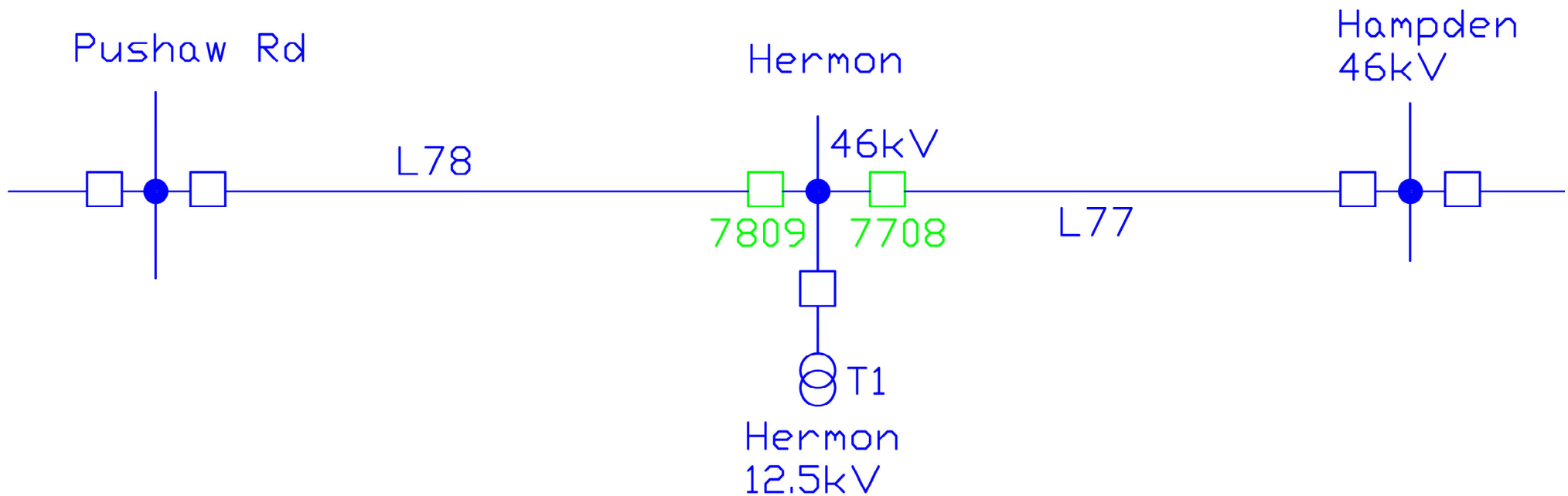
Project Descriptions – Under Construction

- Lincoln Sub L83 and L87 VT Additions – Add three phase VTs to these lines to improve operation and protection
- Hermon Breaker and Protection Upgrade – Add L77 and 78 breakers and related protection to improve area reliability
- UMaine L7 Breaker Addition – Addition of L7 breaker to UMaine sub to accommodate future protection and operational upgrade
- Tibbetts St L76 Relay Replacement – Replace relays on L76 due to condition and function – supports communications protection in future
- Bradley Switching Station – 46kV Switching station addition to better accommodate reliability needs
- Graham Replace T6-8 – Add new T10 to replace the combination of existing T6-8
- Orono T4 and T4H Replacement – Replace temporary installation with long term solution

