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Program Release Form

Approved at May 26, 2021 EPAC
Link to Meeting Minutes

Date Prepared: 05/20/2021	**Project Title: BES Battery Monitor Installation Program – [redacted] Release**
Company: Eversource CT	**Facility Name: [redacted] Substation**
Organization: Asset Management	**Project Number CS00483 (D), 405364 (T)**
Project Initiator: [redacted]	**Class(es) of Plant: D SS, T SS**
Project Manager: [redacted]	**Project Category: Stations - Monitoring - BatteriesStations -**
Project Sponsor: [redacted]	**Project Type:**
Program Level Title: BES Battery Monitor Installation Program	**Capital Investment Part of Original Operating Plan? Yes**
Program Level Project Number: CS00428 (D), 405229 (T)	**O&M Expenses Part of the Original Operating Plan? N/A**
Total Request: $392K ($233K - D, $159K - T)	**Estimated in service date(s): 8/27/2021**
	Facility Type (check all that apply): ☐ PTF ☒ non-PTF ☒ Distribution

Executive Summary

This Program Release is requesting full funding of $392K ($233K D, $159K T) to install Bulk Electric System (BES) battery monitoring at the [redacted] Approval of this request will provide for improved real-time condition monitoring. This data will provide a more comprehensive overview of system health, streamline data reviews for compliance, and reduce human error through standardized reports, analysis, and reviews.

This Program Release is requesting dollar authorization in accordance with the Program Level criteria specified in the BES Battery Monitoring Installation Program Level PAF – CS00428 (D) and 405229 (T) (Attachment G) and this document for this specific location. The Program Level PAF had $50K of initial funding approved for each CT (D) and CT (T) approved in PowerPlan on 12/23/20 (CT - D) and 2/8/2021 (CT - T). Preliminary engineering for this [redacted] release has been completed. As of 5/14/2021, minimal charges have been spent for this substation; these costs will be journaled over accordingly to the individual release project numbers CS00483 (D) and 405364 (T).

Project Scope

This project is part of a multistate program to add BES Battery Monitors to the remaining un-monitored BES battery systems. North American Electric Reliability Corporation (NERC) Std. PRC-005-2 requires periodic maintenance and testing practices of BES system protection elements which includes station batteries. This includes measurement and analysis of cell and connection resistance to determine any potential issues. Multiple measurements of each cell at

hundreds of stations company-wide are required each year. The installation of substation battery monitors allows for real-time monitoring of the batteries on the Eversource system. This data will provide a more comprehensive overview of system health and streamline data reviews for compliance, and reduce human error through standardized reports, analysis, and reviews.

Project Scope

The scope of this project is as follows:



Constructability reviews were performed on 3/18/2021 (See Attachments E and F).

Unitized Release Costs

Note: This table represents the Distribution portion of this release. The D estimate was prepared for two (2) D monitors so the unit cost below is doubled.

Dollar amounts are in thousands

Line item Category	Unitized Program Level PAF Cost	Release Cost	Delta
1. ROW / Easements / Land Acquisition	$0	$0	$0
2. Environmental Approvals / Permits	$0	$0	$0
3. Outreach	$0	$0	$0
4. Siting Approvals / Permits	$0	$0	$0
5. Engineering / Design	$16	$8	($8)
6. Materials (Eversource purchased)	$6	$3	($3)
7. Construction (incl matl's by contractors)	$74	$70	($4)
8. Testing / Commissioning	$2	$1	($1)
9. Project Mgmt Team	$12	$6	($6)
10. Removals	$0	$0	$0
11. Other	$0	$0	$0
12. Risks	$18	$18	$0
SUBTOTAL DIRECTS W/ RISKS	**$128**	**$107**	**($21)**
13. Indirects/Overhead	$94	$118	$24
14. AFUDC	$2	$0	($2)
PROJECT TOTAL – BASELINE BUDGET	**$224**	**$225**	**$1**
15. Contingency	$10	$8	($2)
TOTAL CAPITAL REQUEST	**$232**	**$233**	**$1**
16. Reimbursables/Customer Contribution	$0	$0	$0
PROJECT TOTAL (LESS REIMBURSABLES)	**$232**	**$233**	**$1**
O&M	$0	$0	$0
Total Request	**$232**	**$233**	**$1**

