EVERSOURCE

Project Approval Form

Project Title: [redacted] Islanded Substation	Project Number: CD01340
Date Prepared: 09/20/2023	**Company:** Eversource CT
Organization: Distribution Engineering	**Project Category:** ISLANDED SUBSTATION PROGRAM
Project Initiator: [redacted]	**Project Type:** Specific
Initiating Organization: Distribution	**Capital Investment part of original Op Plan:** Yes
Project Manager: [redacted]	**Emergency Related Request?** No
Project Sponsor: [redacted]	**Facility Type** (check all that apply)**:** ☐ PTF ☐ non-PTF ☒ Distribution ☐ N/A (General Plant)
Required in service date: 12/31/2023	
Total Capital Request: $529K	**Authorization Type:** Full Funding

1. Executive Summary

This project was established to address the [redacted]

- Approved Initial Funding Authorization: $329K at the 6/20/2019 CTPAC meeting.
- Requesting Full Funding authorization: $529K, a difference of $200K or 61% of the Initial Funding authorization.
- Project Location:
  - Division: Western
  - District: Waterbury AWC
  - Town: Middlebury

There is no change in scope. The variance is due to the following:

- $110K - Increased labor and material charges. The legacy estimating units used to produce the Initial Funding estimate are about 30% lower than the estimates used today, which were updated to reflect increased labor & material costs.
- $90K – Contractor Costs. This project was originally estimated to be constructed by internal labor. However, contract labor will be utilized for construction of this project.

2. Project Cost Summary

Note: Dollar values are in thousands.

Financial Evaluation ($000's)

Capital Costs	2020 Actual	2021 Actual	2022 Actual	2023 Actual	Total
Internal Labor and Construction Equipment	0.5	5.4	2.7	16.5	25.2
Outside Services	3.1	30.4	14.8	92.3	140.5
Materials	2.1	20.9	10.2	63.5	96.8
Removals	1.2	12.4	6.0	39.8	59.5
Risk and Contingency	0.0	0.0	0.0	10.4	10.4
Other	0.0	0.0	0.0	0.0	0.0
Subtotal	**7.0**	**69.1**	**33.7**	**222.5**	**332.3**

Indirect Capital Costs	2020 Actual	2021 Actual	2022 Actual	2023 Actual	Total
Indirects/Overheads (including benefits)	13.4	51.2	25.5	99.8	190.0
Capitalized interest or AFUDC, if any	0.4	0.8	2.6	2.9	6.7
Subtotal	**13.9**	**52.0**	**28.1**	**102.8**	**196.7**
Total Capital Costs (Gross)	**20.8**	**121.1**	**61.8**	**325.3**	**529.0**
Less Total Customer Contribution	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Project Costs (Net of Reimbursement)	**20.8**	**121.1**	**61.8**	**325.3**	**529.0**

3. Technical Justification

Background, Project Need/Justification, and Project Scope

a. Background

[redacted]

b. Project Need

[redacted]

c. Project Scope

The scope of this project is as follows:

[redacted]

4. Alternatives Considered

[redacted]

Project Option Comparison

Design Criteria	Option		
[redacted]			
Authorization Type	Full	Partial	Partial
Capital Cost	$529K	$396K	$248K
Expense Cost	$28K	$21K	$13K
Total Cost	$557K	$416K	$261K
Preferred option	X		

5. Project Schedule

Add any additional milestones that are pertinent to the project.

Milestone/Phase Name	Estimated Date
Initial Approval	6/20/2019
100% Detailed Engineering Completion	Completed
Fully Funded	9/28/23
In Service Date	12/31/2023

6. Regulatory Decisions

- N/A

7. Codes and Standards

- N/A

8. Risk and Contingencies

Risk Event	Risk Horizon	Likelihood of Occurrence	Risk Mitigation
Actual cost higher than estimated due to scope changes.	2023	Low	Included contingency costs in the funding request. Perform detailed Field Analysis and walk down in project development to avoid potential issues.
Customer Permission / Siting Council / Municipal approvals	2023	Low	Design to minimize customer impact. Project Preplanning and customer/community outreach.
Internal construction resources not available to perform the work.	2023	Low	Plan internal resources to perform the work. Use competitive bidding to ensure lowest outside labor cost.
Internal engineering resources not available to perform the work.	2022	Low	Plan internal resources to perform the work. Use competitive bidding to ensure lowest outside labor cost.
Materials Shortage or long lead times	2023	Medium	Pre-order long lead time material; minimize the use of non-standard and non-stocked material.
Storm delays	2023	Low	If storm activity delays work, we may be forced to use external resources.
System abnormal configuration	2023	Low	Schedule work to minimize system abnormal time. Install temporary bypasses/equipment if system will be abnormal for extended periods.
Technological risks involving integration of new technology	2023	Low	Before use of new technology ensure support of standards and manufacturer. Schedule project to