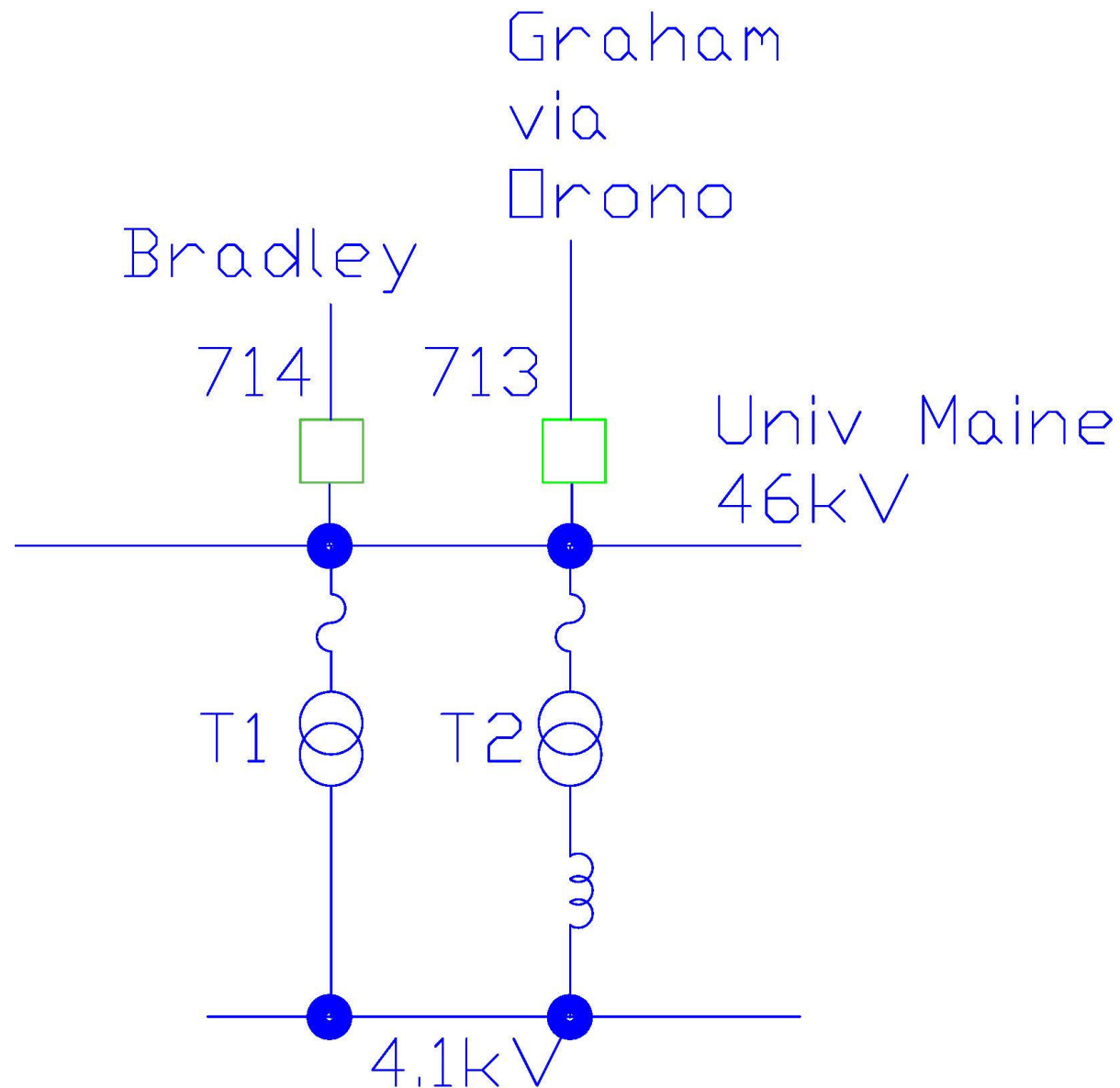
Lincoln Sub L83 and L87 VT Additions



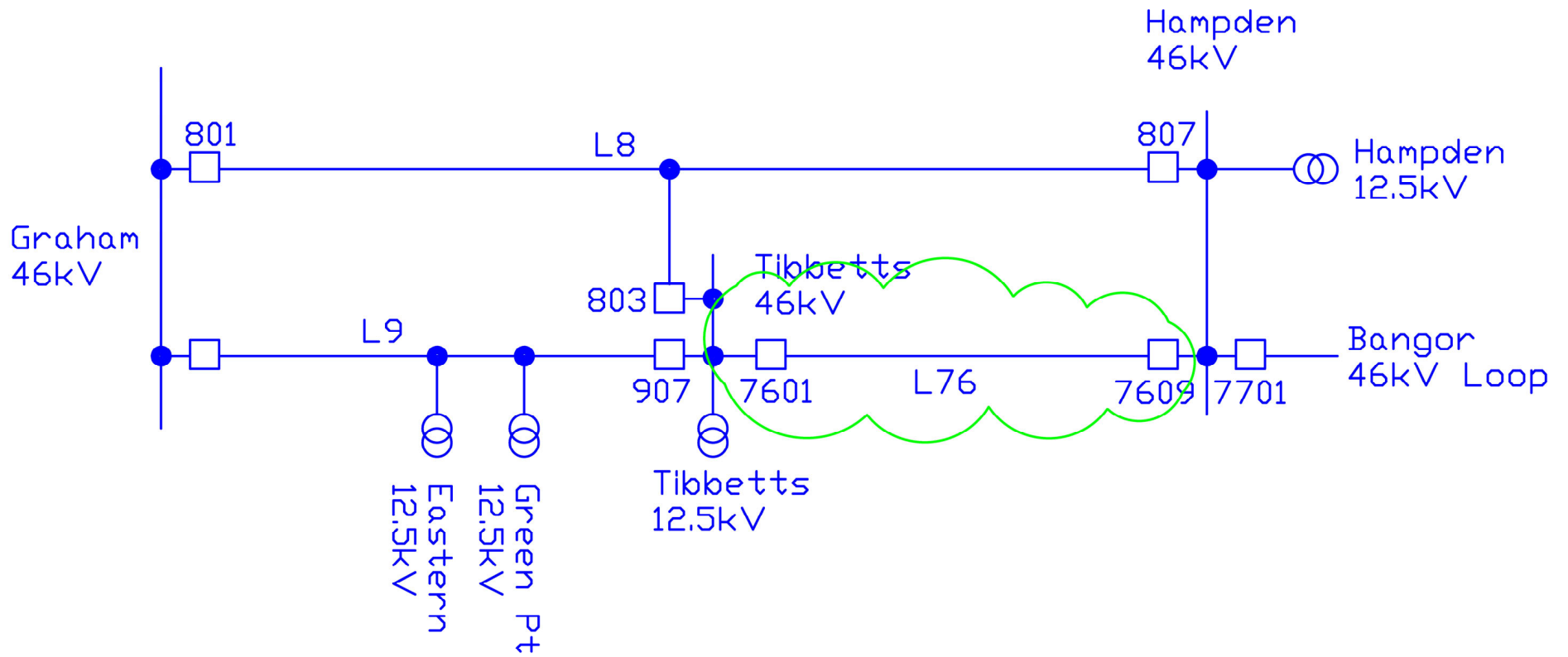