Justification for Modification

1. **ROW / Easements / Land Acquisition: $0K** – No change.
2. **Environmental Approvals / Permits: $0K** – No change.
3. **Outreach: $0K** – No change.
4. **Siting Approvals / Permits: $0K** – No change.
5. **Engineering / Design: ($8)** – Variance due to economies of scale.
6. **Materials (by Eversource): ($3K)** – No major changes from Program Level PAF.

7. **Construction (including materials supplied by contractors): ($4) –** Variance due to economies of scale.
8. **Testing / Commissioning: $1K –** No major changes from program level PAF.
9. **Project Management Team: ($6) –** Reduced unit cost due to economy of scale
10. **Removals: $0K –** No change.
11. **Other: $0K –** No change.
12. **Risk: $0K –** No change.
13. **Indirects/Overhead: $24K –** Unitized costs reflects lower indirect rates. This project's estimate predates the new lower indirects.
14. **AFUDC: ($2K)–** No major changes from program level PAF.
15. **Contingency: ($2K)–** No major changes from program level PAF.
16. **Reimbursables/Customer Contribution: $0K –** No change.
17. **O&M: $0K –** No change.

Note: This table represents the Transmission portion of this release. The T estimate was prepared for two (2) T monitors so the unit cost below is doubled. Dollar amounts are in thousands

Line item Category	Unitized Program Level PAF Cost	Release Cost	Delta
1 ROW / Easements / Land Acquisition	$0	$0	$0
2 Environmental Approvals / Permits	$0	$0	$0
3 Outreach	$0	$0	$0
4 Siting Approvals / Permits	$0	$0	$0
5 Engineering / Design	$16	$8	($8)
6 Materials (Eversource purchased)	$4	$4	$0
7 Construction (incl matl's by contractors)	$54	$54	$0
8 Testing / Commissioning	$2	$2	$0
9 Project Mgmt Team	$12	$6	($6)
10 Removals	$0	$0	$0
11 Other	$0	$0	$0
12 Risks	$12	$12	$0
SUBTOTAL DIRECTS W/ RISKS	**$100**	**$86**	**($14)**
13 Indirects/Overhead	$80	$68	($12)
14 AFUDC	$0	$0	$0
PROJECT TOTAL – BASELINE BUDGET	**$180**	**$154**	**($26)**
15 Contingency	$6	$6	$0
TOTAL CAPITAL REQUEST	**$186**	**$159**	**($27)**
16 Reimbursables/Customer Contribution	$0	$0	$0
PROJECT TOTAL (LESS REIMBURSABLES)	**$186**	**$159**	**($27)**
O&M	$0	$0	$0
Total Request	**$186**	**159**	**($27)**

Justification for Modification

1. **ROW / Easements / Land Acquisition: $0K** – No change.
2. **Environmental Approvals / Permits: $0K** – No change.
3. **Outreach: $0K** – No change.
4. **Siting Approvals / Permits: $0K** –No change.
5. **Engineering / Design: : ($8)** – Variance due to economies of scale.
6. **Materials (by Eversource): $0K** – No change.
7. **Construction (including materials supplied by contractors): $0K** – No change.

8. **Testing / Commissioning: $0K –** No change.
9. **Project Management Team: : ($6) –** Variance due to economies of scale.
10. **Removals: $0K –** No change.
11. **Other: $0K –** No change.
12. **Risk: $0K –**.No change.
13. **Indirects/Overhead: : ($12) –** Indirects are proportional to direct costs.
14. **AFUDC: $0K –** No change.
15. **Contingency: $0K –** No change.
16. **Reimbursables/Customer Contribution: $0K –** No change.
17. **O&M: $0K –** No change.