			accommodate for extra time or ensure new technology is not on the critical path.
Wetlands / Environmentally sensitive area	2023	Low	Use of mats and specialty equipment, only work during certain times of the year.

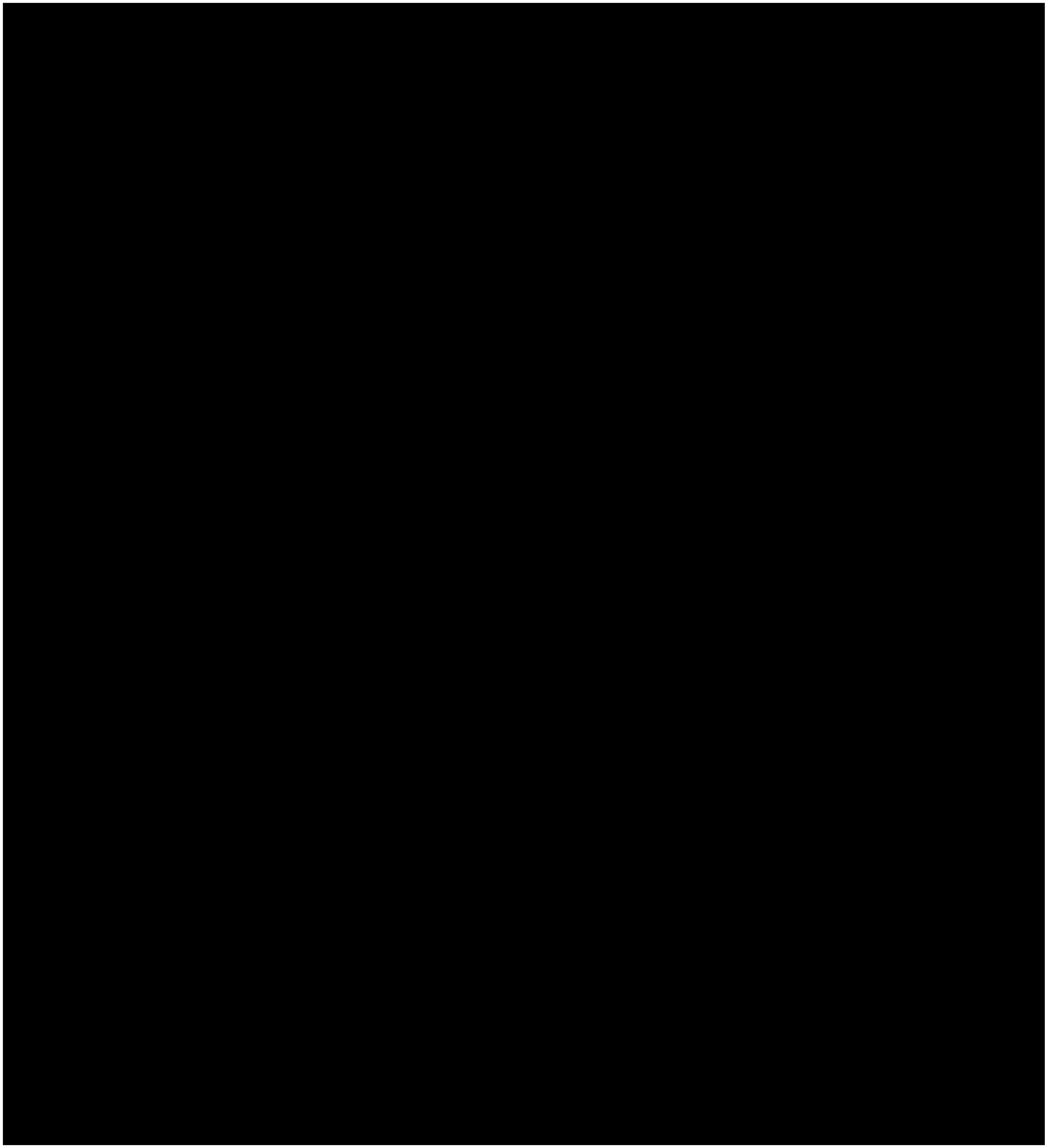
9. References

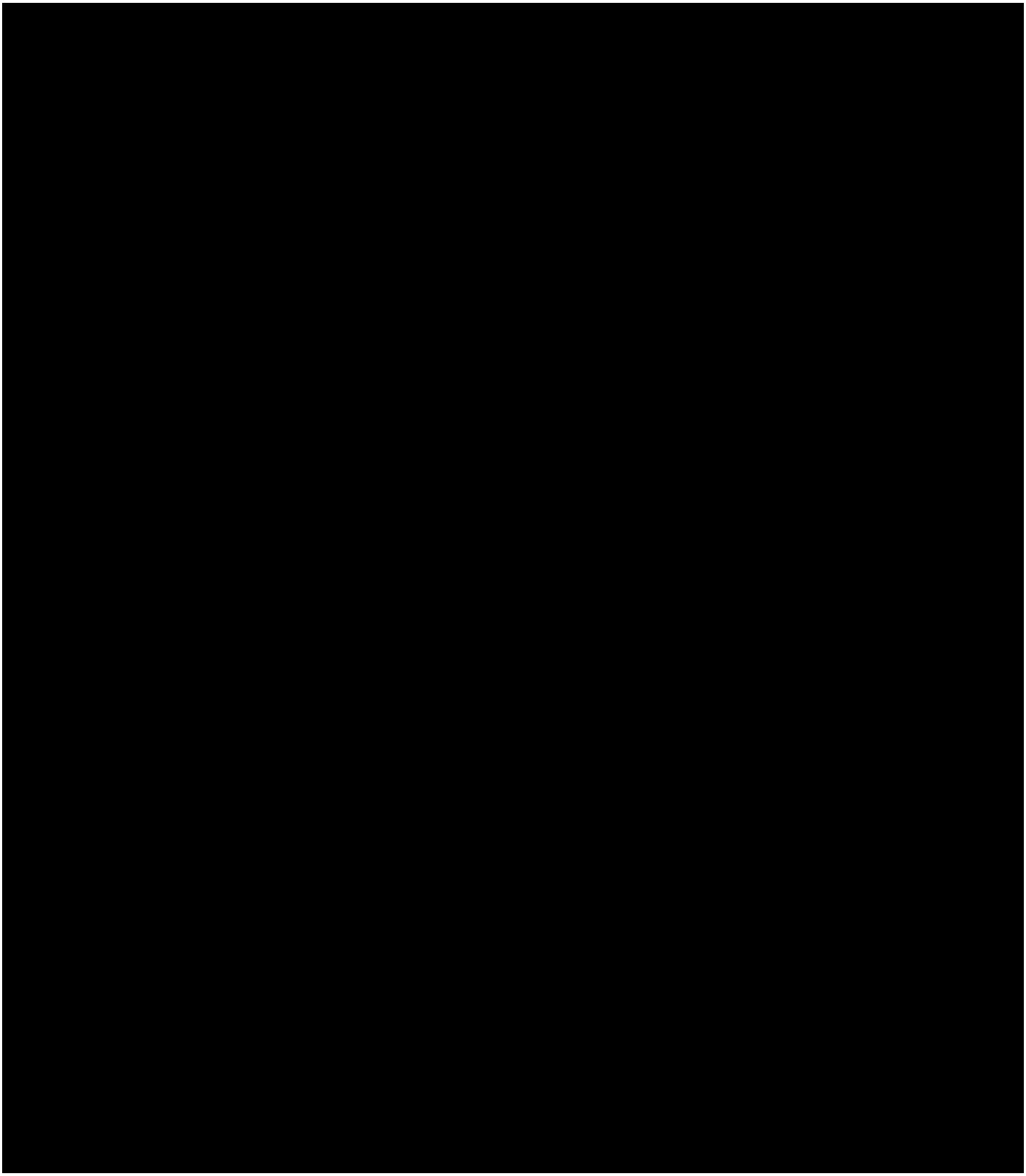
References
1. DSEM 07.011 - Primary services supplied by underground require two paths of primary supply

