



Supplement Request Form

| | |
|---|--|
| Date Prepared: 10/1/19 | Project Title: 11W1 – Replace Submarine Cable |
| Company/ies: Eversource NH | Project ID Number: A16N01 |
| Organization: NH Operations | Plant Class/(F.P.Type): Distribution Line |
| Project Initiator: Sam Bosse | Project Type: Specific |
| Project Manager: Sam Bosse | Capital Investment Part of Original Operating Plan? N |
| Project Sponsor: Paul Renaud | O&M Expenses Part of the Original Operating Plan? N |
| Current Authorized Amount: \$360,000 | Estimated in service date(s): 12/15/19 |
| Supplement Request: \$1,557,000 | Other: |
| Total Request: \$1,917,000 | |

Supplement Justification

Supplement Request Forms must be completed for projects in accordance with the Project Authorization Policy and approval levels in the Delegation of Authority Policy (DOA) as follows:

Justification for Additional Resources

Two 15 kV submarine cables were installed between the mainland and Welch Island & Lockes Island in 1960 and 1940 respectively to provide electric service to residents of the islands. The 1,100 foot Lockes Island cable is a three phase cable serving single phase load and one of the phases has already failed. The 5,400 foot cable serving Welch Island has a severely deteriorated neutral conductor where it crosses the shoreline onto the island. This project is to install two single phase 1/0 15 kV submarine cables to each island, totaling approximately 15,000 feet of cable. One cable will be the normal feed to the island with the second serving as a backup cable. Eversource has secured all necessary permits, including three easements from property owners, one municipal license, two water crossing permits, four shoreland impact permits, and four wetland impact permits.

This project was originally authorized in 2016 for \$360,000. Current charges to the project total approximately \$163,000. At this time the project has been put out to bid twice, with the lowest cost vendor selected after the second round. The anticipated cost of this project is \$1,917,000, with \$1,142,000 in direct spending.



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Supplement Cost Summary

Note: Dollar values are in thousands:

| | Prior Authorized | Supplement Request | Total |
|--------------------------------|---------------------|-----------------------|-----------------|
| Capital Additions - Direct | \$ 240 | \$ 734 | \$ 974 |
| Less Customer Contribution | - | - | - |
| Removals net of Salvage ____ % | 13 | 155 | 168 |
| Total Direct Spending | \$ 253 | \$ 889 | \$ 1,142 |
| Capital Additions - Indirect | 103 | 670 | 773 |
| AFUDC | 4 | (2) | 2 |
| Total Capital Request | \$ 360 | \$ 1,557 | \$ 1,917 |
| O&M | - | - | - |
| Total Request | \$ 360 | \$ 1,557 | \$ 1,917 |

Note: Dollar values are in thousands:

Total Supplement Request by year view:

| | Year 2019 | Year 20__ | Year 20__+ | Total |
|--------------------------------|-----------------|-------------|-------------|-----------------|
| Capital Additions - Direct | \$ 734 | \$ - | \$ - | \$ 734 |
| Less Customer Contribution | - | - | - | - |
| Removals net of Salvage ____ % | 155 | - | - | 155 |
| Total Direct Spending | 889 | - | - | 889 |
| Capital Additions - Indirect | 670 | - | - | 670 |
| AFUDC | (2) | - | - | (2) |
| Total Capital Request | 1,557 | - | - | 1,557 |
| O&M | - | - | - | - |
| Total Request | \$ 1,557 | \$ - | \$ - | \$ 1,557 |



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Project Authorization Form

General Information

| | |
|--|---|
| Date Prepared: 4/5/2016 | Project Title: 11W1 – Install Submarine Cable to Welch Island |
| Company: Eversource - NH | Project ID Number: A16N01 |
| Organization: NH Operations | Class(es) of Plant: Distribution |
| Project Initiator: Bill Steff | Project Category: Reliability (Dist. Lines) |
| Project Owner/Manager: Marc Geaumont/Sam Bosse | Project Purpose: part of regulatory tracked program? No |
| Project Sponsor: Jim Eilenberger | Project Type: Specific |
| Estimated in service date: 10/31/2016 | Capital Investment Part of Original Operating Plan? Yes |
| If Transmission Project: N/A | Supplement to Existing Authorization? No |
| | O&M Expenses Part of the Original Operating Plan? N/A |

If Chief Executive Officer or subsidiary board approval is required, document the review by Enterprise Risk Management (ERM) and Financial Planning and Analysis (FP&A)

ERM: _____

FP&A: _____

Executive Summary

Two 15 kV submarine cables were installed between the mainland and Welch Island & Lockes Island in 1960 to provide electric service to residents of the two islands. The Lockes Island cable is a 3Ø cable, where one of the phases has already failed. The cable serving Welch Island has a severely deteriorated neutral conductor where it crosses the shoreline onto the island. The distance between the mainland and Welch Island is about 5,400ft, and Lockes Island is about 1,400ft. This proposal would install a new 3Ø 1/0 submarine cable to both islands. The anticipated cost of this project is \$360,000.



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Project Costs Summary

Note: Dollar values are in thousands

| | Prior Authorized* | Prior Spend* | 2016 | 2017+ | Totals | Supplemental Authorization* |
|------------------------------|-------------------|--------------|--------|-------|--------|-----------------------------|
| Capital Additions - Direct | \$ | \$ | \$ 240 | \$ | \$ 240 | |
| Customer Contribution | \$ | \$ | \$ 0 | \$ | \$ 0 | |
| Removals net of Salvage | \$ | \$ | \$ 13 | \$ | \$ 13 | |
| Total - Direct Spending | \$ | \$ | \$ 253 | \$ | \$ 253 | \$ |
| Capital Additions - Indirect | \$ | \$ | \$ 103 | \$ | \$ 103 | |
| Subtotal Request | \$ | \$ | \$ 356 | \$ | \$ 356 | |
| AFUDC | \$ | \$ | \$ 4 | \$ | \$ 4 | |
| Total Request | \$ | \$ | \$ 360 | \$ | \$ 360 | |

* to be completed if supplemental authorization is required

Summary Project Description

Replace 5,400 feet of submarine cable between the mainland and Welch Island, install 2 new riser poles, one on shore, and the other on the island. Directional bore conduit from the risers out into the lake bed to a depth of approximately 25 feet to avoid exposing the cable to wave and ice damage.

Replace 1,400 feet of submarine cable between the mainland and Lockes Island, install 2 new riser poles, one on shore, and the other on the island. Directional bore conduit from the risers out into the lake bed to a depth of approximately 25 feet to avoid exposing the cable to wave and ice damage.

Note: Dollar values are in thousands

| | Total Project Costs | Amount in Operating Plan | Difference |
|----------------|---------------------|--------------------------|------------|
| Capital | \$360 | \$360 | \$0 |
| O&M | \$0 | \$0 | \$0 |
| Total | \$360 | \$360 | \$0 |



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Project Authorization

| Approver | Approver Name | Approver Signature | Date |
|-----------------------------|-------------------|--------------------|------|
| Project Initiator | Bill Steff | | |
| Project Manager | Marc Geaumont | | |
| Plant Accounting Manager | Michele Roncaioli | | |
| Director | Sam Bosse | | |
| | James Eilenberger | | |
| Sr. Vice President | Peter Clarke | | |

Overall Justification

Electric service to Welch Island is presently provided through a single #2 -15 kV submarine cable which has a deteriorated neutral conductor. Failure of this cable would result in an outage of a very significant length to the 58 customers on the island. Likewise, electric service to Lockes Island is presently provided through a 3Ø #4 – 15 kV submarine cable, which has 1 phase already failed. Failure of this cable would result in an outage of a very significant length to the 42 customer on the island. This project seeks to proactively replace the aging cables with new submarine cables and eliminate the cables from exposure to wave and ice action which has accelerated the deterioration.

Project Scope

Obtain permits as needed for the cable on the lake bottom and the shore crossings on the mainland and islands. Lay new submarine cables along the lake bed between the mainland and islands. Supply new riser poles to serve both ends of the cable. Directional bore conduits each end of the cables to protect the cables from wave and ice action.

Project Objectives

Prevent an open neutral condition on Welch Island. Proactively replace an aging and damaged cable (neutral bundle) before it fails and leaves 56 customers on the island without power for an undeterminable length of time. Proactively replace an aging and damaged cable (1Ø already failed) before it fails and leaves 42 customers on Lockes Island without power for an undeterminable length of time.

Business Process and / or Technical Improvements

Upgrade aging equipment to new technology.

Assumptions



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This project assumes that the permitting of the cable will receive approval from the various State departments, and will not delay the installation. The project assumes that the untimely failure of the existing cables could result in a time consuming and costly repair depending upon the season and weather involved. It also assumes that the untimely failure of the existing cables during winter months where the lake is frozen over, no action would be taken to restore service until the ice melts in the spring.

Alternatives Considered

Install distributed generation on the Island to serve as backup to the eventual failure of the cables. Distributed generation would be very costly and not an appropriate avenue to provide backup.

Project Schedule

| Milestone/Phase Name | Estimated Completion Date |
|----------------------|---------------------------|
| Complete Engineering | 2/1/16 |
| Complete Design | 4/30/16 |
| Complete Permitting | 9/1/16 |
| Complete job | 10/1/16 |



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Financial Evaluation

Note: Dollar values are in thousands

| Direct Capital Costs | 2016 | 2017 | 2018+ | Total |
|---|-------------|-------------|--------------|--------------|
| Straight Time Labor | \$2 | \$ | \$ | \$2 |
| Overtime Labor | \$0 | \$ | \$ | \$0 |
| Outside Services | \$223 | \$ | \$ | \$223 |
| Materials | \$21 | \$ | \$ | \$21 |
| Other, including contingency amounts (describe) Vehicles | \$7 | \$ | \$ | \$7 |
| Total | 253 | \$ | \$ | \$253 |

| Indirect Capital Costs | 2016 | 2017 | 2018+ | Total |
|--|--------------|-------------|--------------|--------------|
| Indirects/Overheads (including benefits) | \$103 | \$ | \$ | \$103 |
| Capitalized interest or AFUDC, if any | \$4 | \$ | \$ | \$4 |
| Total | \$107 | \$ | \$ | \$107 |

| | | | | |
|----------------------------|--------------|-----------|-----------|--------------|
| Total Capital Costs | \$360 | \$ | \$ | \$360 |
|----------------------------|--------------|-----------|-----------|--------------|

| | | | | |
|----------------------------|------------|-----------|-----------|------------|
| Total O&M Costs | \$0 | \$ | \$ | \$0 |
|----------------------------|------------|-----------|-----------|------------|

| | | | | |
|----------------------------|--------------|-----------|-----------|--------------|
| Total Project Costs | \$360 | \$ | \$ | \$360 |
|----------------------------|--------------|-----------|-----------|--------------|

Note: Explain unique payment provisions, if applicable

Regulatory Approvals

NHDES approvals are required for the shoreline crossing on each of the mainland sites, and island sites. State of NH approval would be required for the cable crossing.

Risks and Risk Mitigation Plans

The risk of not replacing the cables is possibility of incurring a significant outage to the islands. Risk related to power quality issues on Welch Island due to the deteriorated neutral serving the island. One mitigation plan for the neutral issues has been identified to hire a diver to piece on a new neutral wire from the depths of the lake, and run this ashore, parallel to the cable, and splice it onto the cable on land. Additional risk from this plan includes failure of cable due to movement to the cable related to splicing a neutral onto it.



Supplement Request Form

Approved at June 10, 2020 EPAC

[Link to Meeting Minutes](#)

| | |
|---|--|
| Date Prepared: 7/31/2020 | Project Title: Replace Pemigewasset Transformer |
| Company/Companies: Eversource NH | Project ID Number: A18N05 |
| Organization: NH Project Management | Plant Class/ (F.P. Type): Distribution Substation |
| Project Initiator: Robert Mission | Project Type: Specific |
| Project Manager: Walter Quinn | Capital Investment Part of Original Operating Plan? Yes |
| Project Sponsor: Digaunto Chatterjee | O&M Expenses Part of the Original Operating Plan? N/A |
| Current Authorized Amount: \$4,063K | Estimated in service date(s): December 30, 2020 |
| Supplement Request: \$2,754K | Other: |
| Total Request: \$6,817K | |

Supplement Justification

Scope of Work

The Pemigewasset Transformer project proposes to replace the existing 20 MVA transformer with a 62.5 MVA transformer per the original scope and budget as well as replace the two (2) 34.5kV oil circuit breakers (OCBs) with vacuum circuit breakers (VCBs). New control panels will be installed in the newly expanded control house. The control house will contain the new protection and control equipment, HMI cabinet, RTU extension cabinet, and battery bank.

Background

This project received full funding approval for \$4,063K in PowerPlan on March 7, 2018. This supplement requests an additional \$2,754K for a revised project total of \$6,817K.

Several items contribute to this additional funding request:

- Expansion of the control house which was determined to have insufficient space for the necessary equipment additions.
- Testing & Commissioning contracts higher than budget
- Modifications necessary to support Smart Grid implementation
- Installation of animal protection equipment
- Increase in indirect costs

The original scope did not include the control house expansion, the addition of animal protection, or modifications to support Smart Grid implementation which were added scope items.



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The decision to expand the control house was made in May 2019 after it was determined that the existing Control House did not have enough space to insert ten (10) additional control cabinets when only four (4) existing control cabinets were being replaced.