Hermon Sub Breaker and Prot. Upgrade



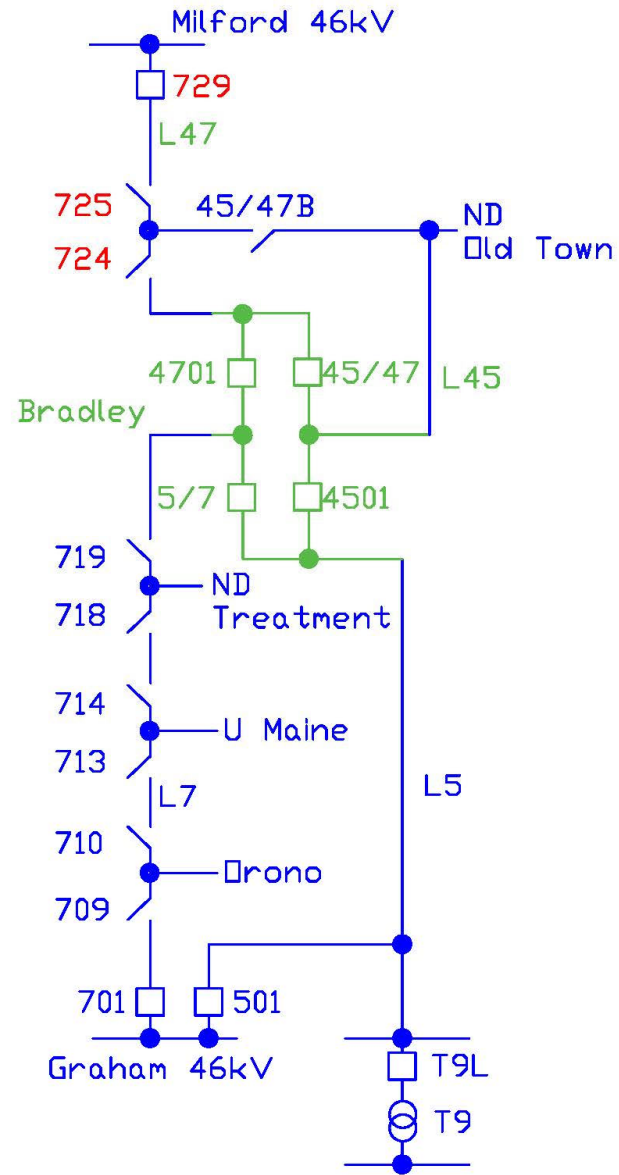
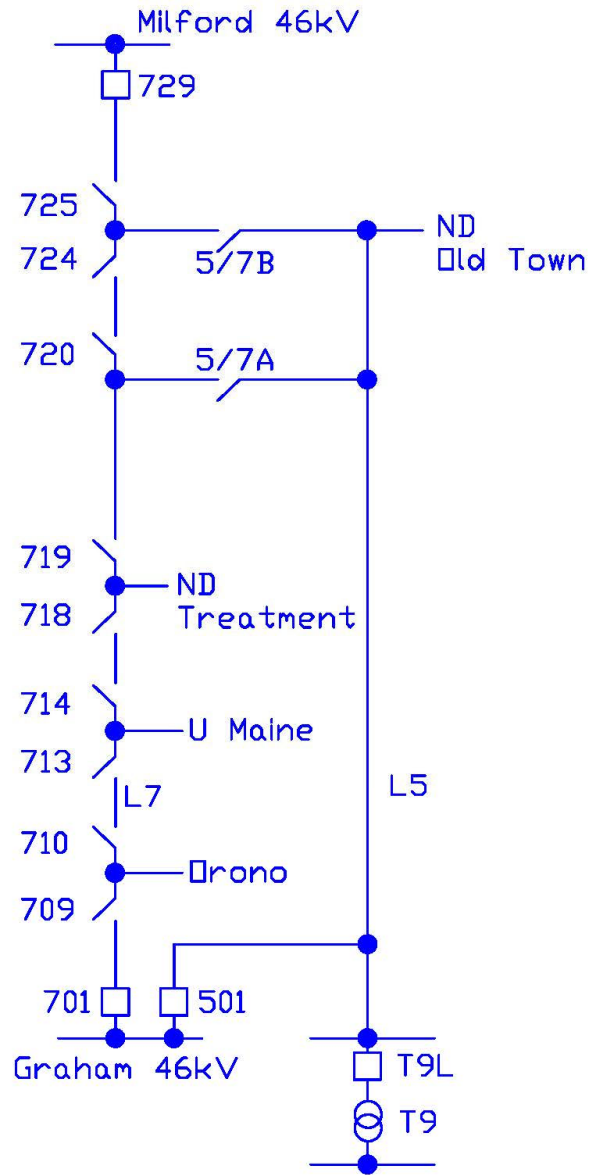
U Maine L7 Breakers Addition