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

Attachment	Included in Submittal?
A. Geographic Map	*YES*
B. System and Station One-Lines	*YES*
C. Load Summary	*YES*
D. Initial Funding PAF	*YES*







Attachment B – One-Lines

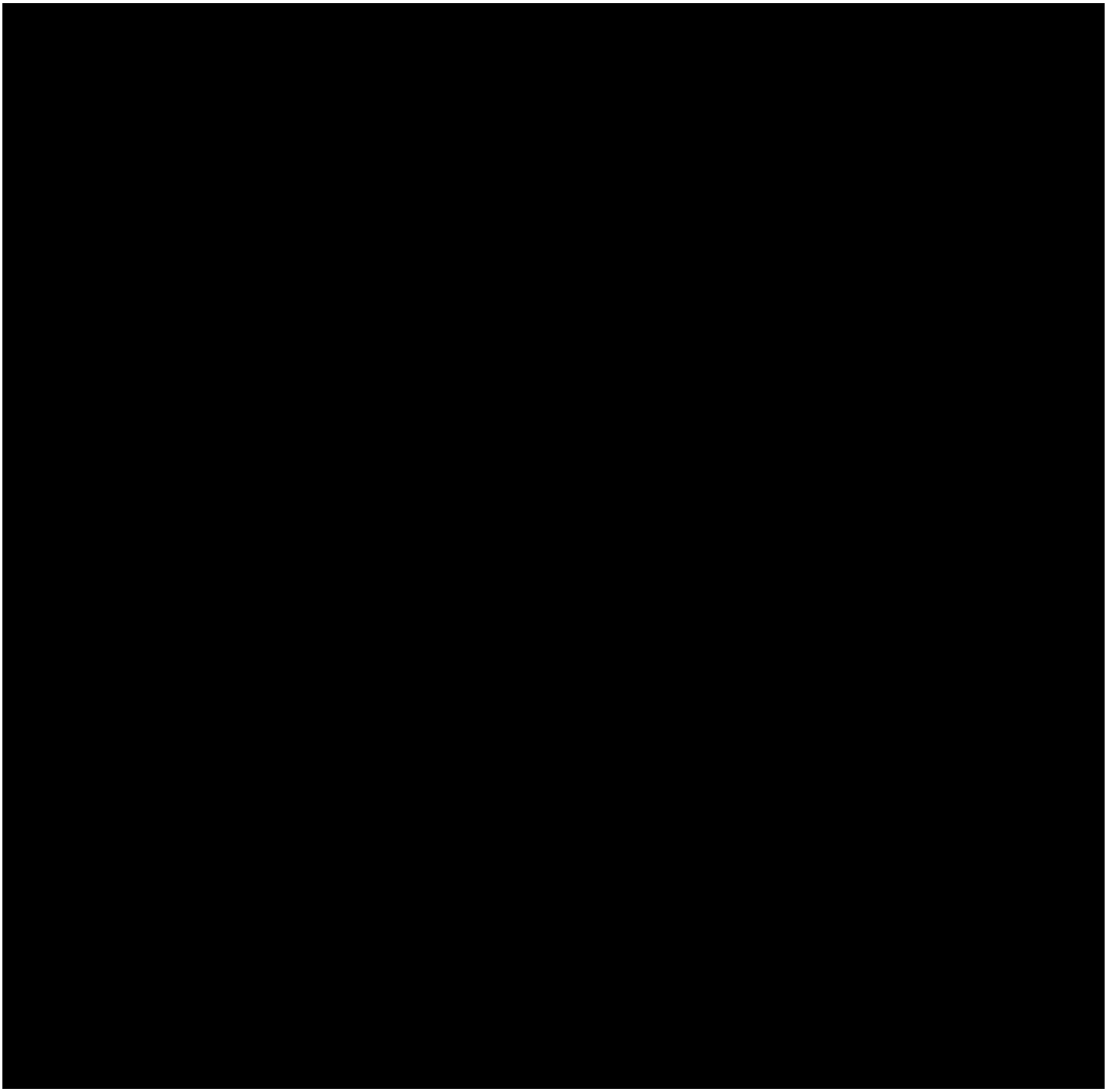
BEFORE



AFTER



Attachment C – Load Summary



EVERSOURCE
Project Authorization Form

Operations Project Authorization Form

Date Prepared: June 18, 2019	**Project Title:** [redacted]slanded Substation
Company/ies: Ct.	**Project ID Number:** CD01340
Organization: Electric	**Class(es) of Plant:** Substation
Project Initiator [redacted]	**Project Category:** Islanded Substation
Project Manager [redacted]	**Project Type:** Specific
Project Sponsor [redacted]	**Project Purpose:** Reliability
Estimated in service date: 12/31/21	**If Transmission Project: PTF?** N/A
Eng. /Constr. Resources Budgeted? No	**Capital Investment Part of Original Operating Plan?** N
Authorization Type: Initial Funding	**O&M Expenses Part of the Original Operating Plan?** N
Total Request: $329K	