Several benefits will be realized by expanding the control house:

- Safety during construction
- Safety during operation: elimination of human performance traps due to cabinets being placed in random locations (basically, wherever one could fit)
- Addition of much needed air conditioning system to cool the new solid-state equipment (ten cabinets)
- After removals, some of the existing control house space will be available for future additions.

The need for supplemental funding to cover the Control House addition was noted at each monthly Work Plan meetings from July 2019 on through April 2020. It was discussed that once the prime electrical contractor was selected, a fully informed estimate could be developed and presented to EPAC, which would include the control house expansion.

Smart Grid additional design was identified as the PAF documents were being developed for this supplement and due to the undefined design at the time, a contingency of \$90k to implement was set. The Electric System Control Center (ESCC) needs the smart grid data from the feeder primary and secondary relays for their Distribution Management System (DMS).

Smart Grid implementation will be required prior to the new feeder breakers going into service. It's an ESCC requirement to have this data being sent to them, although three phase values MW, MVAR and kV are already in the design and being provided via the M650 meters, these smart grid points are still needed before the new breakers are in service.

Subsequent to this project approval, a program to install animal protection at NH substations was approved. That scope has been incorporated into this funding request. In retrospect, a separate funding program release should have been requested for Pemigewasset substation.

Indirect costs were not properly incorporated in the previous authorization. The estimate which this authorization was based on was prepared by a consultant and did not properly account for Eversource overheads.

Project Status

Through the end of June 2020, the project has invested \$4,522K. Work performed to date includes: engineering, material procurement, control house expansion, and associated indirects.



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The project in-service date has been extended from June 1, 2019 to December 30, 2020 due to outage availability.

Supplemental Cost Breakdown

The table below provides an overview of the line item categories from the initial authorization and the updated project estimate.

| | Previously authorized | Current Project Forecast | Delta (request amt) |
|-----------------------|-----------------------|--------------------------|---------------------|
| Internal labor | \$110 | \$378 | \$268 |
| Engineering/PSM | \$907 | \$615 | (\$292) |
| Construction/Removal | \$653 | \$991 | \$338 |
| Material | \$1,576 | \$1,982 | \$406 |
| Testing | \$261 | \$677 | \$416 |
| Contingency | \$338 | 0 | (\$338) |
| Other | \$0 | \$9 | \$9 |
| Subtotal Direct Costs | \$3,845 | \$4,652 | \$807 |
| Indirects | \$215 | \$1,862 | \$1,647 |
| AFUDC | \$3 | \$303 | \$300 |
| Total | \$4,063 | \$6,817 | \$2,754 |



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Justification for Additional Resources

Supplemental funds of \$2,754K are required for the following scope changes and items that were underestimated in the original Project Authorization Form (PAF) as follows:

Internal Labor - \$268K

- Internal labor costs increased due to Internal staffing not originally budgeted for this level of support; Internal Engineering support higher than estimated and Internal line and station construction services associated with installing the mobile transformer and dressing out the new transformer were higher than anticipated.

OS Engineering/PSM – (\$292K)

- Costs for the Project Manager and the Construction Representative were originally budgeted in outside services. The actual positions were staffed by Eversource employees.

Construction / Removal – \$338K

The major cost driver for the additional investment of \$338K was the Control House addition:

- Control House weather tight shell – increase of \$115K
- The Prime Electrical estimate was originally budgeted at \$395K and when the Control House additional scope was included the contract purchase order was \$643K. This increase is attributed to the control house electrical, lights, HVAC, interior grounding, cable tray and animal protection. – increase of \$248K

Materials – \$406K

- The new pad-mount transformer is a 300kVA unit. This is not a standard size and the cost was greater than originally estimated. (Additional cost - \$187K)
- Eversource requested to add animal protection into the design, which was not included in the original scope.
- Additional budget is required for temporary materials for rerouting the 34.5kV lines around the existing 34.5 bus to provide continuity during breaker replacements, which was not identified at the time of the original estimate.
- Additional materials driven primarily by the control house addition, i.e., cable trays, HVAC system, cable trench, wiring/conductor for control house fit out.



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Testing - \$416K

- Testing and Commissioning were originally underestimated. Contractor proposals have been received to support the current forecast for these services. There is also additional budget associated with the control house expansion.

Contingency - (\$338K)

Contingency was used to partially off-set overages in materials, construction and testing, as well as to address Smart Grid.

Other - \$9K

- Additional employee expenses and property tax that were not accounted for in the original estimate.

Indirect - \$1,647K

- Increased direct costs coupled with proper allocation of overhead rates to the original direct costs have increased the indirect costs by \$1,647K since the original estimate.

AFUDC - \$300K

- AFUDC was underestimated in original estimate. Extended in-service date coupled with overhead rate changes have increased the AFUDC by \$300K.

See attached original authorization documentation.

Supplement Cost Summary

Note: Dollar values are in thousands:

| | Prior Authorized | Supplement Request | Total |
|------------------------------|------------------|--------------------|----------------|
| Capital Additions - Direct | \$3,845 | \$807 | \$4652 |
| Less Customer Contribution | \$0 | \$0 | \$0 |
| Removals Net of Salvage % | \$0 | \$0 | \$0 |
| Total Direct Spending | \$3,845 | \$807 | \$4652 |
| Capital Additions - Indirect | \$215 | \$1,647 | \$1862 |
| AFUDC | \$3 | \$300 | \$303 |
| Total Capital Request | \$4,063 | \$2,754 | \$6,817 |
| O&M | \$0 | \$0 | \$0 |
| Total Request | \$4,063 | \$2,754 | \$6,817 |



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Note: Dollar values are in thousands:

Total Supplement Request by Year View

| | 2019 | 2020+ | Total |
|------------------------------|-------------|----------------|----------------|
| Capital Additions Direct | \$0 | \$807 | \$807 |
| Less Customer Contribution | \$0 | \$0 | \$0 |
| Removals Net of Salvage | \$0 | \$0 | \$0 |
| Total Direct Spending | \$0 | \$807 | \$807 |
| Capital Additions - Indirect | \$0 | \$1647 | \$1647 |
| AFUDC | \$0 | \$300 | \$300 |
| Subtotal Request | \$0 | \$2,754 | \$2,754 |
| O&M | \$0 | \$0 | \$0 |
| Total Request | \$0 | \$2,754 | \$2,754 |



Operations Project Authorization Form

Approved at February 14, 2018 EPAC

[Link to Meeting Minutes](#)

| | |
|---|---|
| Date Prepared: 1/23/18 | Project Title: Replace Pemigewasset Transformer |
| Company/ies: Eversource NH | Project ID Number: A18N05 |
| Organization: NH Operations | Class(es) of Plant: Distribution Substation |
| Project Initiator: Robert Mission | Project Category: Peak Load Capacity - Substation |
| Project Manager: Russel Johnson | Project Type: Specific |
| Project Sponsor: George Wegh | Project Purpose: Upgrade overloaded transformer |
| Estimated in service date: June 1, 2019 | If Transmission Project: PTF? n/a |
| Eng. /Constr. Resources Budgeted? Yes | Capital Investment Part of Original Operating Plan? Yes |
| Authorization Type: Full Funding | O&M Expenses Part of the Original Operating Plan? N/A |
| Total Request: \$4,063,000 | |

Financial Requirements:

Project Authorization

ERM: _____

FP&A: _____

Executive Summary

This project is requesting full funding of \$4,063,000 to:

- Replace the existing 115-34.5 kV, 20 MVA Pemigewasset substation transformer (TB88) with a company standard 62.5 MVA transformer,
- Replace 2 (34.5 kV) line oil circuit breakers with vacuum circuit breakers on the 3114X and 3149 lines.
- Upgrade the protective relaying associated with the transformer and breakers being replaced.

The work to be performed consists of final engineering, site work, material purchasing and construction necessary to remove and replace the existing substation transformer.

The NH 2018 load forecast shows that the Pemigewasset Substation transformer (TB88) is overloaded during heavy load periods under normal operating conditions. The size of the existing Pemigewasset transformer also limits customer restoration capabilities for loss of transformers at adjacent substations. Replacing the existing Pemigewasset Substation transformer with a larger unit will resolve the normal (N-0) overload and provide additional transformer capacity so that all customers can be restored for loss of transformers (N-1) at adjacent substations (Ashland or Laconia).

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Project Costs Summary

| | Prior Authorized | 2018 | 2019 | 20_+ | Totals |
|------------------------------|-----------------------------|-------------|-------------|-------------|---------------|
| Capital Additions - Direct | \$ - | \$ 1,797 | \$ 2,048 | \$ - | \$ 3,845 |
| Less Customer Contribution | - | - | - | - | - |
| Removals net of Salvage % | - | - | - | - | - |
| Total - Direct Spending | \$ - | \$ 1,797 | \$ 2,048 | \$ - | \$ 3,845 |
| Capital Additions - Indirect | - | 100 | 115 | - | 215 |
| Subtotal Request | \$ - | \$ 1,897 | \$ 2,163 | \$ - | \$ 4,060 |
| AFUDC | - | 1 | 2 | - | 3 |
| Total Capital Request | \$ - | \$ 1,898 | \$ 2,165 | \$ - | \$ 4,063 |
| O&M | - | - | - | - | - |
| Total Request | \$ - | \$ 1,898 | \$ 2,165 | \$ - | \$ 4,063 |

Financial Evaluation

Note: Dollar values are in thousands

| Direct Capital Costs | 2018 | 2019 | 2020+ | Total |
|---|-------------|-------------|--------------|--------------|
| Straight Time Labor | 60 | 50 | | 110 |
| Overtime Labor | | | | |
| Outside Services | 1,011 | 810 | | 1,821 |
| Materials | 576 | 1,000 | | 1,576 |
| Other, including contingency amounts (describe) | 150 | 188 | | 338 |
| Total | 1,797 | 2,048 | | 3,845 |

| Indirect Capital Costs | Year 1 | Year 2 | Year 3+ | Total |
|--|---------------|---------------|----------------|--------------|
| Indirects/Overheads (including benefits) | 100 | 115 | | 215 |
| Capitalized interest or AFUDC, if any | 1 | 2 | | 3 |
| Total | 101 | 117 | | 218 |

| | | | | |
|---------------------|-------|-------|--|-------|
| Total Capital Costs | 1,898 | 2,165 | | 4,063 |
|---------------------|-------|-------|--|-------|

| | | | | |
|----------------------------------|--|--|--|--|
| Less Total Customer Contribution | | | | |
|----------------------------------|--|--|--|--|

| | | | | |
|------------------------------------|--------------|--------------|--|--------------|
| Total Capital Project Costs | 1,898 | 2,165 | | 4,063 |
|------------------------------------|--------------|--------------|--|--------------|

| | | | | |
|------------------------------------|--|--|--|--|
| Total O&M Project Costs | | | | |
|------------------------------------|--|--|--|--|

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\$338K of Contingency/Risk Allocation includes:

1. SS site expansion \$248K
2. Soil disposal/trucking 60 tons \$60K
3. Mobile SS installation \$30K

Future Financial Impacts:

Provide below the estimated future costs that will result from the project:

Note: Dollar values are in thousands:

| Future Costs | Year 20__ | Year 20__ | Year20__ | Year 20__+ | Total Future Project Costs |
|--------------|-------------|-------------|-------------|-------------|----------------------------|
| Capital | \$ - | \$ - | \$ - | \$ - | \$ - |
| O&M | - | - | - | - | - |
| Other | - | - | - | - | - |
| TOTAL | \$ - |

Describe the estimated future Capital, O&M and/or Other costs noted above:

Future costs for these structure installations will be limited to regular inspections and minor maintenance as necessary.

What functional area(s) will these future costs be funded in? NH Operations
A representative from the respective functional area is required to be included as a project approver.

If this is other than a Reliability Project, please complete the section below:

Provide below the estimated financial benefits that will result from the project:

Note: Dollar values are in thousands:

| Future Benefits | Year 20__ | Year 20__ | Year20__ | Year 20__+ | Total Future Project Benefits |
|-----------------|-------------|-------------|-------------|-------------|-------------------------------|
| Capital | \$ - | \$ - | \$ - | \$ - | \$ - |
| O&M | - | - | - | - | - |
| Other | - | - | - | - | - |
| TOTAL | \$ - |

Describe the estimated future Capital, O&M and/or Other benefits noted above:

What functional area(s) will these benefits be reflected in? NH Operations
A representative from the respective functional area is required to be included as a project approver.

Asset Retirement Obligation (ARO) and/ or Environmental Cleanup Costs (Environmental Liabilities):

Is there an ARO associated with this project? NO If yes, please provide details:

Are there other environmental cleanup costs associated with this project? If yes, please provide details:
 None Anticipated

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Technical Justification:

Project Need Statement

The NH 2018 load forecast shows that the existing 115-34.5 kV, 20 MVA Pemigewasset Substation transformer (TB88) is overloaded (forecast load of 23 MVA) for heavy load periods under normal operating conditions. The size of the existing Pemigewasset transformer also limits customer restoration capabilities for loss of transformers at adjacent substations. Replacing the existing Pemigewasset Substation transformer with a larger unit will resolve the normal (N-0) overload and provide additional transformer capacity so that all customers can be restored for loss of transformers (N-1) at adjacent substations (Ashland or Laconia).

Replacing the Pemigewasset transformer with a larger unit will require an outage(s) of the 34 kV bus at the substation. The existing 34 kV equipment was surveyed to determine if other equipment should be replaced based upon its condition. Two 34 kV distribution line breakers (3114X and 3149) and their associated relaying were identified as equipment that should be addressed at this time. Both breakers are oil circuit breakers that are approximately 65 years old.