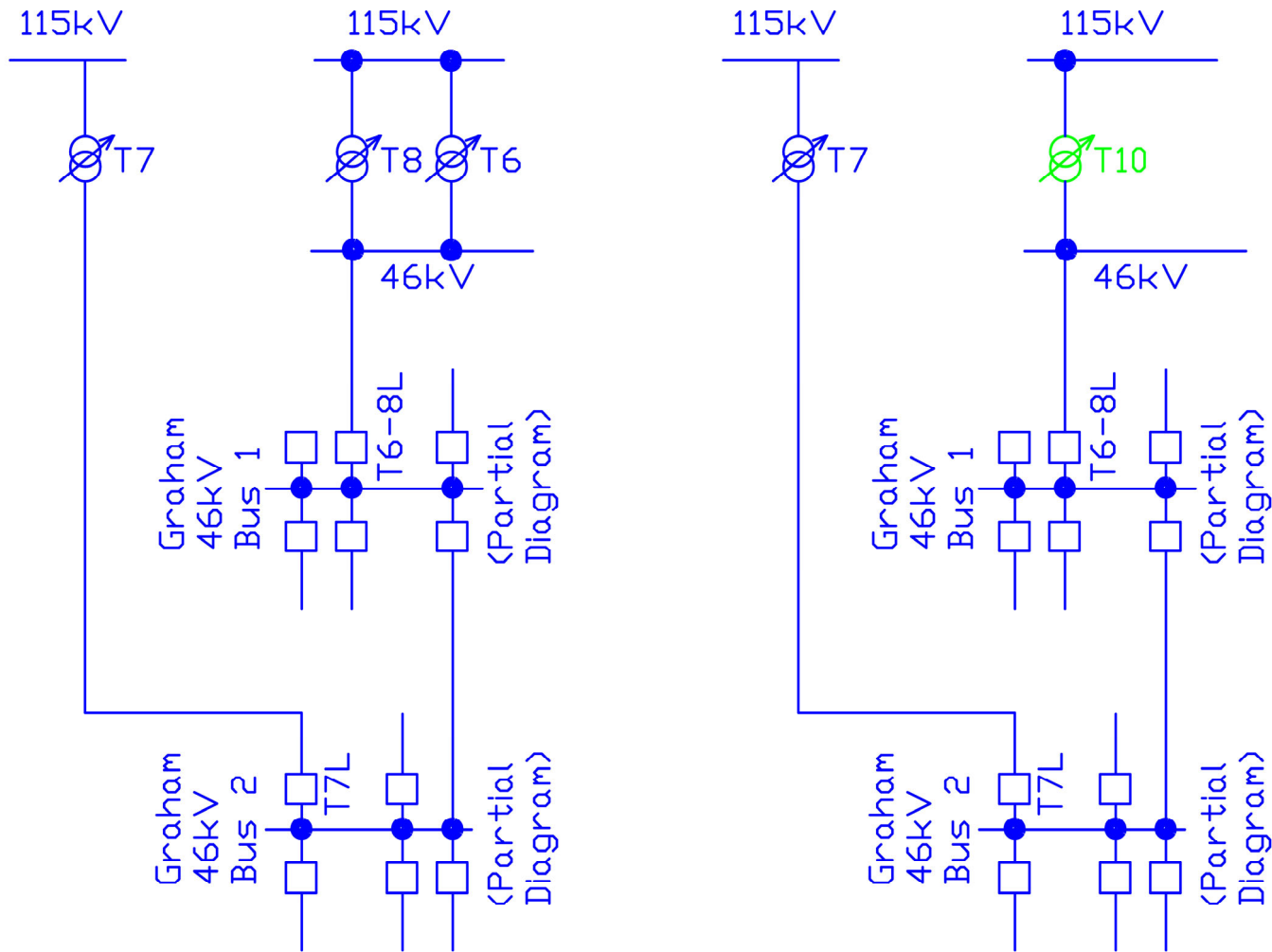
Tibbetts St L76 Relay Upgrade



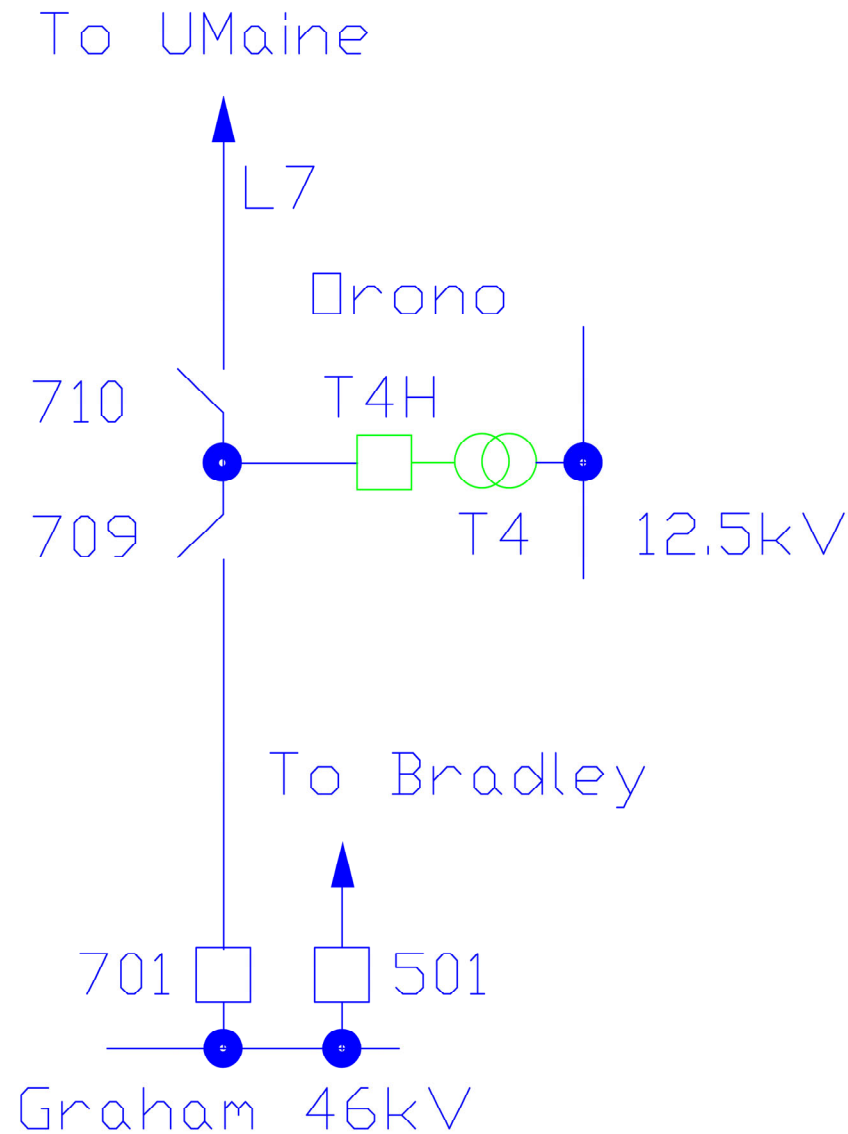
Bradley Switching Station



Graham T6-8 Replacement



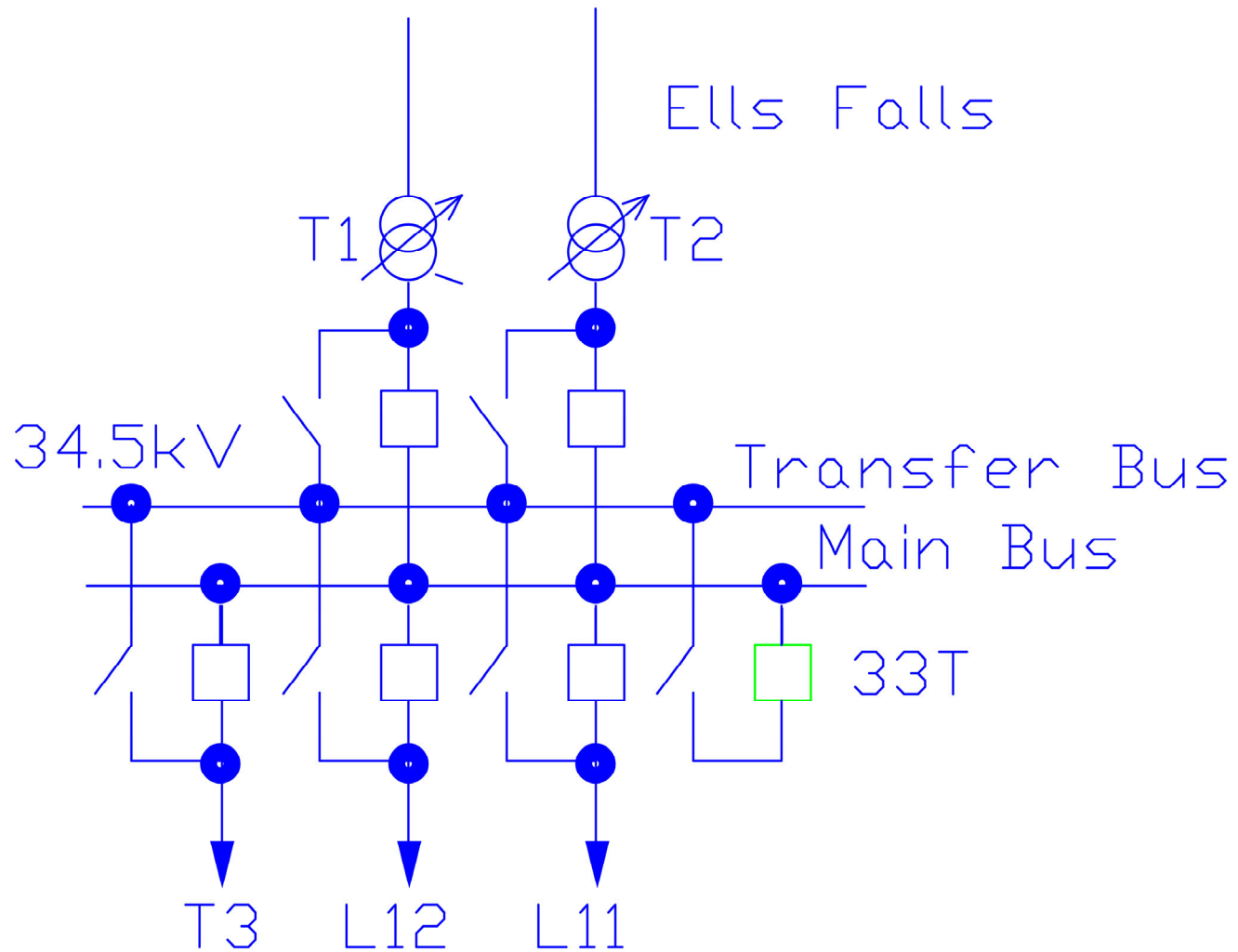
Orono T4 and T4H Replacement



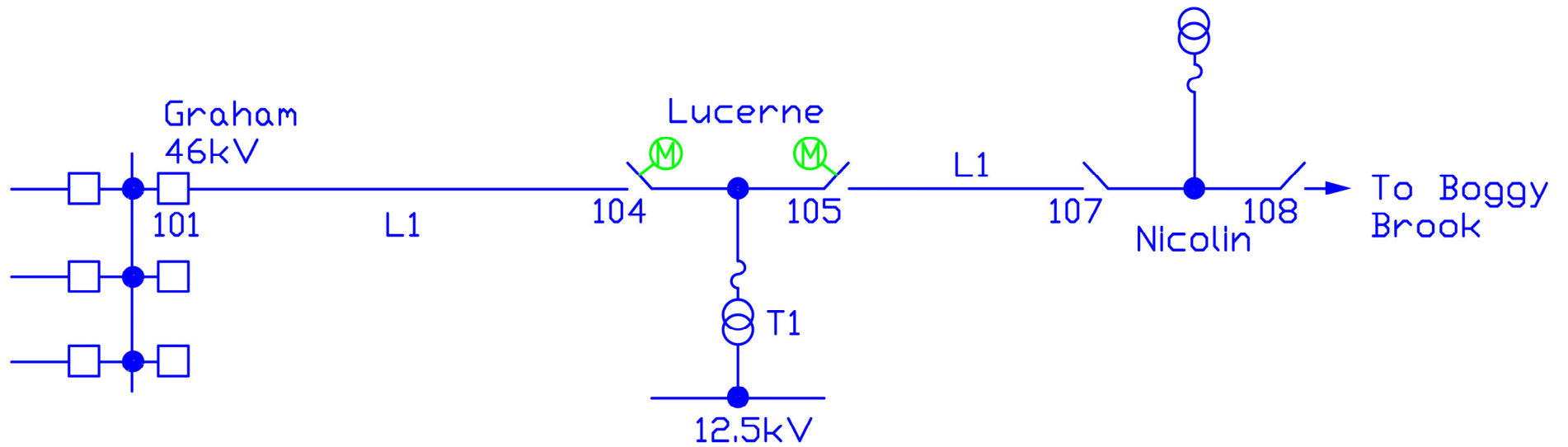
Project Descriptions – Under Construction

- Ellsworth Falls 33T Breaker Replacement – Replace 34.5kV breaker due to asset condition
- Lucerne Sub Auto Restoration – Update control system associated with Line 1 auto flop over
- Cherryfield Sub MO and SCADA addition – Replace 1707 and 17/18 switches with motor operated versions under SCADA control to improve area reliability
- Scotts Hill Rd Relay Replacement – Replace relays on Lines 3, 4, 19, and 20 due to functionality to improve area protection
- WCS UP6 Breaker Replacement – Replace breaker due to asset condition
- Machias Sub – New substation to replace obsolete old facility and improve area transmission.
- Various Line Targeted Rebuilds – L19 Crossarm P6, L81 River Crossing, L2 Rebuild P2, L25 Reconductor P2, MDI Loop L48, MDI Loop L40, L13, L28 targeted rebuilds