Financial Requirements:

Project Authorization
ERM: _____

FP&A: _____

Executive Summary

- [redacted]

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Project Authorization Form

Project Costs Summary

	Prior Authorized	2021	20__	20__+	Totals
Capital Additions - Direct	$0	$167,374	$0	$0	$167,374
Less Customer Contribution	$0	$0	$0	$0	$0
Removals net of Salvage ____%	$0	$29,439	$0	$0	$29,439
Total - Direct Spending	$0	$196,813	$0	$0	$196,813
Capital Additions - Indirect	$0	$112,072	$0	$0	$112,072
Subtotal Request	$0	$308,885	$0	$0	$308,885
AFUDC	$0	$5,050	$0	$0	$5,050
Total Capital Request	$0	$313,935	$0	$0	$313,935
O&M	$0	$15,113	$0	$0	$15,113
Total Request	$0	$329,048	$0	$0	$329,048

Financial Evaluation

Direct Capital Costs	Year 1	Year 2	Year 3+	Total
Straight Time Labor	$31,416	$0	$0	$31,416
Overtime Labor	$5,452	$0	$0	$5,452
Outside Services	$121,444	$0	$0	$121,444
Materials	$36,626	$0	$0	$36,626
Other, including contingency amounts (describe)	$1,874	$0	$0	$1,874
Total Direct Costs	**$196,813**	**$0**	**$0**	**$196,813**

Indirect Capital Costs	Year 1	Year 2	Year 3+	Total
Indirects/Overheads (including benefits)	$112,072	$0	$0	$112,072
Capitalized interest or AFUDC, if any	$4,814	$0	$0	$4,814
Total Indirect Costs	**$116,886**	**$0**	**$0**	**$116,886**
Total Capital Costs	**$313,699**	**$0**	**$0**	**$313,699**
Less Total Customer Contribution	$0	$0	$0	$0
Total Capital Project Costs	**$313,699**	**$0**	**$0**	**$313,699**
Total O&M Project Costs	**$15,349**	**$0**	**$0**	**$15,349**

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Project Authorization Form

Technical Justification:

Project Need Statement

[redacted]

Project Objectives

- Reduce the length of time customers are interrupted for a:
  - Substation transformer failure
  - Step-down bank failure
  - Radial cable fault failure
- Reduce customer zone size

Project Scope

[redacted]

Background / Justification

When an islanded substation fails it can take up to 24 hours to install a mobile and restore all the customers. This is an inexpensive solution to restore 100% of the customers in less than 2 hours and thus meet our CAIDI goal.

Regulations from the Distribution System Engineering Manual:
07.011: Primary services supplied by underground require two paths of primary supply.
07.221: Recommended design of a single-phase or three-phase loop for UG design

Business Process and / or Technical Improvements:

[redacted]

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Project Authorization Form

Alternatives Considered with Cost Estimates

[redacted]

Project Schedule

Milestone/Phase Name	Estimated Completion Date
Preliminary Engineering	7/1/19
Detail Engineering	06/31/20
Construction	12/31/21

Regulatory Approvals

None.

EVERSOURCE
Project Authorization Form

Risks and Risk Mitigation Plans

Risk Event	Risk Horizon	Likelihood of occurrence	Risk Mitigation
Actual cost higher than estimated due to scope changes.	2020	Low	Included contingency costs in the funding request. Perform detailed Field Analysis and walk down in project development to avoid potential issues.
Customer Permission / Siting Council / Municipal approvals	2021	Low	Design to minimize customer impact. Project Preplanning and customer/community outreach
Internal construction resources not available to perform the work.	2021	Low	Plan internal resources to perform the work. Use competitive bidding to ensure lowest outside labor cost.
Internal engineering resources not available to perform the work.	2020	Low	Plan internal resources to perform the work. Use competitive bidding to ensure lowest outside labor cost.
Storm delays	2021	Low	If storm activity delays work, we may be forced to use external resources.
System abnormal configuration	2021	Low	Schedule work to minimize system abnormal time. Install temporary bypasses/equipment if system will be abnormal for extended periods