Project Objectives

Increase Pemigewasset Substation transformer capacity to be able to supply the summer peak load in the area. Increased transformation capacity will also be utilized to restore customers during contingent loss of the adjacent substation transformers.

Replacing aging circuit breakers and protection equipment will improve system performance during fault detection and isolation along with reducing maintenance and testing work.

Project Scope

Replace the existing 115-34.5 kV, 20 MVA transformer at Pemigewasset substation with the standard 62.5 MVA transformer. The existing 34.5 kV, 3114X & 3149 line Oil Circuit Breakers (OCBs) will be replaced with new Siemens SDV7 vacuum circuit breakers. The existing relaying for the new transformer and the new line circuit breakers will also be upgraded to current standard relay packages.

Background / Justification

The Pemigewasset substation has a single 20 MVA transformer. This substation supplies the load on the 3114X and 345 lines. The 10.5 MW Ayers Island hydro station is connected to the 3149 line. The substation supplies the 3114X and 345 circuit loads, totaling 23.0 MW. This loading level requires that load be transferred from Pemigewasset substation to Laconia substation during high load periods. The capacity of the Pemigewasset transformer is also limiting the ability to restore the load for a loss of the Ashland transformer or loss of the 338 line between Ashland and Straits Road. (see attached area One-Line)

Currently for a loss of the Ashland transformer, cascading switching is required:

- Step #1; The 3196 line can be restored from Beebe River by opening the 3196 breaker at Ashland and closing the normally open tie switch 3196J11.
- Step #2; The NHEC substation at Moultonborough can be fed from White Lake by opening switch 338J10 and closing switch 338J50.
- Step #3 (Cascaded switching step); To restore the Ashland Municipal load from Pemi, a portion of the 345 line load (8.7 MW) needs to be transferred from Pemi to Laconia by opening 345R2 at Straits Rd and closing switch 345J90
- Step #4; Restore Ashland Municipal load by opening both breaker 3380 at Ashland and switch 338J7 at Straits Rd and closing switch 338J1 at Straits Rd.

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- After the four switching steps above, there would be 13.8 MW isolated at the NHEC substations at Meredith and Center Harbor. The ability to restore any additional load is limited by the existing Pemi transformer capacity.

Currently for loss of a transformer at Laconia, the remaining Laconia transformer is loaded above LTE. The existing Pemi transformer does not have any available capacity to pick up the 23 MW of customer load on the 368 line. The larger transformer at Pemi allows these customers to be restored. With the ability to transfer this load from Laconia to Pemi, this lowers the loading on the remaining Laconia transformer to below LTE.

A larger Pemigewasset transformer will allow the restoration of all customer load for the N-1 loss of the Ashland or Laconia transformers.

Business Process and / or Technical Improvements:

Eliminates the existing transformer overload during summer peak. Address concerns about reliability and removes the need to reconfigure the distribution system for summer heavy load conditions.

Alternatives Considered

Adding a second transformer at Pemigewasset was considered but found to be more expensive and impractical because of the substations hill top location. Factors considered include;

- Added costs of the 115 kV circuit switcher and expanding the 115 kV bus
- Added costs of the 34 kV transformer secondary breaker and expanding the 34 kV bus
- Added costs of control and protection work for the second transformer
- Extensive civil work needed to expand the existing hill top substation site.

Adding a second transformer at Ashland was considered however, the existing Ashland S/S is fed by a radial 115 kV tap from the E115 Line so that loss of the E115 line would result in loss of both Ashland transformers. Customer restoration would still be limited by the existing Pemigewasset transformer capacity. To resolve the N-0 loading issue at Pemigewasset load on the 345 line would need to be permanently transferred to Ashland.

Based upon the above, replacing the existing Pemigewasset Substation transformer with a larger unit is the preferred solution.

Project Schedule

| Milestone/Phase Name | Estimated Completion Date |
|---------------------------|---------------------------|
| Engineering (Start 3/18) | 12/18 |
| Construction (Start 9/18) | 6/19 |
| Material Procurement* | 3/19 |
| In-Service | 6/19 |
| | |

* Transformer procurement may be earlier if decision is to use a transformer initially ordered for a project that has been delayed.

Regulatory Approvals

None



Risks and Risk Mitigation Plans

Loading on Pemigewasset substation during construction requires that customers be transferred from Pemi to Laconia substation during the peak periods. Additionally, failure of the existing transformer may require that customers be transferred to Laconia and use of the 115-34.5 kV mobile to restore all customers.

Outage cancellation due to unplanned events on the system resulting in schedule delay and potential labor costs to remobilize.

1. Mitigation Plan – establish and manage outages using proven coordination teams such as
 - a. construction management
 - b. coordination meetings
 - c. outage planning meetings.

Internal and external resources available for engineering.

1. Effort is being exercised to balance engineering and review work between internal and external resources.

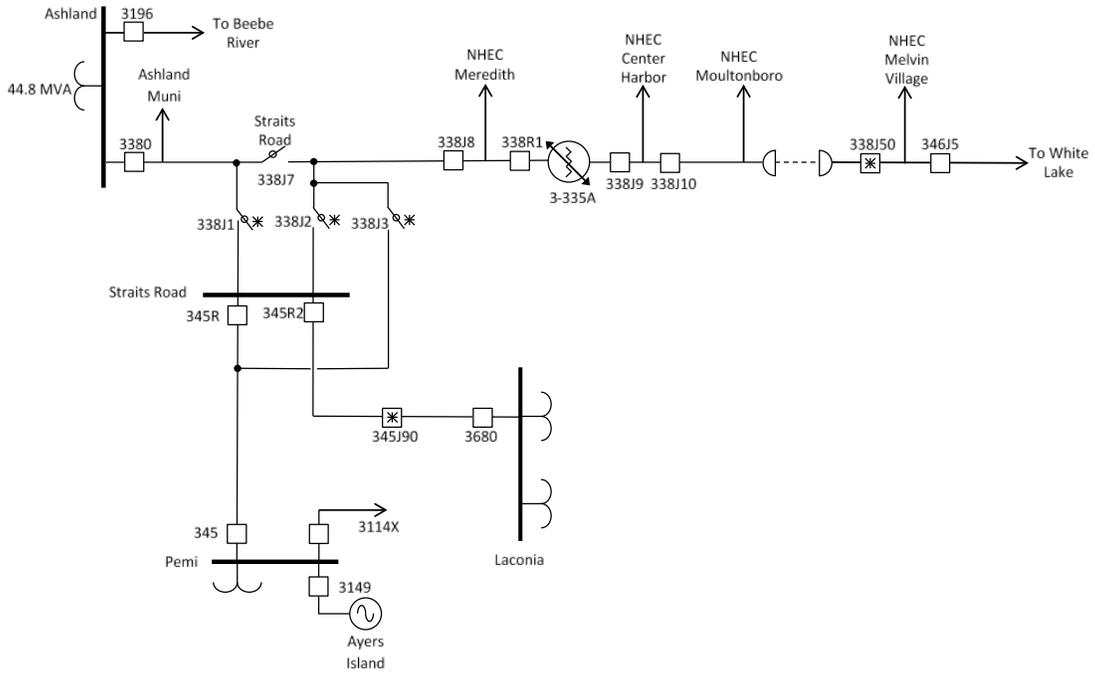
References

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Attachments (One-Line Diagrams, Images, etc.)

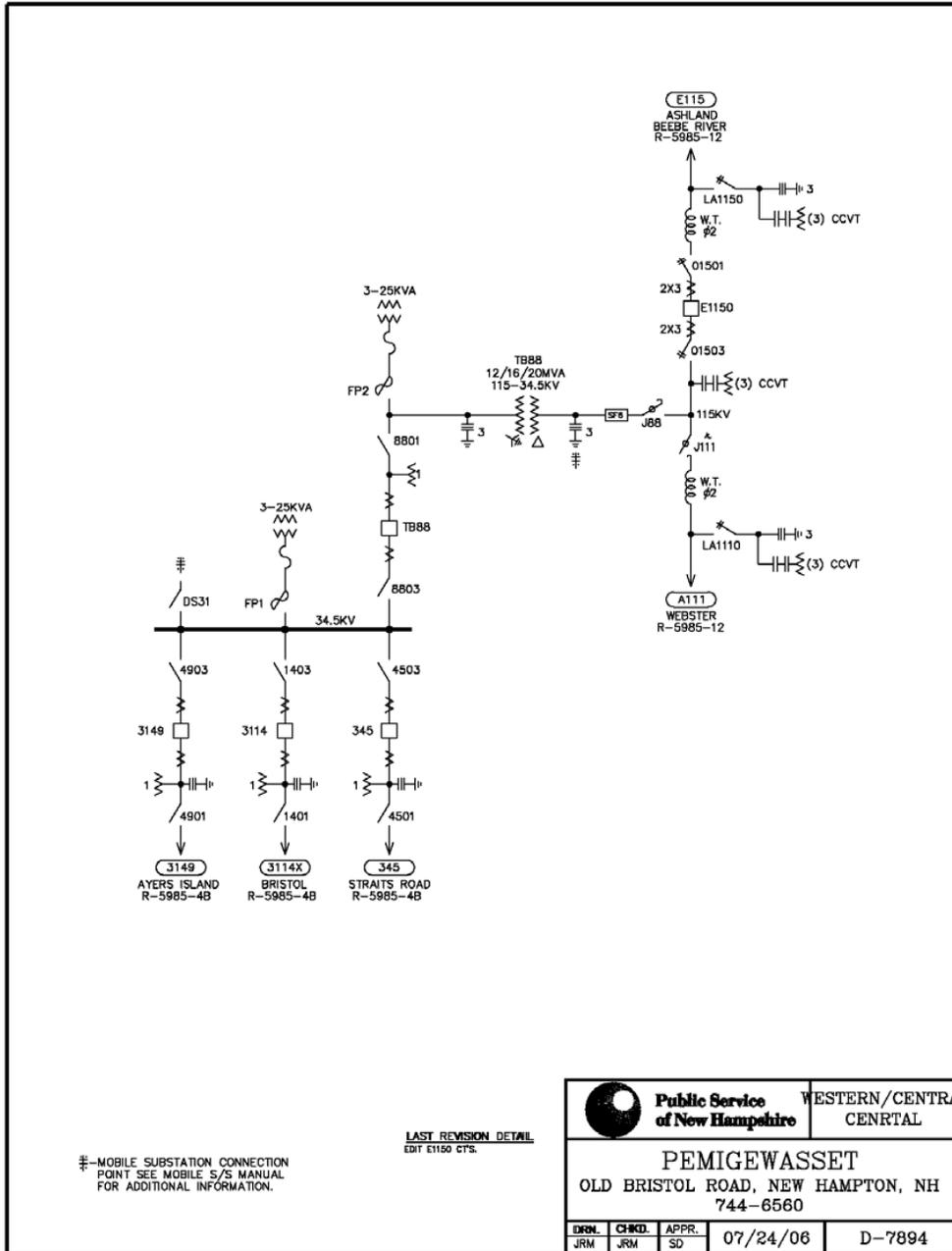
Pemigewasset / Ashland Area One-Line



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Pemigewasset Substation One-Line Diagram





Project Checklist – Transmission and Substation

INSTRUCTIONS:

It is the responsibility of the initiator to contact the area disciplines to determine if the project considerations contained in this list are applicable to their project. They should fill out the checklist and determine a transition plan for the purpose of project execution.

| Checklist for Studies and Processes of a Transmission & Substation Capital Project | |
|---|---|
| Project Name : Replace Pemigewasset Transformer | PAF No: A18N05 |
| Facility Type: <input type="checkbox"/> BPS <input checked="" type="checkbox"/> BES <input checked="" type="checkbox"/> PTF <input type="checkbox"/> non-PTF <input type="checkbox"/> CIP <input checked="" type="checkbox"/> Distribution | |
| PLANNING | |
| Is a NX-9 required? | Yes _____ |
| Is an ISO-NE PAC presentation required? | No _____ |
| Is a PPA required? | Yes _____ |
| Is a TCA Application Required? | No _____ |
| PLANNING/PROTECTION & CONTROLS | |
| Are RAS/SPS/UVLs affected? | No _____ |
| OPERATIONS | |
| Outage Required? | <input checked="" type="checkbox"/> Primary Equipment (Power Transfer) <input type="checkbox"/> Secondary Equipment (P&C only) <input type="checkbox"/> Outage Not Required |
| Do SCLL Conditions Exist? | Yes _____ |
| Has an outage schedule been approved? | No _____ |
| Are Operations & Maintenance procedures/training required? | Yes _____ |
| STANDARDS | |
| Does the project include standard equipment and designs? | Yes _____ |
| SUBSTATION ENGINEERING | |
| Does this impact Revenue Metering | No _____ |
| Is preliminary short circuit/ breaker duty analysis required? | No _____ |
| Are there any changes to the baseline audible noise? | No _____ |
| Is there an impact to the existing ground grid? | Yes _____ |
| Is a Transient Over Voltage (TOV) analysis required? | No _____ |
| P&C ENGINEERING | |
| OP-22 - Are PMUs and DDR required? | No _____ |
| If BPS, is an NPCC Directory #4 presentation required? | No _____ |



| Checklist for Studies and Processes of a Transmission & Substation Capital Project | |
|---|-----------------------|
| Project Name : Replace Pemigewasset Transformer | PAF No: A18N05 |
| TRANSMISSION LINE ENGINEERING | |
| Are there any changes that affect the baseline EMF? | No _____ |
| Are there any changes that affect the baseline EMI? | No _____ |
| Is there an impact to the existing ground grid? | No _____ |
| SITING | |
| Is a Siting filing required? | No _____ |
| PERMITTING | |
| Is there any permitting required? | Yes _____ |
| Siting & Construction Services (Outreach) | |
| What is the level of outreach expected? | Low _____ |
| INITIATOR | |
| Has a field constructability review been completed? | Yes _____ |