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Project Costs Summary CT D (CS00483)

Note: Dollar values are in thousands

Line item Category	Prior Authorized	Actuals to Date	2021 to Go	2022	2023	2024	2025	2026	Total
1. ROW / Easements / Land Acquisition	$	$	$0	$	$	$	$	$	$0
2. Environmental Approvals / Permits	$	$	$0	$	$	$	$	$	$0
3. Outreach	$	$	$0	$	$	$	$	$	$0
4. Siting Approvals / Permits	$	$	$0	$	$	$	$	$	$0
5. Engineering / Design	$	$	$8	$	$	$	$	$	$8
6. Materials (Eversource purchased)	$	$	$3	$	$	$	$	$	$3
7. Construction (incl matl's by contractors)	$	$	$70	$	$	$	$	$	$70
8. Testing / Commissioning	$	$	$1	$	$	$	$	$	$1
9. Project Mgmt Team	$	$	$6	$	$	$	$	$	$6
10. Removals	$	$	$0	$	$	$	$	$	$0
11. Other	$	$	$0	$	$	$	$	$	$0
12. Risks	$	$	$18	$	$	$	$	$	$18
SUBTOTAL DIRECTS W/ RISKS	**$50**	**0 $**	**$107**	**$**	**$**	**$**	**$**	**$**	**$107**
13. Indirects/Overhead	$	$	$118	$	$	$	$	$	$118
14. AFUDC	$	$	$0	$	$	$	$	$	$0
PROJECT TOTAL – BASELINE BUDGET	**$50**	**$**	**$225**	**$**	**$**	**$**	**$**	**$**	**$225**
15. Contingency	$	$	$8	$	$	$	$	$	$8
TOTAL CAPITAL REQUEST	**$50**	**$**	**$233**	**$**	**$**	**$**	**$**	**$**	**$233**
16. Reimbursables/Customer Contribution	$	$	$0	$	$	$	$	$	$0
PROJECT TOTAL (LESS REIMBURSABLES)	**$50**	**$**	**$233**	**$**	**$**	**$**	**$**	**$**	**$233**
O&M	$	$	$0	$	$	$	$	$	$0
TOTAL REQUEST	**$50**	**$**	**$233**	**$**	**$**	**$**	**$**	**$**	**$233**

Note: Explain unique payment provisions, if applicable: *Provide a detailed breakdown of Other costs here.* Risk allocation of $18K is included for: D $18K For lead/asbestos in wall or ceiling, potential obstructions, and delays

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Breakout Costs

Note: Dollar values are in thousands

Line item Category	Prior Authorized	Actuals to Date	2021 to Go	2022	2023	2024	2025	2026	Total
ST Labor	$	$	$44	$	$	$	$	$	$44
OT Labor	$	$	$	$	$	$	$	$	$
Outside Services Labor	$	$	$39	$	$	$	$	$	$39
Materials*	$	$	$3	$	$	$	$	$	$3
Removals	$	$	$	$	$	$	$	$	$
Other	$	$	$28	$	$	$	$	$	$28
Indirects	$	$	$118	$	$	$	$	$	$118
AFUDC	$	$	$0	$	$	$	$	$	$0
TOTAL CAPITAL REQUEST - W/O REIMBURSABLES	**$50**	**$0**	**$233**	**$**	**$**	**$**	**$**	**$**	**$233**

*All materials including Eversource purchased and outside service purchased. Note that outside service purchased material included in construction in project cost summary above

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Project Costs Summary CT T (405364)