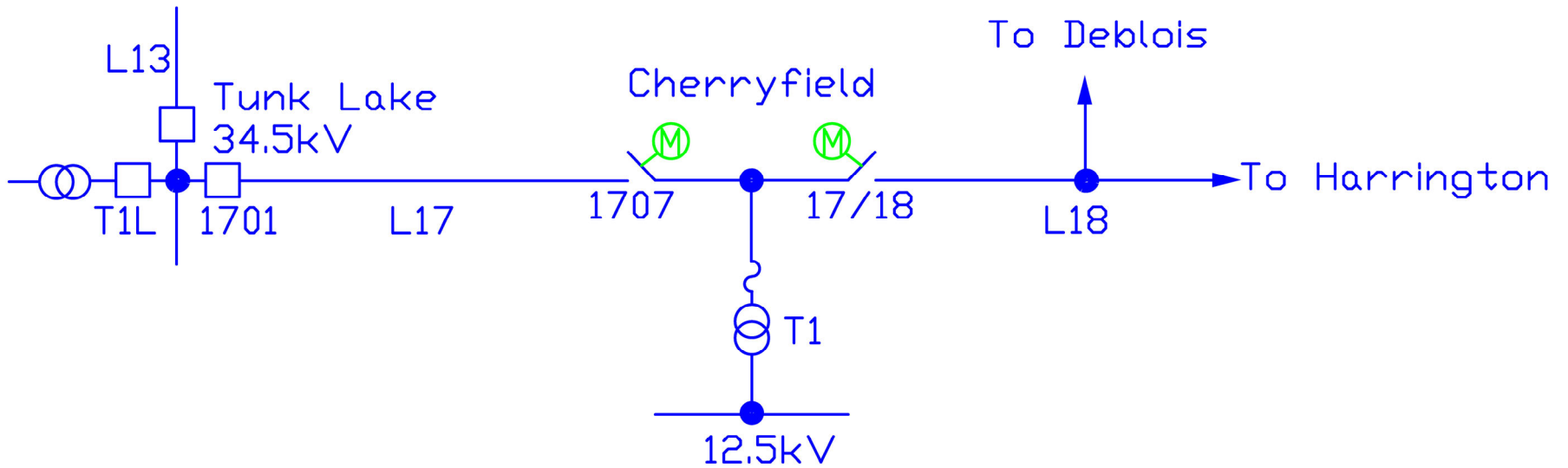
Ellsworth Falls 33T



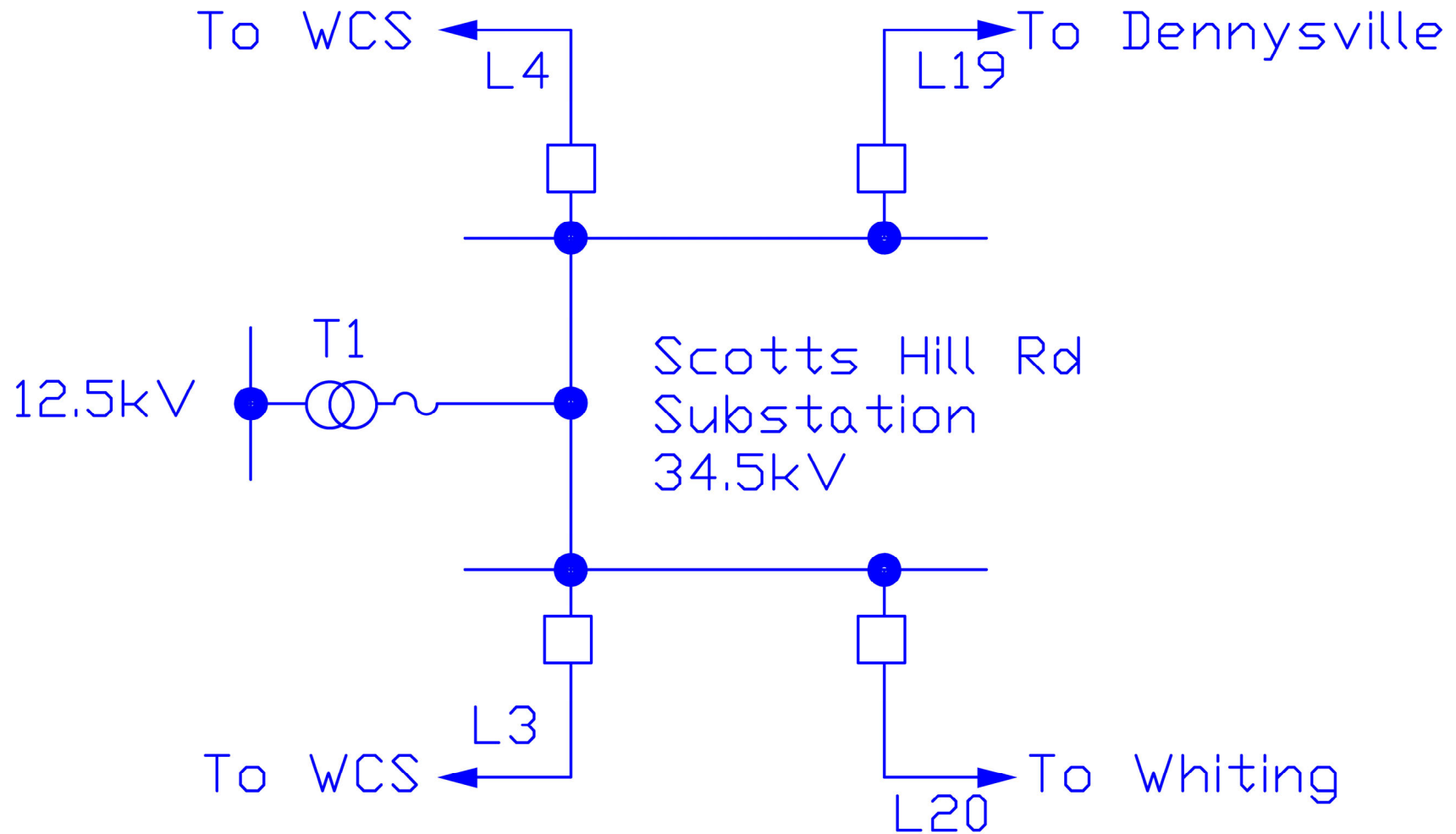
Lucerne Sub Auto Restoration



Cherryfield Sub MO and SCADA addition

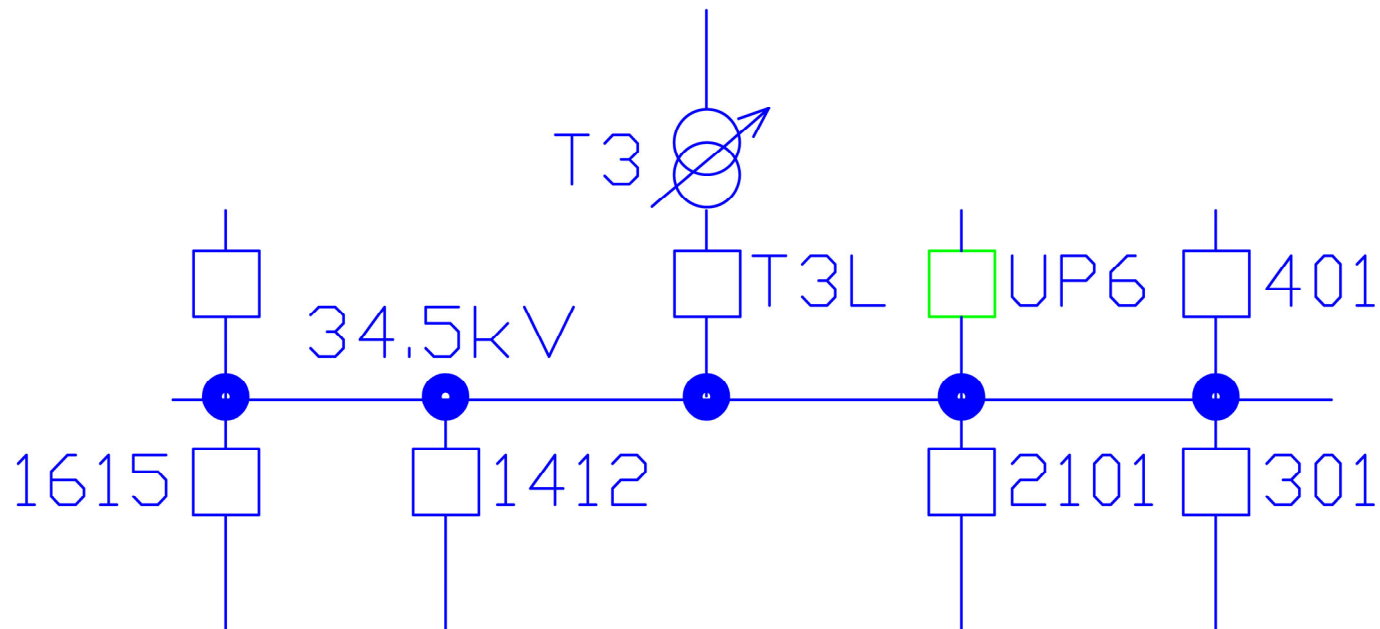