Cost Estimate Backup Details

Standard Estimate Report
Pemigewasset Upgrade

Project name Pemigewasset Upgrade
731 Old Bristol Rd
New Hampton
NH 03256
USA

Labor rate table L-16-US40

Equipment rate table E-16-US

Report format Sorted by 'BidPkg/Bid Item/Model'
'Model' summary

Standard Estimate Report
Pemigewasset Upgrade

| Description | Quantity | Labor | | Material | | Subcontract | Equipment | Other | Total |
|----------------------------|---|-----------|----------------|-----------|---------------|---------------|--------------|-------|----------------|
| | | Unit Cost | Amount | Unit Cost | Amount | | | | |
| Contracted | | | | | | | | | |
| Bus Replacements | | | | | | | | | |
| G4010.1070 | Substation Outdoor Hard Bus & Shielding: Bus, Disconnect Switch Replacement | | 1,048 | | 1,632 | | 6 | | 2,686 |
| G4010.1070 | | | | | 4,801 | | | | 4,801 |
| | Bus Replacements | | 1,048 | | 6,433 | | 6 | | 7,487 |
| | 14.40 Labor hours | | | | | | | | |
| | 5.76 Equipment hours | | | | | | | | |
| Control House | | | | | | | | | |
| G4010.1070 | | | | | 50,000 | | | | 50,000 |
| | Control House | | | | 50,000 | | | | 50,000 |
| | 0.000 Labor hours | | | | | | | | |
| Equipment Additions | | | | | | | | | |
| G4010.1056 | Substation Circuit Breaker: 2, CBs, 34.5kV, 1200A, Vacuum, 3114/3148 | | 18,624 | | 16,506 | | 60 | | 35,191 |
| G4010.1060 | Substation Transformer: 1, TX88 XFMR Installation, 115-34kV, 62.5MVA | | 37,998 | | 48,822 | 25,000 | 1,165 | | 112,986 |
| G4010.1060 | | | 111,307 | | | | | | 111,307 |
| | Equipment Additions | | 167,929 | | 65,328 | 25,000 | 1,226 | | 259,483 |
| | 2,471.423 Labor hours | | | | | | | | |
| | 32.174 Equipment hours | | | | | | | | |
| Equipment Removals | | | | | | | | | |
| G4010.1050 | Substation Disconnect Switch: 2, LA1110/LA1150 Switch Removal | | 18,148 | | | | 882 | | 19,030 |
| G4010.1056 | Substation Circuit Breaker: 2, CB Removal, 34.5kV, 1200A, Oil, 3114/3149 | | 23,061 | | | | 60 | | 23,122 |
| G4010.1060 | Substation Transformer: 1, TB88 XFMR Removal, 115-34kV, 12/16/20 MVA | | 38,938 | | | | 160 | | 39,098 |
| | Equipment Removals | | 80,147 | | | | 1,103 | | 81,250 |
| | 1,153.631 Labor hours | | | | | | | | |
| | 42.183 Equipment hours | | | | | | | | |
| Site Development | | | | | | | | | |
| G4010.1010 | Site Development: Site Development, Expansion | | 10,574 | | 6,073 | | 617 | | 17,264 |
| G4010.1010 | | | 1,016 | | 7,527 | | | | 8,543 |
| | Site Development | | 11,589 | | 13,600 | | 617 | | 25,807 |
| | 169.914 Labor hours | | | | | | | | |
| | 17.191 Equipment hours | | | | | | | | |

Standard Estimate Report
Pemigewasset Upgrade

| Description | Quantity | Labor | | Material | | Subcontract | Equipment | Other | Total |
|----------------------------|--|-----------|----------------|-----------|------------------|---------------|--------------|----------|------------------|
| | | Unit Cost | Amount | Unit Cost | Amount | Amount | Amount | Amount | Amount |
| Contracted | | | 260,713 | | 135,362 | 25,000 | 2,951 | 0 | 424,027 |
| 3,809.37 | Labor hours | | | | | | | | |
| 97.31 | Equipment hours | | | | | | | | |
| ES Procurement | | | | | | | | | |
| Equipment Additions | | | | | | | | | |
| G4010.1030 | Metering, Protection and Controls: Protection and Controls Equipment | | | | 550,000 | | | | 550,000 |
| G4010.1056 | Substation Circuit Breaker: 2, CBs, 34.5kV, 1200A, Vacuum, 3114/3148 | | | | 32,240 | | | | 32,240 |
| G4010.1060 | Substation Transformer: 1, TX88 XFMR Installation, 115-34kV, 62.5MVA | | | | 858,940 | | | | 858,940 |
| Equipment Additions | | | | | 1,441,180 | | | | 1,441,180 |
| 1,529.000 | Labor hours | | | | | | | | |
| ES Procurement | | | 0 | | 1,441,180 | 0 | 0 | 0 | 1,441,180 |
| 1,529.000 | Labor hours | | | | | | | | |

Standard Estimate Report
Pemigewasset Upgrade

Estimate Totals

| Description | Amount | Totals | Hours | Rate | Cost Basis | Cost per Unit | Percent of Total |
|--------------------------------------|------------------|----------------------|---------------|----------|------------|---------------|----------------------|
| Labor | 260,713 | | 5,338.369 hrs | | | | 6.42% |
| Material | 1,576,542 | | | | | | 38.80% |
| Subcontract | 25,000 | | | | | | 0.62% |
| Equipment | 2,951 | | 97.308 hrs | | | | 0.07% |
| Other | | | | | | | |
| Subtotal (Before Overheads) | 1,865,206 | 1,865,206 USD | | | | | 45.91 45.91% |
| Contracted Labor Overhead | 130,357 | | | 50.000 % | C | | 3.21% |
| Contracted Material Overhead | 144,118 | | | 10.000 % | C | | 3.55% |
| Equipment Overhead | 295 | | | 10.000 % | C | | 0.01% |
| Temp. Construction Mobile XFMR | 50,000 | | | | L | | 1.23% |
| Profit | 328,496 | | | 15.000 % | T | | 8.09% |
| Contracted Overhead Subtotal | 653,266 | 2,518,472 USD | | | | | 16.08 61.99% |
| Substation Engineering | 137,280 | | | | L | | 3.38% |
| P&C Engineering | 304,735 | | | | L | | 7.50% |
| Testing & Commissioning | 96,000 | | | | L | | 2.36% |
| Sound Study | 25,000 | | | | L | | 0.62% |
| Thermal Limits Study | 6,000 | | | | L | | 0.15% |
| Engineering Subtotal | 569,015 | 3,087,487 USD | | | | | 14.00 75.99% |
| Supplemental Design Eng. | 53,802 | | | | L | | 1.32% |
| Supplemental Construction Eng. | 26,900 | | | | L | | 0.66% |
| ES Supplemental Eng. Subtotal | 80,702 | 3,168,189 USD | | | | | 1.99 77.98% |
| ES Material Overhead | 201,765 | | | 14.000 % | C | | 4.97% |
| AS&E | 7,920 | | | 0.250 % | T | | 0.19% |
| E&S | 5,380 | | | | L | | 0.13% |
| ES Overhead Subtotal | 215,065 | 3,383,254 USD | | | | | 5.29 83.27% |
| Project Management | 338,326 | | | 10.000 % | T | | 8.33% |
| Risk Allocation | 338,326 | | | 10.000 % | T | | 8.33% |
| AFUDC | 3,045 | | | 0.090 % | T | | 0.07% |
| Global Overhead Subtotal | 679,697 | 4,062,951 USD | | | | | 16.73 100.00% |
| Total | | 4,062,951 USD | | | | | |



Supplement Request Form

Approved by EPAC Chairmen external to meeting on 04/05/2021

[Link to 04/14/2021 EPAC Meeting Minutes](#)

| | |
|--|--|
| Date Prepared: 1/22/2021 | Project Title: Replace Pemigewasset Transformer |
| Company/Companies: Eversource NH | Project ID Number: A18N05 (D) Work Order Number: TSNN2014 (T) |
| Organization: NH Project Management | Plant Class/ (F.P. Type): Distribution S/S; Transmission S/S |
| Project Initiator: Robert Mission | Project Type: Specific |
| Project Manager: Walter Quinn | Capital Investment Part of Original Operating Plan? Yes |
| Project Sponsor: Digaunto Chatterjee | O&M Expenses Part of the Original Operating Plan? N/A |
| Current Authorized Amount: D- \$4,063K/T- \$0 | Estimated in service date(s): December 31, 2020 |
| Supplement Request: D-\$3,666K/T-\$89K | Other: |
| Total Request: D-\$7,729K/T-\$89K | |

Supplement Justification

Scope of Work

The Pemigewasset Transformer project proposes to replace the existing 20 MVA transformer with a 62.5 MVA transformer per the original scope and budget as well as replace the two (2) 34.5kV oil circuit breakers (OCBs) with vacuum circuit breakers (VCBs). New control panels will be installed in the newly expanded control house. The control house will contain the new protection and control equipment, HMI cabinet, RTU extension cabinet, and battery bank. Also, Webster A111 required a transfer trip scheme to be installed, which is a transmission asset, requiring a transmission project which was not part of the original authorization.

Background

This project received full funding approval for \$4,063K in PowerPlan on March 7, 2018. This supplement requests an additional \$3,755K for a revised project total of \$7,818K.

Several items contribute to this additional funding request:

- Expansion of the control house which was determined to have insufficient space for the necessary equipment additions.
 - The original field team agreed with the no expansion design. A new CR was assigned and after a subsequent field review with the conceptual design drawings, determined that a control house expansion was necessary for the reasons listed below in this document.

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- Testing & Commissioning contracts higher than budget
- Aborted energization for the transformer due to Synch Scope voltage issue (this was a design error by the engineering contractor)
- Internal support services higher than estimated
 - Additional support for all disciplines for control house addition
 - Additional work with Engineering Contractor on layout of equipment in control house addition.
 - 70% P&C package was rejected due to being incomplete, requiring additional time.
 - When the revised 70% package was submitted, P&C did not have internal resources available to review and obtained outside resources to complete the review to maintain schedule which added cost.
- Installation of animal protection equipment
- Increase in indirect costs

The original scope did not include the control house expansion or the addition of animal protection

The decision to expand the control house was made in May of 2019 after it was determined that the original layout's remove and replace sequence would cause unacceptable reliability risk.

Several benefits will be realized by expanding the control house:

- Safety during construction
- Safety during operation: elimination of human performance traps due to cabinets being placed in random locations
- Addition of much needed air conditioning system to cool the new solid-state equipment (ten cabinets)
- After removals, some of the existing control house space will be available for future additions.

The need for supplemental funding to cover the Control House addition was noted at each monthly Work Plan meetings from July 2019 on through April 2020. It was discussed that once the prime electrical contractor was selected, a fully informed estimate could be developed and presented to EPAC, which would include the control house expansion.

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The A111 tripping relay at Webster could not detect all transformer faults. To ensure that the Webster A111 terminal trips for all transformer faults coincident with circuit switcher failure, a transfer trip scheme needed to be installed. This requirement was known but not budgeted separately to a Transmission work order.

Subsequent to this project approval, a program to install animal protection at NH substations was approved. That scope has been incorporated into this funding request. In retrospect, a separate funding program release should have been requested for Pemigewasset substation.

During the energization of the Transformer, as the team was in the middle of voltage checks, an incorrect voltage on the synch scope was encountered which required a fix to the design costing several weeks and additional project impact costs. The lost time also pushed the ISD from 15 December to 31 December 2020.

Indirect costs were not properly incorporated in the previous authorization. The estimate which this authorization was based on was prepared by a consultant and did not properly account for Eversource overheads.

Project Status

Through the end of December 2020, the project has invested \$7,514K. Work performed to date includes: engineering, material procurement, control house expansion, electrical construction and associated indirects. The project in-service date has been extended from June 1, 2019 to December 31, 2020 due to budget constraints, outage availability, storm delays and late breaking design issues. The Project reached In-Service December 31, 2020. Some additional rework remains to remove a redundant switch on the new transformer, which is not needed in the protection system. P&C Engineering wants the switch removed to avoid confusion and to clean-up drawings.



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Supplement Request Form

Supplemental Cost Breakdown

The table below provides an overview of the line item categories from the initial authorization and the updated project estimate.