Note: Dollar values are in thousands

Line item Category	Prior Authorized	Actuals to Date	2021 to Go	2022	2023	2024	2025	2026	Total
1. ROW / Easements / Land Acquisition	$	$	$0	$	$	$	$	$	$0
2. Environmental Approvals / Permits	$	$	$0	$	$	$	$	$	$0
3. Outreach	$	$	$0	$	$	$	$	$	$0
4. Siting Approvals / Permits	$	$	$0	$	$	$	$	$	$0
5. Engineering / Design	$	$	$8	$	$	$	$	$	$8
6. Materials (Eversource purchased)	$	$	$4	$	$	$	$	$	$4
7. Construction (incl matl's by contractors)	$	$	$54	$	$	$	$	$	$54
8. Testing / Commissioning	$	$	$1	$	$	$	$	$	$1
9. Project Mgmt Team	$	$	$6	$	$	$	$	$	$6
10. Removals	$	$	$0	$	$	$	$	$	$0
11. Other	$	$	$0	$	$	$	$	$	$0
12. Risks	$	$	$12	$	$	$	$	$	$12
SUBTOTAL DIRECTS W/ RISKS	**$50**	**0 $**	**$85**	**$**	**$**	**$**	**$**	**$**	**$85**
13. Indirects/Overhead	$	$	$68	$	$	$	$	$	$68
14. AFUDC	$	$	$0	$	$	$	$	$	$0
PROJECT TOTAL – BASELINE BUDGET	**$50**	**$**	**$154**	**$**	**$**	**$**	**$**	**$**	**$154**
15. Contingency	$	$	$5	$	$	$	$	$	$5
TOTAL CAPITAL REQUEST	**$50**	**$**	**$159**	**$**	**$**	**$**	**$**	**$**	**$159**
16. Reimbursables/Customer Contribution	$	$	$0	$	$	$	$	$	$0
PROJECT TOTAL (LESS REIMBURSABLES)	**$50**	**$**	**$159**	**$**	**$**	**$**	**$**	**$**	**$159**
O&M	$	$	$0	$	$	$	$	$	$0
TOTAL REQUEST	**$50**	**$**	**$159**	**$**	**$**	**$**	**$**	**$**	**$159**

Note: Explain unique payment provisions, if applicable: *Provide a detailed breakdown of Other costs here.* Risk allocation of $12K is included for: T $12K for potential obstructions and delays

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Breakout Costs

Note: Dollar values are in thousands

Line item Category	Prior Authorized	Actuals to Date	2021 to Go	2022	2023	2024	2025	2026	Total
ST Labor	$	$	$30	$	$	$	$	$	$30
OT Labor	$	$	$	$	$	$	$	$	$
Outside Services Labor	$	$	$38	$	$	$	$	$	$38
Materials*	$	$	$4	$	$	$	$	$	$4
Removals	$	$	$	$	$	$	$	$	$
Other	$	$	$19	$	$	$	$	$	$19
Indirects	$	$	$68	$	$	$	$	$	$68
AFUDC	$	$	$	$	$	$	$	$	$
TOTAL CAPITAL REQUEST - W/O REIMBURSABLES	**$50**	**$0**	**$159**	**$**	**$**	**$**	**$**	**$**	**$159**

*All materials including Eversource purchased and outside service purchased. Note that outside service purchased material included in construction in project cost summary above

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: N/A

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

Are there other environmental cleanup costs associated with this project? If yes, please provide details: The potential for lead/asbestos in ceiling and wall (D only) exists and is covered as a $6K risk in the D Estimate

Alternatives Considered with Cost Estimates

Preferred Alternative – Add BES Battery Monitors to the remaining un-monitored BES battery systems.

NERC Std. PRC-005-2 requires periodic maintenance and testing practices of BES system protection elements which includes station batteries. This includes measurement and analysis of cell and connection resistance to determine any potential issues. Multiple measurements of each cell at hundreds of stations company-wide are required each year. The installation of substation battery monitors allows for real-time monitoring of the batteries on the Eversource system. This data will provide a more comprehensive overview of system health and streamline data reviews for compliance, and reduce human error through standardized reports, analysis, and reviews

Do nothing Alternative - (Not preferred): No estimate for this alternative

The alternative to installing these monitors is to continue with the established inspections and replace obsolete batteries separately. NERC Std. PRC-005-2 requires periodic maintenance and testing practices of BES system protection elements which includes station batteries. This includes various visual and physical inspections, as well as measurement and analysis of cell and connection resistance to determine any potential issues. The latter test consists of multiple monthly measurements of each cell (typically 60 per bank) at hundreds of stations company-wide each year. [redacted]

Regulatory Approvals

N/A

Risks and Risk Mitigation Plans

Risk dollars have been allocated for:

T $12K For potential obstructions and delays

D $18K For lead/asbestos in wall or ceiling, potential obstructions, and delays

Contingency

Contingency of $13K ($8K - D; $5K - T) is included in this release for any additional unknowns with respect to this release.