References
Distribution System Engineering Manual:
07.011: Primary services supplied by underground require two paths of primary supply.
07.221: Recommended design of a single-phase or three-phase loop for UG design

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Project Authorization Form

Cost Estimate Backup Details

Budget Summary - Preferred Option

ID	Title	Status	Rev #	Contingency	2021 Expenditure Amount	All segments Net Estimate
1	Install 6-500kVA Step Transformers	Prelim	0	28%	$113,727	$113,727
2	Close dead section & Install manual tie	Prelim	0	28%	$40,489	$40,489
3	Add parallel UG fo[redacted]	Prelim	0	28%	$92,084	$92,084
4	Install Smart Switch on [redacted]	Prelim	0	28%	$82,747	$82,747
				2021 Total:	$329,048	$329,048
				Total Project:	$329,048	$329,048

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

[redacted]


oad Summary.pdf


CD01340_project_needs_statement.pdf


07.011.pdf


07-221.pdf

Connecticut Light & Power
A Northeast Utilities Company

Specific Project Proposal - Project #: CD01340

[redacted]slanded Substation

Work Classification

Category: Line
Type: SRIS
Type Desc: ISLANDED SUBSTATION PROGRAM
Work Type:

Ownership / Management

AWC: Cheshire
Statewide: No
Owner: [redacted]
Manager: [redacted]

Project Information

Status: Draft
SPS #:
AIS Score:
Associated Projects:
Assignment ID:
Patrol Find ID:

Budget Summary - Preferred Option

All segments

2021

ID	Title	Status	Rev #	Contingency	Expenditure Amount	Net Estimate
4	Install smart switch on [redacted]	Draft	0	28%	$82,747	$82,747
3	Add parallel UG for [redacted]	Draft	0	28%	$92,084	$92,084
2	Close dead section & install manual tie	Draft	0	28%	$40,489	$40,489
1	Install 6-500kVA Step Transformers	Draft	0	28%	$113,727	$113,727
				2021 Total:	**$329,048**	**$329,048**
				Total Project:	**$329,048**	**$329,048**

Project Option Summary

ID	Description	Segments	Preliminary Estimate	Construction Estimate	Variance	IEEE $/CMS	All (w/Storm)	Prfrd
O1	All segments	1,2,3,4	$329,048	$0	100%	$0.00	$0.00	☑
O2	Step transformers, manual tie, and UG	1,2,3	$246,301	$0	100%	$0.00	$0.00	☐
O3	Step transformers and manual tie w[redacted]	1,2	$154,216	$0	100%	$0.00	$0.00	☐

Segments

ID	Title	Preliminary Estimate	Construction Estimate	Variance	IEEE $/CMS	All (w/Storm)
1	Install 6-500kVA Step Transformers	$113,727			$0.00	$0.00
2	Close dead section & install manual tie	$40,489			$0.00	$0.00
3	Add parallel UG for[redacted]	$92,084			$0.00	$0.00
4	Install smart switch on [redacted]	$82,747			$0.00	$0.00

Design Alternative CD01340-01

Estimate

	Preliminary Estimate Summary
Revision Number:	0
Contingency:	28.00%
SubTotal:	$88,850
Contingency Amount:	$24,878
Estimate:	$113,727
Reimbursement:	$0
Net Amount:	**$113,727**
Description:	

Item Description	CU	$ / Per	Qty	Amount
SWITCHING OH/DB/UG - SWITCHING NonNetwork - Average	16-ALL17	[redacted]		$3,509.60
TRAFFIC OH/DB/UG - Traffic Control - Flagger	16-ALL19			$2,000.00
SECTIONALIZE OH-Vertical Disconnect Switches-600/900 amp 3-1ph 1 switch for 13.8kV, 2 for 4.8kV	16-OH43			$30,849.60
XF OH - Stepdown - 1ph - on POLE 6-500kVA step-down transformers to install by substation	16-OH49			$40,800.00
POLE OH - JUNCTION POLE - 3ph (CL&P custodian) replace pole C2256	16-OH14A			$11,690.40