Summary Distribution & Transmission

| | Previously authorized | Current Project Forecast | Delta (request amt) |
|-----------------------|------------------------------|---------------------------------|----------------------------|
| Internal labor | \$110 | \$693 | \$583 |
| Engineering/PSM | \$907 | \$664 | (\$243) |
| Construction/Removal | \$653 | \$1,042 | \$389 |
| Material | \$1,576 | \$2,022 | \$446 |
| Testing | \$261 | \$897 | \$636 |
| Contingency | \$338 | \$15 | (\$323) |
| Other | \$0 | \$172 | \$172 |
| Subtotal Direct Costs | \$3,845 | \$5,505 | \$1,660 |
| Indirects | \$215 | \$2,053 | \$1,838 |
| AFUDC | \$3 | \$260 | \$257 |
| Total | \$4,063 | \$7,818 | \$3,755 |



APS 1 - Project Authorization Policy

Supplement Request Form

A18N05 Pemigewasset Transformer

| | Previously authorized | Current Project Forecast | Delta (request amt) |
|-----------------------|-----------------------|--------------------------|---------------------|
| Internal labor | \$110 | \$675 | \$565 |
| Engineering/PSM | \$907 | \$664 | (\$243) |
| Construction/Removal | \$653 | \$1,041 | \$388 |
| Material | \$1,576 | \$1,990 | \$414 |
| Testing | \$261 | \$895 | \$634 |
| Contingency | \$338 | \$10 | (\$328) |
| Other | \$0 | \$172 | \$172 |
| Subtotal Direct Costs | \$3,845 | \$5,447 | \$1,602 |
| Indirects | \$215 | \$2,024 | \$1,809 |
| AFUDC | \$3 | \$258 | \$255 |
| Total | \$4,063 | \$7,729 | \$3,666 |

TSNN2014 Webster A111 Transfer Trip

| | Previously authorized | Current Project Forecast | Delta (request amt) |
|-----------------------|-----------------------|--------------------------|---------------------|
| Internal labor | \$0 | \$18 | \$18 |
| Engineering/PSM | \$0 | \$0 | \$0 |
| Construction/Removal | \$0 | \$1 | \$1 |
| Material | \$0 | \$32 | \$32 |
| Testing | \$0 | \$2 | \$2 |
| Contingency | \$0 | \$5 | \$5 |
| Other | \$0 | \$0 | \$0 |
| Subtotal Direct Costs | \$0 | \$58 | \$58 |
| Indirects | \$0 | \$29 | \$29 |
| AFUDC | \$0 | \$2 | \$2 |
| Total | \$0 | \$89 | \$89 |



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Supplement Request Form

Justification for Additional Resources

Supplemental funds of \$3,755K are required for the following scope changes and items that were underestimated in the original Project Authorization Form (PAF) as follows:

Internal Labor - \$583K

- Internal labor costs increased due to Internal staffing not originally budgeted for this level of support; Internal Engineering support higher than estimated and Internal line and station construction services associated with installing the mobile transformer and dressing out the new transformer were higher than anticipated as well as overall Area Work Center support to complete the project. Additional costs were required by Eversource Engineering, Electrical Maintenance, Transformer Testing when the energization of the new transformer had to be aborted at the last minute due to incorrect voltage connections on the Synch Scope.

OS Engineering/PSM – (\$243K)

- Costs for Project Management & Support were estimated at \$338K. The actuals have run considerably less at \$145K for a savings of \$193K. The Engineering was estimated at \$569K and the actuals are \$519K for additional savings of \$50K.

Construction / Removal – \$389K

- The major cost driver for the additional investment of \$389K was the Control House addition:
 - Control House weather tight shell – increase of \$115K
 - The prime electrical estimate was originally budgeted at \$395K and when the Control House additional scope was included, the contract purchase order was increased to \$643K. This increase is attributed to the control house electrical, lights, HVAC, interior grounding, cable tray and animal protection. – increase of \$248K and additional testing support of \$26K.

Materials – \$446K

- The new pad-mount transformer is a 300kVA unit. This is not a standard size and the cost was greater than originally estimated. (Additional cost - \$187K)
- Eversource requested to add animal protection into the design, which was not included in the original scope.
- Additional budget is required for temporary materials for rerouting the 34.5kV lines around the existing 34.5 bus to provide continuity during breaker replacements, which was not identified at the time of the original estimate.



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- Additional materials driven primarily by the control house addition, i.e., cable trays, HVAC system, cable trench, wiring/conductor for control house fit out.

Testing - \$636K

- Testing and Commissioning were originally underestimated. Contractor proposals have been received to support the current forecast for these services. There is also additional budget associated with the control house expansion, extended schedule and the completion of the testing for the aborted Transformer energization.

Contingency - (\$323K)

- Contingency was used to partially off-set overages in materials, construction and testing, as well as to address Smart Grid.

Other - \$172K

- Due to property tax that was not accounted for in the original estimate.

Indirect - \$1,838K

- Increased direct costs coupled with proper allocation of overhead rates to the original direct costs have increased the indirect costs by \$1,838K since the original estimate,

AFUDC - \$257K

- AFUDC was underestimated in original estimate. Extended in-service date coupled with overhead rate changes have increased the AFUDC by \$257K.

See attached original authorization documentation.



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Supplement Request Form

Supplement Cost Summary

Note: Dollar values are in thousands:

| | Prior Authorized | Supplement Request | Total |
|------------------------------|------------------|--------------------|----------------|
| Capital Additions - Direct | \$3,845 | \$1,660 | \$5,505 |
| Less Customer Contribution | \$0 | \$0 | \$0 |
| Removals Net of Salvage % | \$0 | \$0 | \$0 |
| Total Direct Spending | \$3,845 | \$1,660 | \$5,505 |
| Capital Additions - Indirect | \$215 | \$1,838 | \$2,053 |
| AFUDC | \$3 | \$257 | \$260 |
| Total Capital Request | \$4,063 | \$3,755 | \$7,818 |
| O&M | \$0 | \$0 | \$0 |
| Total Request | \$4,063 | \$3,755 | \$7,818 |

Total Supplement Request by Year View

Note: Dollar values are in thousands:

| | 2019 | 2020+ | Total |
|------------------------------|------------|----------------|----------------|
| Capital Additions Direct | \$0 | \$1,660 | \$1,660 |
| Less Customer Contribution | \$0 | \$0 | \$0 |
| Removals Net of Salvage | \$0 | \$0 | \$0 |
| Total Direct Spending | \$0 | \$1,660 | \$1,660 |
| Capital Additions - Indirect | \$0 | \$1,838 | \$1,838 |
| AFUDC | \$0 | \$257 | \$257 |
| Subtotal Request | \$0 | \$3,755 | \$3,755 |
| O&M | \$0 | \$0 | \$0 |
| Total Request | \$0 | \$3,755 | \$3,755 |



APS 1 - Project Authorization Policy

Supplement Request Form

Supplement Cost - Pemi S/S Transformer – A18N05

Note: Dollar values are in thousands:

| | Prior Authorized | Supplement Request | Total |
|------------------------------|------------------|--------------------|----------------|
| Capital Additions - Direct | \$3,845 | \$1,602 | \$5,447 |
| Less Customer Contribution | \$0 | \$0 | \$0 |
| Removals Net of Salvage % | \$0 | \$0 | \$0 |
| Total Direct Spending | \$3,845 | \$1,602 | \$5,447 |
| Capital Additions - Indirect | \$215 | \$1,809 | \$2,024 |
| AFUDC | \$3 | \$255 | \$258 |
| Total Capital Request | \$4,063 | \$3,666 | \$7,729 |
| O&M | \$0 | \$0 | \$0 |
| Total Request | \$4,063 | \$3,666 | \$7,729 |

Total Supplement Request by Year View

Note: Dollar values are in thousands:

| | 2019 | 2020+ | Total |
|------------------------------|------------|----------------|----------------|
| Capital Additions Direct | \$0 | \$1,602 | \$1,602 |
| Less Customer Contribution | \$0 | \$0 | \$0 |
| Removals Net of Salvage | \$0 | \$0 | \$0 |
| Total Direct Spending | \$0 | \$1,602 | \$1,602 |
| Capital Additions - Indirect | \$0 | \$1,809 | \$1,809 |
| AFUDC | \$0 | \$255 | \$255 |
| Subtotal Request | \$0 | \$3,666 | \$3,666 |
| O&M | \$0 | \$0 | \$0 |
| Total Request | \$0 | \$3,666 | \$3,666 |



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Supplement Request Form

Supplement Cost – Webster Transfer Trip – TSN2014

Note: Dollar values are in thousands:

| | Prior Authorized | Supplement Request | Total |
|------------------------------|------------------|--------------------|-------|
| Capital Additions - Direct | \$0 | \$58 | \$58 |
| Less Customer Contribution | \$0 | \$0 | \$0 |
| Removals Net of Salvage % | \$0 | \$0 | \$0 |
| Total Direct Spending | \$0 | \$58 | \$58 |
| Capital Additions - Indirect | \$0 | \$29 | \$29 |
| AFUDC | \$0 | \$2 | \$2 |
| Total Capital Request | \$0 | \$89 | \$89 |
| O&M | \$0 | \$0 | \$0 |
| Total Request | \$0 | \$89 | \$89 |

Total Supplement Request by Year View

Note: Dollar values are in thousands:

| | 2019 | 2020+ | Total |
|------------------------------|------|-------|-------|
| Capital Additions Direct | \$0 | \$58 | \$58 |
| Less Customer Contribution | \$0 | \$0 | \$0 |
| Removals Net of Salvage | \$0 | \$0 | \$0 |
| Total Direct Spending | \$0 | \$58 | \$58 |
| Capital Additions - Indirect | \$0 | \$29 | \$29 |
| AFUDC | \$0 | \$2 | \$2 |
| Subtotal Request | \$0 | \$89 | \$89 |
| O&M | \$0 | \$0 | \$0 |
| Total Request | \$0 | \$89 | \$89 |



Operations Project Authorization Form

Approved at February 14, 2018 EPAC

[Link to Meeting Minutes](#)

| | |
|---|---|
| Date Prepared: 1/23/18 | Project Title: Replace Pemigewasset Transformer |
| Company/ies: Eversource NH | Project ID Number: A18N05 |
| Organization: NH Operations | Class(es) of Plant: Distribution Substation |
| Project Initiator: Robert Mission | Project Category: Peak Load Capacity - Substation |
| Project Manager: Russel Johnson | Project Type: Specific |
| Project Sponsor: George Wegh | Project Purpose: Upgrade overloaded transformer |
| Estimated in service date: June 1, 2019 | If Transmission Project: PTF? n/a |
| Eng. /Constr. Resources Budgeted? Yes | Capital Investment Part of Original Operating Plan? Yes |
| Authorization Type: Full Funding | O&M Expenses Part of the Original Operating Plan? N/A |
| Total Request: \$4,063,000 | |

Financial Requirements:

Project Authorization

ERM: _____

FP&A: _____

Executive Summary

This project is requesting full funding of \$4,063,000 to:

- Replace the existing 115-34.5 kV, 20 MVA Pemigewasset substation transformer (TB88) with a company standard 62.5 MVA transformer,
- Replace 2 (34.5 kV) line oil circuit breakers with vacuum circuit breakers on the 3114X and 3149 lines.
- Upgrade the protective relaying associated with the transformer and breakers being replaced.

The work to be performed consists of final engineering, site work, material purchasing and construction necessary to remove and replace the existing substation transformer.

The NH 2018 load forecast shows that the Pemigewasset Substation transformer (TB88) is overloaded during heavy load periods under normal operating conditions. The size of the existing Pemigewasset transformer also limits customer restoration capabilities for loss of transformers at adjacent substations. Replacing the existing Pemigewasset Substation transformer with a larger unit will resolve the normal (N-0) overload and provide additional transformer capacity so that all customers can be restored for loss of transformers (N-1) at adjacent substations (Ashland or Laconia).

EVERSOURCE
 Project Authorization Form

Project Costs Summary

| | Prior Authorized | 2018 | 2019 | 20_+ 20 | Totals |
|------------------------------|---------------------|----------|----------|------------|----------|
| Capital Additions - Direct | \$ - | \$ 1,797 | \$ 2,048 | \$ - | \$ 3,845 |
| Less Customer Contribution | - | - | - | - | - |
| Removals net of Salvage % | - | - | - | - | - |
| Total - Direct Spending | \$ - | \$ 1,797 | \$ 2,048 | \$ - | \$ 3,845 |
| Capital Additions - Indirect | - | 100 | 115 | - | 215 |
| Subtotal Request | \$ - | \$ 1,897 | \$ 2,163 | \$ - | \$ 4,060 |
| AFUDC | - | 1 | 2 | - | 3 |
| Total Capital Request | \$ - | \$ 1,898 | \$ 2,165 | \$ - | \$ 4,063 |
| O&M | - | - | - | - | - |
| Total Request | \$ - | \$ 1,898 | \$ 2,165 | \$ - | \$ 4,063 |

Financial Evaluation

Note: Dollar values are in thousands

| Direct Capital Costs | 2018 | 2019 | 2020+ | Total |
|---|-------|-------|-------|-------|
| Straight Time Labor | 60 | 50 | | 110 |
| Overtime Labor | | | | |
| Outside Services | 1,011 | 810 | | 1,821 |
| Materials | 576 | 1,000 | | 1,576 |
| Other, including contingency amounts (describe) | 150 | 188 | | 338 |
| Total | 1,797 | 2,048 | | 3,845 |

| Indirect Capital Costs | Year 1 | Year 2 | Year 3+ | Total |
|--|--------|--------|---------|-------|
| Indirects/Overheads (including benefits) | 100 | 115 | | 215 |
| Capitalized interest or AFUDC, if any | 1 | 2 | | 3 |
| Total | 101 | 117 | | 218 |

| | | | | |
|---------------------|-------|-------|--|-------|
| Total Capital Costs | 1,898 | 2,165 | | 4,063 |
|---------------------|-------|-------|--|-------|

| | | | | |
|----------------------------------|--|--|--|--|
| Less Total Customer Contribution | | | | |
|----------------------------------|--|--|--|--|

| | | | | |
|------------------------------------|--------------|--------------|--|--------------|
| Total Capital Project Costs | 1,898 | 2,165 | | 4,063 |
|------------------------------------|--------------|--------------|--|--------------|

| | | | | |
|------------------------------------|--|--|--|--|
| Total O&M Project Costs | | | | |
|------------------------------------|--|--|--|--|

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 Project Authorization Form

\$338K of Contingency/Risk Allocation includes:

1. SS site expansion \$248K
2. Soil disposal/trucking 60 tons \$60K
3. Mobile SS installation \$30K

Future Financial Impacts:

Provide below the estimated future costs that will result from the project:

Note: Dollar values are in thousands:

| Future Costs | Year 20__ | Year 20__ | Year20__ | Year 20__+ | Total Future Project Costs |
|--------------|-------------|-------------|-------------|-------------|----------------------------|
| Capital | \$ - | \$ - | \$ - | \$ - | \$ - |
| O&M | - | - | - | - | - |
| Other | - | - | - | - | - |
| TOTAL | \$ - |

Describe the estimated future Capital, O&M and/or Other costs noted above:

Future costs for these structure installations will be limited to regular inspections and minor maintenance as necessary.