Scotts Hill Rd Relay Replacement

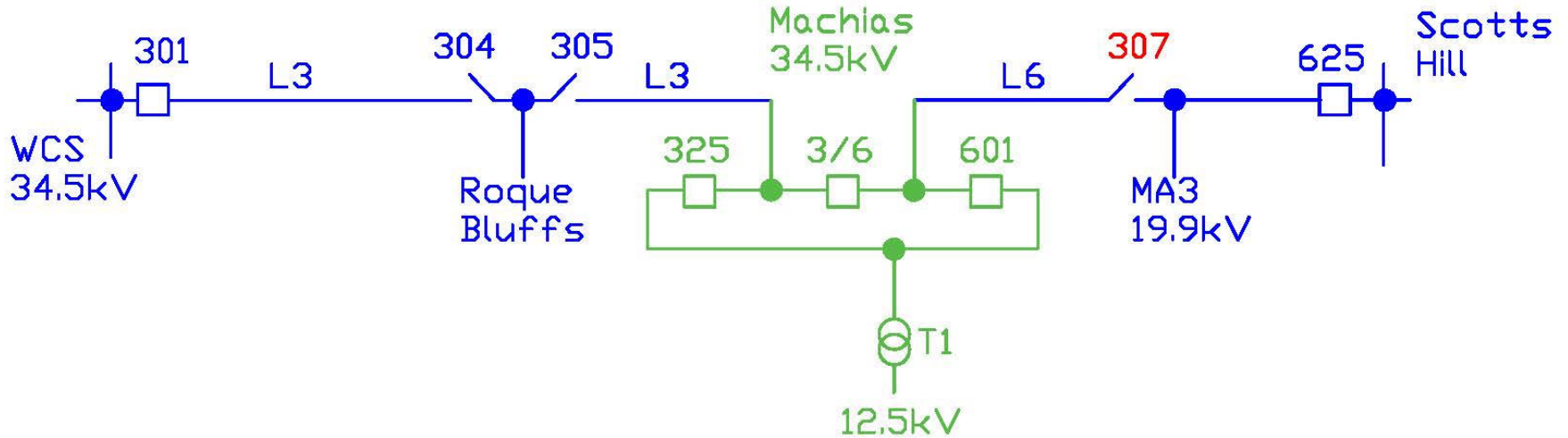
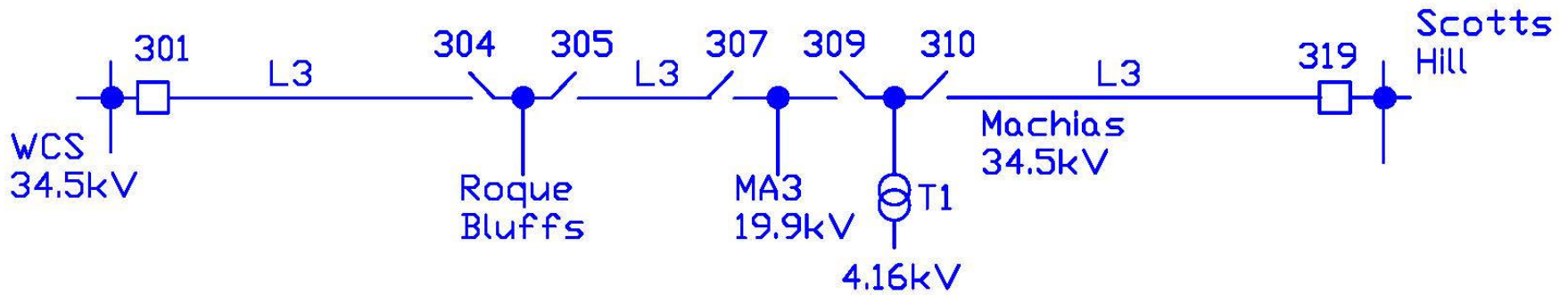


WCS UP6 Breaker Replacement

Washington County Sub



Machias 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.