Design Alternative CD01340-02

Estimate

	Preliminary Estimate Summary
Revision Number:	0
Contingency:	28.00%
SubTotal:	$31,632
Contingency Amount:	$8,857
Estimate:	$40,489
Reimbursement:	$0
Net Amount:	**$40,489**

Description:

Item Description	CU	$ / Per	Qty	Amount
TRAFFIC OH/DB/UG - Traffic Control - Police Officer	16-ALL18	[redacted]		$2,000.00
POLE OH - POLE - 3ph (CL&P custodian) Existing 40ft, neutral very high, pole set in 1989 (pole 6237)	16-OH14			$4,676.00
OTHER OTHER No Live Tie sign	16-ALL14			$1,000.00
SECTIONALIZE OH - GOAB Switch on pole 6237, to tie 2 different circuits	16-OH44			$20,566.40
OH WIRE OH - Neutral Run span of triplex from pole 6238 and 6237 so not feeding through fuses	16-OH31			$1,280.00
XF OH - OH XF - 1ph Shift XFs [redacted] from BC to AB	16-OH45	[redacted]		$2,109.60

Design Alternative CD01340-03

Estimate

Preliminary Estimate Summary

Revision Number:	0
Contingency:	28.00%
SubTotal:	$71,941
Contingency Amount:	$20,143
Estimate:	$92,084
Reimbursement:	$0
Net Amount:	**$92,084**

Description:

Item Description	CU	$ / Per	Qty	Amount
TRAFFIC OH/DB/UG - Traffic Control - Flagger	16-ALL19	[redacted]		$2,000.00
SECTIONALIZE OH-Vertical Disconnect Switches-600/900 amp 3-1ph	16-OH43			$10,283.20
DB CABLE DB/UG - 4/0 - 3-1/C (3ph) Al	16-UG113			$19,555.20
UG CABLE DB - Splice Box add a second box for the parallel wire	16-UG154			$3,513.60
POLE DB/UG - Riser - 3ph transition from OH to UG	16-UG146			$21,588.80
OTHER OTHER Trenching to new riser poles	16-ALL14			$15,000.00

Design Alternative CD01340-04

Estimate

Preliminary Estimate Summary

Revision Number:	0
Contingency:	28.00%
SubTotal:	$64,646
Contingency Amount:	$18,101
Estimate:	$82,747
Reimbursement:	$0
Net Amount:	**$82,747**
Description:	

Item Description	CU	$ / Per	Qty	Amount
TRAFFIC OH/DB/UG - Traffic Control - Police Officer	16-ALL18	[redacted]		$2,000.00
SECTIONALIZE OH - Recloser - 3ph Add SS on pole G5610	16-OH38			$47,989.60
SECTIONALIZE OH - Recloser Control - setting changes only Reprogramming [redacted]	16-OH39A			$14,656.80

Underground/DB Design
Section 07.01

General UG and DB System Design Philosophy

07.011

GENERAL – This DSEM states the design philosophy for Eversource Energy underground and direct buried electric distribution system standards.

An *underground system* is an electrical system built with conductors installed in duct banks run between manholes, customer vaults, transformer vaults, and equipment pads. Except for equipment pads, these structures are built to accommodate entry by craft workers to install and splice cables. Duct banks are almost always encased in concrete.

A *direct buried system* is an electrical system built with conductors that are either directly buried in the earth or are installed in ducts run between hand holes, shallow vaults, and equipment pads. These structures are not designed for personnel entry and work is performed by craft workers outside of the structure. Duct banks are almost always just buried in the earth without concrete encasement.

BASIS OF DESIGN – GENERAL – The following five considerations form the basis of Eversource Energy Distribution System Designs. These are general considerations and are discussed in detail in **DSEM Section 05.01 – General Distribution System Design Philosophy.**

- Safety – For company employees and the public
- Capacity – To supply present and future loads
- Voltage – To comply with regulatory requirements
- Reliability – To meet needs of customers and regulatory authorities
- Power Quality – with voltage variations controlled to acceptable levels for customer satisfaction
- Economics – To spend funds wisely and consistently across the system while balancing the needs of the electric system and the need for a fair return to investors
- Aesthetics – To show respect for the appearance of the communities we serve

SPECIFICS FOR THE BASIS OF UNDERGROUND SYSTEM DESIGNS