What functional area(s) will these future costs be funded in? NH Operations
A representative from the respective functional area is required to be included as a project approver.

If this is other than a Reliability Project, please complete the section below:

Provide below the estimated financial benefits that will result from the project:

Note: Dollar values are in thousands:

| Future Benefits | Year 20__ | Year 20__ | Year20__ | Year 20__+ | Total Future Project Benefits |
|-----------------|-------------|-------------|-------------|-------------|-------------------------------|
| Capital | \$ - | \$ - | \$ - | \$ - | \$ - |
| O&M | - | - | - | - | - |
| Other | - | - | - | - | - |
| TOTAL | \$ - |

Describe the estimated future Capital, O&M and/or Other benefits noted above:

What functional area(s) will these benefits be reflected in? NH Operations
A representative from the respective functional area is required to be included as a project approver.

Asset Retirement Obligation (ARO) and/ or Environmental Cleanup Costs (Environmental Liabilities):

Is there an ARO associated with this project? NO If yes, please provide details:

Are there other environmental cleanup costs associated with this project? If yes, please provide details:
 None Anticipated

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Project Authorization Form

Technical Justification:

Project Need Statement

The NH 2018 load forecast shows that the existing 115-34.5 kV, 20 MVA Pemigewasset Substation transformer (TB88) is overloaded (forecast load of 23 MVA) for heavy load periods under normal operating conditions. The size of the existing Pemigewasset transformer also limits customer restoration capabilities for loss of transformers at adjacent substations. Replacing the existing Pemigewasset Substation transformer with a larger unit will resolve the normal (N-0) overload and provide additional transformer capacity so that all customers can be restored for loss of transformers (N-1) at adjacent substations (Ashland or Laconia).

Replacing the Pemigewasset transformer with a larger unit will require an outage(s) of the 34 kV bus at the substation. The existing 34 kV equipment was surveyed to determine if other equipment should be replaced based upon its condition. Two 34 kV distribution line breakers (3114X and 3149) and their associated relaying were identified as equipment that should be addressed at this time. Both breakers are oil circuit breakers that are approximately 65 years old.

Project Objectives

Increase Pemigewasset Substation transformer capacity to be able to supply the summer peak load in the area. Increased transformation capacity will also be utilized to restore customers during contingent loss of the adjacent substation transformers.

Replacing aging circuit breakers and protection equipment will improve system performance during fault detection and isolation along with reducing maintenance and testing work.

Project Scope

Replace the existing 115-34.5 kV, 20 MVA transformer at Pemigewasset substation with the standard 62.5 MVA transformer. The existing 34.5 kV, 3114X & 3149 line Oil Circuit Breakers (OCBs) will be replaced with new Siemens SDV7 vacuum circuit breakers. The existing relaying for the new transformer and the new line circuit breakers will also be upgraded to current standard relay packages.

Background / Justification

The Pemigewasset substation has a single 20 MVA transformer. This substation supplies the load on the 3114X and 345 lines. The 10.5 MW Ayers Island hydro station is connected to the 3149 line. The substation supplies the 3114X and 345 circuit loads, totaling 23.0 MW. This loading level requires that load be transferred from Pemigewasset substation to Laconia substation during high load periods. The capacity of the Pemigewasset transformer is also limiting the ability to restore the load for a loss of the Ashland transformer or loss of the 338 line between Ashland and Straits Road. (see attached area One-Line)

Currently for a loss of the Ashland transformer, cascading switching is required:

- Step #1; The 3196 line can be restored from Beebe River by opening the 3196 breaker at Ashland and closing the normally open tie switch 3196J11.
- Step #2; The NHEC substation at Moultonborough can be fed from White Lake by opening switch 338J10 and closing switch 338J50.
- Step #3 (Cascaded switching step); To restore the Ashland Municipal load from Pemi, a portion of the 345 line load (8.7 MW) needs to be transferred from Pemi to Laconia by opening 345R2 at Straits Rd and closing switch 345J90
- Step #4; Restore Ashland Municipal load by opening both breaker 3380 at Ashland and switch 338J7 at Straits Rd and closing switch 338J1 at Straits Rd.

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Project Authorization Form

- After the four switching steps above, there would be 13.8 MW isolated at the NHEC substations at Meredith and Center Harbor. The ability to restore any additional load is limited by the existing Pemi transformer capacity.

Currently for loss of a transformer at Laconia, the remaining Laconia transformer is loaded above LTE. The existing Pemi transformer does not have any available capacity to pick up the 23 MW of customer load on the 368 line. The larger transformer at Pemi allows these customers to be restored. With the ability to transfer this load from Laconia to Pemi, this lowers the loading on the remaining Laconia transformer to below LTE.

A larger Pemigewasset transformer will allow the restoration of all customer load for the N-1 loss of the Ashland or Laconia transformers.

Business Process and / or Technical Improvements:

Eliminates the existing transformer overload during summer peak. Address concerns about reliability and removes the need to reconfigure the distribution system for summer heavy load conditions.

Alternatives Considered

Adding a second transformer at Pemigewasset was considered but found to be more expensive and impractical because of the substations hill top location. Factors considered include;

- Added costs of the 115 kV circuit switcher and expanding the 115 kV bus
- Added costs of the 34 kV transformer secondary breaker and expanding the 34 kV bus
- Added costs of control and protection work for the second transformer
- Extensive civil work needed to expand the existing hill top substation site.

Adding a second transformer at Ashland was considered however, the existing Ashland S/S is fed by a radial 115 kV tap from the E115 Line so that loss of the E115 line would result in loss of both Ashland transformers. Customer restoration would still be limited by the existing Pemigewasset transformer capacity. To resolve the N-0 loading issue at Pemigewasset load on the 345 line would need to be permanently transferred to Ashland.

Based upon the above, replacing the existing Pemigewasset Substation transformer with a larger unit is the preferred solution.

Project Schedule

| Milestone/Phase Name | Estimated Completion Date |
|---------------------------|---------------------------|
| Engineering (Start 3/18) | 12/18 |
| Construction (Start 9/18) | 6/19 |
| Material Procurement* | 3/19 |
| In-Service | 6/19 |
| | |

* Transformer procurement may be earlier if decision is to use a transformer initially ordered for a project that has been delayed.

Regulatory Approvals

None



Risks and Risk Mitigation Plans

Loading on Pemigewasset substation during construction requires that customers be transferred from Pemi to Laconia substation during the peak periods. Additionally, failure of the existing transformer may require that customers be transferred to Laconia and use of the 115-34.5 kV mobile to restore all customers.

Outage cancellation due to unplanned events on the system resulting in schedule delay and potential labor costs to remobilize.

1. Mitigation Plan – establish and manage outages using proven coordination teams such as
 - a. construction management
 - b. coordination meetings
 - c. outage planning meetings.

Internal and external resources available for engineering.

1. Effort is being exercised to balance engineering and review work between internal and external resources.

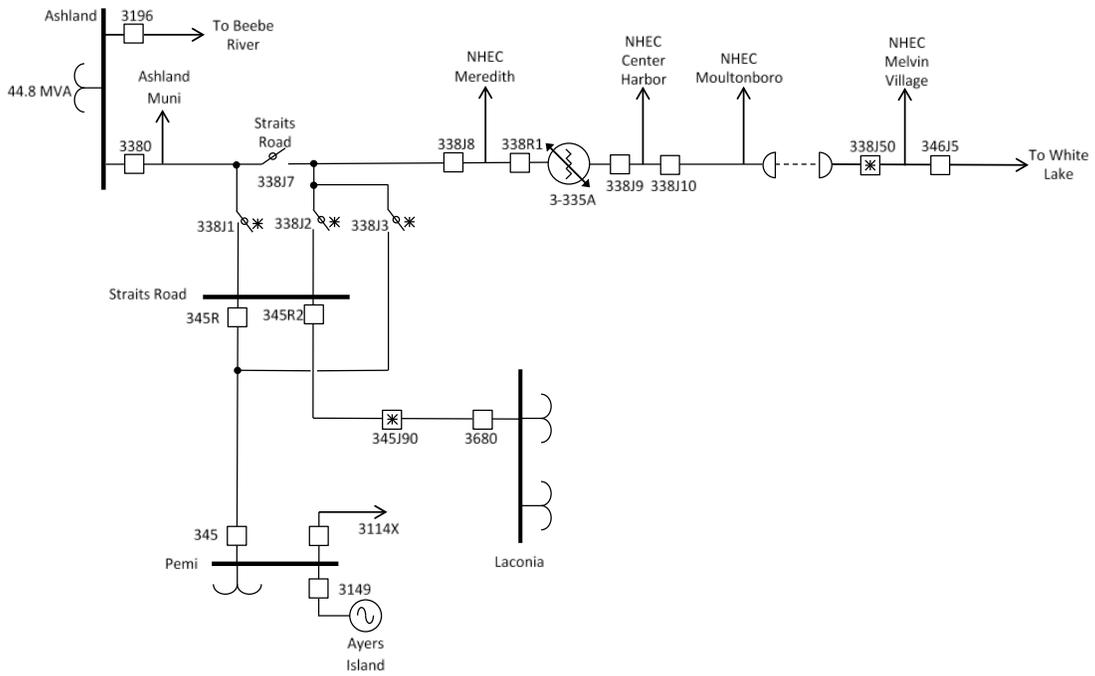
References

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Project Authorization Form

Attachments (One-Line Diagrams, Images, etc.)

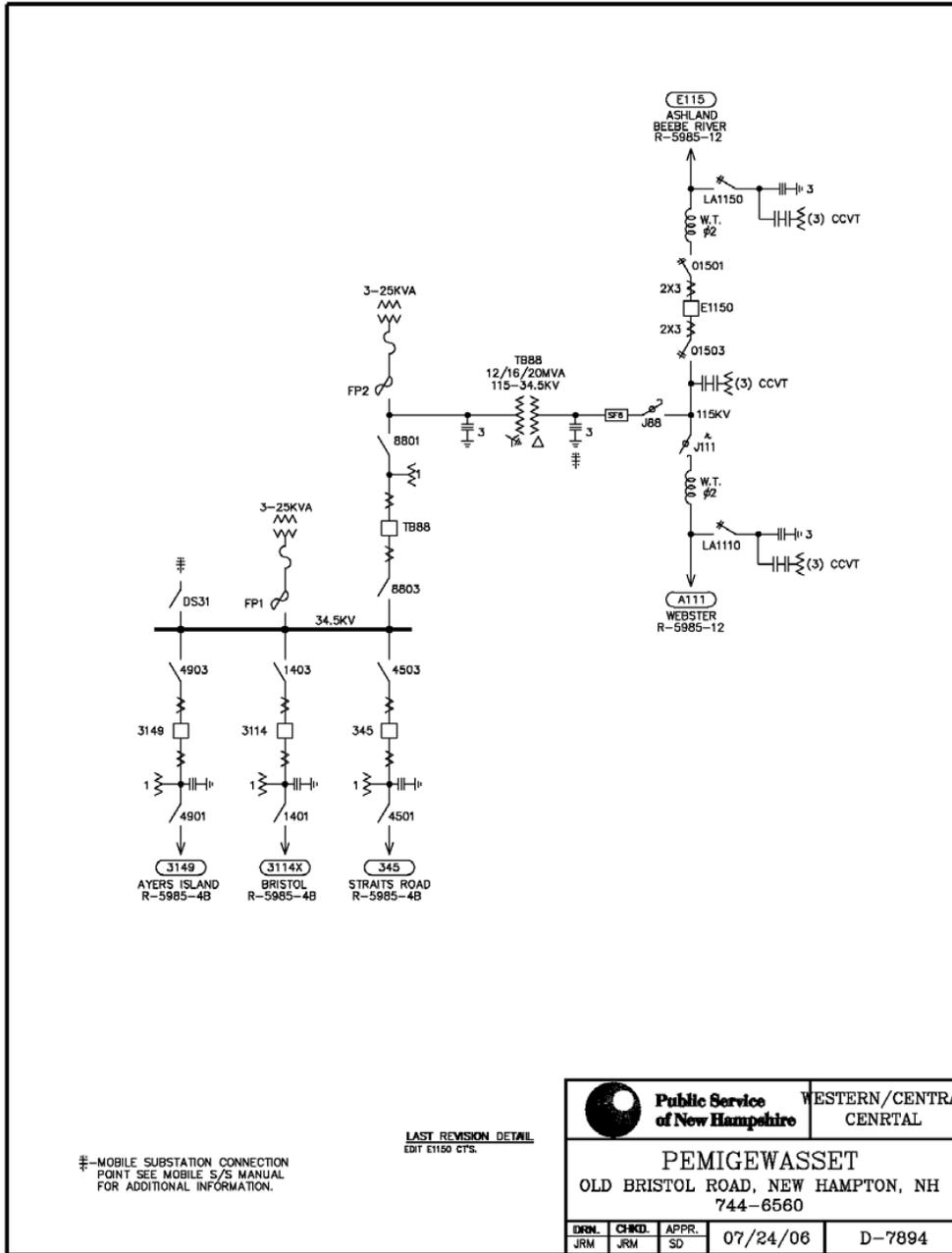
Pemigewasset / Ashland Area One-Line



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Project Authorization Form

Pemigewasset Substation One-Line Diagram





Project Checklist – Transmission and Substation

INSTRUCTIONS:

It is the responsibility of the initiator to contact the area disciplines to determine if the project considerations contained in this list are applicable to their project. They should fill out the checklist and determine a transition plan for the purpose of project execution.

| Checklist for Studies and Processes of a Transmission & Substation Capital Project | |
|---|---|
| Project Name : Replace Pemigewasset Transformer | PAF No: A18N05 |
| Facility Type: <input type="checkbox"/> BPS <input checked="" type="checkbox"/> BES <input checked="" type="checkbox"/> PTF <input type="checkbox"/> non-PTF <input type="checkbox"/> CIP <input checked="" type="checkbox"/> Distribution | |
| PLANNING | |
| Is a NX-9 required? | Yes _____ |
| Is an ISO-NE PAC presentation required? | No _____ |
| Is a PPA required? | Yes _____ |
| Is a TCA Application Required? | No _____ |
| PLANNING/PROTECTION & CONTROLS | |
| Are RAS/SPS/UVLs affected? | No _____ |
| OPERATIONS | |
| Outage Required? | <input checked="" type="checkbox"/> Primary Equipment (Power Transfer) <input type="checkbox"/> Secondary Equipment (P&C only) <input type="checkbox"/> Outage Not Required |
| Do SCLL Conditions Exist? | Yes _____ |
| Has an outage schedule been approved? | No _____ |
| Are Operations & Maintenance procedures/training required? | Yes _____ |
| STANDARDS | |
| Does the project include standard equipment and designs? | Yes _____ |
| SUBSTATION ENGINEERING | |
| Does this impact Revenue Metering | No _____ |
| Is preliminary short circuit/ breaker duty analysis required? | No _____ |
| Are there any changes to the baseline audible noise? | No _____ |
| Is there an impact to the existing ground grid? | Yes _____ |
| Is a Transient Over Voltage (TOV) analysis required? | No _____ |
| P&C ENGINEERING | |
| OP-22 - Are PMUs and DDR required? | No _____ |
| If BPS, is an NPCC Directory #4 presentation required? | No _____ |



| Checklist for Studies and Processes of a Transmission & Substation Capital Project | |
|---|-----------------------|
| Project Name : Replace Pemigewasset Transformer | PAF No: A18N05 |
| TRANSMISSION LINE ENGINEERING | |
| Are there any changes that affect the baseline EMF? | No _____ |
| Are there any changes that affect the baseline EMI? | No _____ |
| Is there an impact to the existing ground grid? | No _____ |
| SITING | |
| Is a Siting filing required? | No _____ |
| PERMITTING | |
| Is there any permitting required? | Yes _____ |
| Siting & Construction Services (Outreach) | |
| What is the level of outreach expected? | Low _____ |
| INITIATOR | |
| Has a field constructability review been completed? | Yes _____ |



Cost Estimate Backup Details

Standard Estimate Report
Pemigewasset Upgrade

Project name Pemigewasset Upgrade
731 Old Bristol Rd
New Hampton
NH 03256
USA

Labor rate table L-16-US40

Equipment rate table E-16-US

Report format Sorted by 'BidPkg/Bid Item/Model'
'Model' summary

Standard Estimate Report
Pemigewasset Upgrade

| Description | Quantity | Labor | | Material | | Subcontract | Equipment | Other | Total |
|----------------------------|---|-----------|----------------|-----------|---------------|---------------|--------------|-------|----------------|
| | | Unit Cost | Amount | Unit Cost | Amount | | | | |
| Contracted | | | | | | | | | |
| Bus Replacements | | | | | | | | | |
| G4010.1070 | Substation Outdoor Hard Bus & Shielding: Bus, Disconnect Switch Replacement | | 1,048 | | 1,632 | | 6 | | 2,686 |
| G4010.1070 | | | | | 4,801 | | | | 4,801 |
| | Bus Replacements | | 1,048 | | 6,433 | | 6 | | 7,487 |
| | 14.40 Labor hours | | | | | | | | |
| | 5.76 Equipment hours | | | | | | | | |
| Control House | | | | | | | | | |
| G4010.1070 | | | | | 50,000 | | | | 50,000 |
| | Control House | | | | 50,000 | | | | 50,000 |
| | 0.000 Labor hours | | | | | | | | |
| Equipment Additions | | | | | | | | | |
| G4010.1056 | Substation Circuit Breaker: 2, CBs, 34.5kV, 1200A, Vacuum, 3114/3148 | | 18,624 | | 16,506 | | 60 | | 35,191 |
| G4010.1060 | Substation Transformer: 1, TX88 XFMR Installation, 115-34kV, 62.5MVA | | 37,998 | | 48,822 | 25,000 | 1,165 | | 112,986 |
| G4010.1060 | | | 111,307 | | | | | | 111,307 |
| | Equipment Additions | | 167,929 | | 65,328 | 25,000 | 1,226 | | 259,483 |
| | 2,471.423 Labor hours | | | | | | | | |
| | 32.174 Equipment hours | | | | | | | | |
| Equipment Removals | | | | | | | | | |
| G4010.1050 | Substation Disconnect Switch: 2, LA1110/LA1150 Switch Removal | | 18,148 | | | | 882 | | 19,030 |
| G4010.1056 | Substation Circuit Breaker: 2, CB Removal, 34.5kV, 1200A, Oil, 3114/3149 | | 23,061 | | | | 60 | | 23,122 |
| G4010.1060 | Substation Transformer: 1, TB88 XFMR Removal, 115-34kV, 12/16/20 MVA | | 38,938 | | | | 160 | | 39,098 |
| | Equipment Removals | | 80,147 | | | | 1,103 | | 81,250 |
| | 1,153.631 Labor hours | | | | | | | | |
| | 42.183 Equipment hours | | | | | | | | |
| Site Development | | | | | | | | | |
| G4010.1010 | Site Development: Site Development, Expansion | | 10,574 | | 6,073 | | 617 | | 17,264 |
| G4010.1010 | | | 1,016 | | 7,527 | | | | 8,543 |
| | Site Development | | 11,589 | | 13,600 | | 617 | | 25,807 |
| | 169.914 Labor hours | | | | | | | | |
| | 17.191 Equipment hours | | | | | | | | |

Standard Estimate Report
Pemigewasset Upgrade

| Description | Quantity | Labor | | Material | | Subcontract | Equipment | Other | Total |
|----------------------------|--|-----------|----------------|-----------|------------------|---------------|--------------|----------|------------------|
| | | Unit Cost | Amount | Unit Cost | Amount | Amount | Amount | Amount | Amount |
| Contracted | | | 260,713 | | 135,362 | 25,000 | 2,951 | 0 | 424,027 |
| 3,809.37 | Labor hours | | | | | | | | |
| 97.31 | Equipment hours | | | | | | | | |
| ES Procurement | | | | | | | | | |
| Equipment Additions | | | | | | | | | |
| G4010.1030 | Metering, Protection and Controls: Protection and Controls Equipment | | | | 550,000 | | | | 550,000 |
| G4010.1056 | Substation Circuit Breaker: 2, CBs, 34.5kV, 1200A, Vacuum, 3114/3148 | | | | 32,240 | | | | 32,240 |
| G4010.1060 | Substation Transformer: 1, TX88 XFMR Installation, 115-34kV, 62.5MVA | | | | 858,940 | | | | 858,940 |
| Equipment Additions | | | | | 1,441,180 | | | | 1,441,180 |
| 1,529.000 | Labor hours | | | | | | | | |
| ES Procurement | | | 0 | | 1,441,180 | 0 | 0 | 0 | 1,441,180 |
| 1,529.000 | Labor hours | | | | | | | | |

Standard Estimate Report
Pemigewasset Upgrade

Estimate Totals

| Description | Amount | Totals | Hours | Rate | Cost Basis | Cost per Unit | Percent of Total |
|--------------------------------------|------------------|----------------------|---------------|----------|------------|---------------|----------------------|
| Labor | 260,713 | | 5,338.369 hrs | | | | 6.42% |
| Material | 1,576,542 | | | | | | 38.80% |
| Subcontract | 25,000 | | | | | | 0.62% |
| Equipment | 2,951 | | 97.308 hrs | | | | 0.07% |
| Other | | | | | | | |
| Subtotal (Before Overheads) | 1,865,206 | 1,865,206 USD | | | | | 45.91 45.91% |
| Contracted Labor Overhead | 130,357 | | | 50.000 % | C | | 3.21% |
| Contracted Material Overhead | 144,118 | | | 10.000 % | C | | 3.55% |
| Equipment Overhead | 295 | | | 10.000 % | C | | 0.01% |
| Temp. Construction Mobile XFMR | 50,000 | | | | L | | 1.23% |
| Profit | 328,496 | | | 15.000 % | T | | 8.09% |
| Contracted Overhead Subtotal | 653,266 | 2,518,472 USD | | | | | 16.08 61.99% |
| Substation Engineering | 137,280 | | | | L | | 3.38% |
| P&C Engineering | 304,735 | | | | L | | 7.50% |
| Testing & Commissioning | 96,000 | | | | L | | 2.36% |
| Sound Study | 25,000 | | | | L | | 0.62% |
| Thermal Limits Study | 6,000 | | | | L | | 0.15% |
| Engineering Subtotal | 569,015 | 3,087,487 USD | | | | | 14.00 75.99% |
| Supplemental Design Eng. | 53,802 | | | | L | | 1.32% |
| Supplemental Construction Eng. | 26,900 | | | | L | | 0.66% |
| ES Supplemental Eng. Subtotal | 80,702 | 3,168,189 USD | | | | | 1.99 77.98% |
| ES Material Overhead | 201,765 | | | 14.000 % | C | | 4.97% |
| AS&E | 7,920 | | | 0.250 % | T | | 0.19% |
| E&S | 5,380 | | | | L | | 0.13% |
| ES Overhead Subtotal | 215,065 | 3,383,254 USD | | | | | 5.29 83.27% |
| Project Management | 338,326 | | | 10.000 % | T | | 8.33% |
| Risk Allocation | 338,326 | | | 10.000 % | T | | 8.33% |
| AFUDC | 3,045 | | | 0.090 % | T | | 0.07% |
| Global Overhead Subtotal | 679,697 | 4,062,951 USD | | | | | 16.73 100.00% |
| Total | | 4,062,951 USD | | | | | |



80 N. Commercial Street, Manchester, NH 03101

Eversource Energy
P.O. Box 330
Manchester, NH 03105-0330
(603) 634-2261

Erica L. Menard
Manager, NH Revenue Requirements

E-Mail: ericar.menard@eversource.com

July 15, 2021

Brian D. Buckley
Staff Attorney
New Hampshire Public Utilities Commission
21 South Fruit Street, Suite 10
Concord, NH 03301-2429

RE: DE 19-057 Public Service Company of New Hampshire d/b/a Eversource Energy
Notice of Intent to File Rate Schedules

Dear Attorney Buckley:

Enclosed please find Public Service Company of New Hampshire d/b/a Eversource Energy's response to the data request asked at the July 14th technical session in the above-referenced docket.

A hard copy will not follow unless requested. If you have any questions, please do not hesitate to contact me. Thank you for your assistance with this matter.

Very truly yours,

A handwritten signature in black ink that reads "Erica L. Menard". The signature is written in a cursive, flowing style.

Erica L. Menard
Manager, NH Revenue Requirements

Enclosure
CC: Discovery Service List

Public Service of New Hampshire d/b/a Eversource Energy
Docket No. DE 19-057

Date Request Received: 07/14/2021

Date of Response: 07/15/2021

Request No. TS 5-001

Page 1 of 2

Request from: New Hampshire Public Utilities Commission Staff

Witness: David L. Plante

Request:

With respect to the Pemi Substation project (Bates page 25, Line 19) and the supplemental materials regarding that project provided in response to Staff 19-001, please explain the reasons for the significant increase in supplemental funding requested for this project in mid-2020 as compared with that described in the 1/22/2021 SRF.

Response:

Initially, Eversource notes that the supplemental request from mid-2020 was based primarily on the need to expand the control building at the site, which was not initially anticipated for this project. As that request was making its way through the Company's internal approval process it was held up and ultimately not approved because issues with the project were discovered in the testing phase as described below. Therefore, in looking at the relevant costs for this project, that request should be disregarded.

As to the later request and the cost changes that led to the final amount of additional funding needed, though much of the work on the substation was completed through the summer and into the fall of 2020, energizing of the new transformer was aborted in September of 2020 when it was determined by the project test engineer that the design and construction for the phase connections to the synch scope as provided by the engineering firm hired for this project, RLC, were incorrect. The need to correct those designs drove the need for additional internal engineering efforts to assess the problem, determine a path forward, and review the revised engineering. The revised engineering was performed by RLC at no additional cost to the project. This issue also led to additional construction, testing and commissioning costs, as well as project delay costs (overtime, schedule compression, etc.). While the additional engineering costs were covered by RLC, the additional construction, testing, and commissioning costs were not covered by the contract with RLC.

These increases in direct costs also had associated indirect cost impacts. Only once all those costs had become clear could the Company understand the total funding necessary to complete the project and complete the necessary SRF. That SRF was the one approved at the beginning of 2021.

As noted, while the mid-2020 SRF should be disregarded, the table below summarizes the variances from the halted June 2020 SRF and the approved April 2021 SRF.

| Line Item Category | June 2020 SRF (halted) | April 2021 SRF (approved) | Variance |
|--|---------------------------|------------------------------|------------|
| 1. Environmental Approvals / Permits | 16 | 19 | 4 |
| 2. Outreach | 8 | 9 | 1 |
| 3. Siting Approvals / Permits | 20 | 20 | 0 |
| 4. Engineering / Design | 828 | 856 | 28 |
| 5. Materials (Eversource purchased) | 1,289 | 1,316 | 27 |
| 6. Construction (incl mat'l's by contractors) | 1,774 | 2,151 | 377 |
| 7. Testing / Commissioning | 677 | 917 | 240 |
| 8. Project Mgmt Team | 32 | 64 | 32 |
| 9. Other | 9 | 50 | 41 |
| SUBTOTAL DIRECTS W/ RISKS | 4,652 | 5,402 | 749 |
| 13. Indirects/Overhead | 1,862 | 2,057 | 195 |
| 14. AFUDC | 303 | 260 | (43) |
| PROJECT TOTAL - BASELINE BUDGET | 2,165 | 2,317 | 152 |
| 15. Contingency | - | 10 | 10 |
| TOTAL CAPITAL REQUEST | 6,817 | 7,729 | 911 |
| 16. Reimbursable | - | - | - |
| PROJECT TOTAL (LESS REIMBURSEABLES) | 6,817 | 7,729 | 911 |



APS 1 - Project Authorization Policy

Appendix 4
Supplement Request Form

Supplement Request Form

| | |
|--|---|
| Date Prepared: December 14, 2020 | Project Title: 2020 Insurance Claim/Keep Costs Program |
| Company/Companies: Eversource NH | Project ID Number: INSOH9R (Overhead), INSUG9R (Underground), INSDB9R (Direct Buried) |
| Organization: NH Operations | Plant Class/(F.P.Type): Distribution |
| Project Initiator: Patrick Sullivan | Project Type: Specific Annual Program |
| Project Manager: Mark Sandler | Capital Investment Part of Original Operating Plan? Y |
| Project Sponsor: Mark Sandler | O&M Expenses Part of the Original Operating Plan? Y |
| Current Authorized Amount: \$1,789,000 | Estimated in service date(s): 12/31/2020 |
| Supplement Request: \$1,375,000 | Other: |
| Total Request: \$3,164,000 | |

Supplement Justification

Justification for Additional Resources

The Insurance Claim/Keep Costs program includes overhead (INSOH9R), underground (INSUG9R) and direct buried (INSDB9R) costs associated with work associated with trouble call property damage that is eligible for reimbursement (9A billing) but cannot be billed out within the program year. Each area work center has a separate project covering the insurance claim/keep costs projects in the individual work center

There was an increase in the number of jobs that needed to be written that were BIF (build it first) jobs that directly affect this project and its' costs. This year due to the effect of the COVID pandemic, internal processes were slowed and coupled with police department delays in returning police reports all contributed to delays in the billing process which was a factor to the increased spending for insurance claim and keep costs.

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Supplement Cost Summary

Note: Dollar values are in thousands:

| | Prior Authorized | Supplement Request | Total |
|-------------------------------|---------------------|-----------------------|-----------------|
| Capital Additions - Direct | \$ 688 | \$ 470 | \$ 1,158 |
| Less Customer Contribution | (1,189) | (1,003) | (2,192) |
| Removals net of Salvage ____% | 212 | 130 | 342 |
| Total Direct Spending | \$ (289) | \$ (403) | \$ (692) |
| Capital Additions - Indirect | 869 | 775 | 1,644 |
| AFUDC | 20 | - | 20 |
| Total Capital Request | \$ 600 | \$ 372 | \$ 972 |
| O&M | - | - | - |
| Total Request | \$ 600 | \$ 372 | \$ 972 |
| Gross | \$ 1,789 | \$ 1,375 | \$ 3,164 |

Note: Dollar values are in thousands:

Total Supplement Request by year view:

| | Year 2020 | Year 20__ | Year 20__+ | Total |
|-------------------------------|-----------------|-------------|-------------|-----------------|
| Capital Additions - Direct | \$ 470 | \$ - | \$ - | \$ 470 |
| Less Customer Contribution | (1,003) | - | - | (1,003) |
| Removals net of Salvage ____% | 130 | - | - | 130 |
| Total Direct Spending | \$ (403) | \$ - | \$ - | \$ (403) |
| Capital Additions - Indirect | 775 | - | - | 775 |
| AFUDC | - | - | - | - |
| Total Capital Request | \$ 372 | \$ - | \$ - | \$ 372 |
| O&M | - | - | - | - |
| Total Request | \$ 372 | \$ - | \$ - | \$ 372 |



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Operations Project Authorization Form

| | |
|--|--|
| Date Prepared: March 23, 2020 | Project Title: Insurance Claim/Keep Costs Program |
| Company/ies: Eversource NH | Project ID Number: INSOH9R (Overhead), INSUG9R (Underground), INSDB9R (Direct Buried) |
| Organization: NH Operations | Class(es) of Plant: Distribution |
| Project Initiator: Patrick Sullivan | Project Category: : Basic Business – Insurance Claim/Keep Costs |
| Project Manager: Mark Sandler | Project Type: Specific Annual Program |
| Project Sponsor: Joseph Purington | Project Purpose: Insurance Claim Work |
| Estimated in service date: 12/31/2020 | If Transmission Project: PTF? NA |
| Eng. /Constr. Resources Budgeted? Yes | Capital Investment Part of Original Operating Plan? Yes |
| Authorization Type: Full Funding | O&M Expenses Part of the Original Operating Plan? Yes |
| Total Request (Gross): \$1,789,000 | |

Financial Requirements:

Project Authorization

ERM: _____

FP&A: _____

Executive Summary

An approval of \$1,789,000 is requested for the 2020 Insurance Claim/Keep Costs program. This is before estimated contributions of \$1,189,000 (resulting from property damage billing) are credited to the project, resulting in a net budget impact of \$600,000.

The Insurance Claim/Keep Costs program includes overhead (INSOH9R), underground (INSUG9R) and direct buried (INSDB9R) costs associated with work associated with trouble call property damage that is eligible for reimbursement (9A billing),but can not be billed out within the program year. Each area work center will have a separate project covering the insurance claim/keep costs projects in the individual work center.



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Project Costs Summary

| | Prior Authorized | 2020 | 20__ | 20__+ | Totals |
|-------------------------------|---------------------|------------|------|-------|------------|
| Capital Additions - Direct | \$ - | \$ 688 | \$ - | \$ - | \$ 688 |
| Less Customer Contribution | - | \$ (1,189) | \$ - | \$ - | \$ (1,189) |
| Removals net of Salvage ____% | - | \$ 212 | \$ - | \$ - | \$ 212 |
| Total - Direct Spending | \$ - | \$ (289) | \$ - | \$ - | \$ (289) |
| Capital Additions - Indirect | - | \$ 869 | \$ - | \$ - | \$ 869 |
| Subtotal Request | \$ - | \$ 580 | \$ - | \$ - | \$ 580 |
| AFUDC | - | \$ 20 | \$ - | \$ - | \$ 20 |
| Total Capital Request | \$ - | \$ 600 | \$ - | \$ - | \$ 600 |
| O&M | - | \$ - | \$ - | \$ - | \$ - |
| Total Request | \$ - | \$ 600 | \$ - | \$ - | \$ 600 |

Financial Evaluation

Note: Dollar values are in thousands

| Direct Capital Costs | Year 1 | Year 2 | Year 3+ | Total |
|---|--------|--------|---------|-------|
| Straight Time Labor | \$266 | | | \$266 |
| Overtime Labor | \$316 | | | \$316 |
| Outside Services | \$154 | | | \$154 |
| Materials | \$164 | | | \$164 |
| Other, including contingency amounts (describe) | | | | |
| Total | \$900 | | | \$900 |

| Indirect Capital Costs | Year 1 | Year 2 | Year 3+ | Total |
|--|--------|--------|---------|-------|
| Indirects/Overheads (including benefits) | \$869 | | | \$869 |
| Capitalized interest or AFUDC, if any | \$20 | | | \$20 |
| Total | \$889 | | | \$889 |

| | | | | |
|---------------------|---------|--|--|---------|
| Total Capital Costs | \$1,789 | | | \$1,789 |
|---------------------|---------|--|--|---------|

| | | | | |
|----------------------------------|-----------|--|--|-----------|
| Less Total Customer Contribution | (\$1,189) | | | (\$1,189) |
|----------------------------------|-----------|--|--|-----------|

| | | | | |
|------------------------------------|-------|--|--|-------|
| Total Capital Project Costs | \$600 | | | \$600 |
|------------------------------------|-------|--|--|-------|

| | | | | |
|------------------------------------|--|--|--|--|
| Total O&M Project Costs | | | | |
|------------------------------------|--|--|--|--|

Note: Explain unique payment provisions, if applicable

Other:

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Future Financial Impacts:

Provide below the estimated future costs that will result from the project:

Note: Dollar values are in thousands:

| Future Costs | Year 20__ | Year 20__ | Year20__ | Year 20__ + | Total Future Project Costs |
|--------------|-------------|-------------|-------------|-------------|-------------------------------|
| Capital | \$ - | \$ - | \$ - | \$ - | \$ - |
| O&M | - | - | - | - | - |
| Other | - | - | - | - | - |
| TOTAL | \$ - |

Describe the estimated future Capital, O&M and/or Other costs noted above:

What functional area(s) will these future costs be funded in?

A representative from the respective functional area is required to be included as a project approver.

If this is other than a Reliability Project, please complete the section below:

Provide below the estimated financial benefits that will result from the project:

Note: Dollar values are in thousands:

| Future Benefits | Year 20__ | Year 20__ | Year20__ | Year 20__ + | Total Future Project Benefits |
|-----------------|-------------|-------------|-------------|-------------|----------------------------------|
| Capital | \$ - | \$ - | \$ - | \$ - | \$ - |
| O&M | - | - | - | - | - |
| Other | - | - | - | - | - |
| TOTAL | \$ - |

Describe the estimated future Capital, O&M and/or Other benefits noted above:

What functional area(s) will these benefits be reflected in?

A representative from the respective functional area is required to be included as a project approver.

Asset Retirement Obligation (ARO) and/ or Environmental Cleanup Costs (Environmental Liabilities):

Is there an ARO associated with this project? If yes, please provide details: NA



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Are there other environmental cleanup costs associated with this project? No.

Technical Justification

Project Need Statement

This project provides funding for a reimbursable property damage that can not be billed out within the program year.

Project Objectives

This project is intended to fund repairs to existing facilities requiring capital work as a result of actions caused by others.

Project Scope

This project addresses the portion of reimbursable property damage to Eversource's overhead, underground and direct buried assets that is not billed out in the program year. It includes all projects and work orders under the specific area work center project INSOH9x, INSUG9x, and INSDBx where x is the letter representing the area work center.

Background / Justification

This is a program that is funded each year to cover the costs associated with repairs to the Company's distribution system for which a reimbursement can not be processed within the program year.

Business Process and / or Technical Improvements:

Not applicable.

Alternatives Considered with Cost Estimates

Not applicable.

Project Schedule

| Milestone/Phase Name | Estimated Completion Date |
|---------------------------|---------------------------|
| Annual program completion | 12/31/2020 |
| | |

Regulatory Approvals

The construction budget is submitted to the New Hampshire Public Utilities Commission in accordance with Rule Puc 308.07 using Form E-22. Also on a quarterly basis projects not previously reported in the annual construction budget that have exceeded \$100,000 are reported to the New Hampshire Public Utilities Commission.

Risks and Risk Mitigation Plans

On a monthly basis, capital project spending is reviewed and any risks are identified and managed during that meeting.



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References

Not applicable.

Attachments (One-Line Diagrams, Images, etc.)

Not applicable.

Cost Estimate Backup Details

Annual project funding level was estimated using historical spending.

INS Projects Summary

2020 Year-to-Date Capital Spend (Col K., Line 38)

| Funding Project | Gross Amount | Reimbursement Credit | Net Amount |
|------------------------|---------------------|-----------------------------|-------------------|
| INSDB | \$ 418,638 | \$ (130,929) | \$ 287,708 |
| INSOH | \$ 2,675,720 | \$ (2,040,258) | \$ 635,462 |
| INSUG | \$ 11,944 | \$ (5,696) | \$ 6,248 |
| Total | \$ 3,106,301 | \$ (2,176,883) | \$ 929,418 |

Gross Amount: Includes all charges to FERC Accounts 107/106/101/108, excludes reimbursements

Reimbursement Credit: Includes all charges to FERC Accounts 107/106/101/108, reimbursements only

Net Amount: Includes all charges to FERC Accounts 107/106/101/108, including reimbursements

2020 Plant in Service (Col G., Line 38)

| Funding Project | 2020 Plant in Service |
|------------------------|------------------------------|
| INSDB | \$ 394,580 |
| INSOH | \$ 2,237,199 |
| INSUG | \$ 10,370 |
| Total | \$ 2,642,149 |

Plant in Service: All charges to FERC Accounts 106/101