Project Schedule

Milestone/Phase Name	Estimated Date
EPAC Presentation and Approval	5/26/2021 T/D
IFC Engineering T	6/1//2021 T
IFC Engineering D	6/14/2021 D
Material Procurement	7/6/2021 T/D
Construction Start	8/16/2021 T/D
In Service Date	8/27/2021 T/D
Project Closeout	11/2/2021 T/D

See Attachments C and D for the P6 schedules.

Attachments

- Attachment A [redacted] istribution Cost Estimate rev 1.61 dated 4/16/2021
- Attachment B [redacted] Transmission Cost Estimate rev 1.61 dated 4/16/2021
- Attachment C – BMIP CT Southington Distribution Program Release Schedule 05032021
- Attachment D – BMIP CT Southington Transmission Program Release Schedule 05032021
- Attachment E [redacted] Distribution Constructability Review Form
- Attachment F [redacted] Transmission Constructability Review Form
- Attachment G - BES Battery Monitor Installation Program PAF rev_0

INSTRUCTIONS:
It is the responsibility of the initiator to contact the subject matter experts in the listed 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. See the PAF Guide for additional instruction.

Project Checklist - Transmission & Substation Capital Project						
Project Name: BES Battery Monitor Installation Program – [redacted]					**Project Number: CS00483 (D), 405364 (T)**	
Facility Type: ☒ BPS	☒ BES	☐ PTF	☐ non-PTF	☐ CIP	☒ Distribution	
PLANNING						
Is a NX-9 required?					No	
Is an ISO-NE PAC presentation required?					No	
ISO-NE Presentation Date (if completed):						
Cost in ISO-NE Presentation ($M) (if completed):					N/A	
Is a PPA required?					No	
Is a TCA Application Required?					No	
TCA Submittal Date (if submitted):						
Cost in TCA Submittal ($M) (if submitted):					N/A	
Enter ISO-NE RSP / Asset Condition ID, if assigned:					N/A	
PLANNING/PROTECTION & CONTROLS						
Are RAS/SPS/UVLs affected?					No	
OPERATIONS						
Outage Required?	☐ Primary Equipment (Power Transfer)	☐ Secondary Equipment (P&C only)	☒ Outage Not Required			
Do SCLL Conditions Exist?					No	
Has an outage schedule been approved?					NR	
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?					No	
Is a Transient Over Voltage (TOV) analysis required?					NR	

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Project Checklist - Transmission & Substation Capital Project	
Project Name: BES Battery Monitor Installation Program – [redacted]	**Project Number: CS00483 (D), 405364 (T)**

P&C ENGINEERING	
OP-22 - Are PMUs and DDR required?	No
If BPS, is an NPCC Directory #4 presentation required?	No
Are ISO-NE OP-24 Appendix B updates necessary?	No
TRANSMISSION LINE ENGINEERING	
Are there any changes that affect the baseline EMF?	No
Are there any changes that affect the baseline EMI?	No
SITING	
Is a Siting filing required? *(If yes, list in regulatory approvals section)*	No
PERMITTING	
Is there any permitting required? *(If yes, list in regulatory approvals section)*	No
SITING & CONSTRUCTION SERVICES (OUTREACH)	
What is the level of outreach expected?	Low
INITIATOR	
Has a field constructability review been completed?	Yes
INVESTMENT RECOVERY	
Does the project require development of an Investment Recovery plan?	No
COST ESTIMATING	
What team/firm prepared the cost estimate?	Estimate was prepared by Eversource Engineering
Name of the person who prepared the estimate:	[redacted]
Was the estimate reviewed by Eversource Estimating?	Yes - Full Review

Cost Estimate Backup Details

See Attachments A and B for the cost estimate backup files.

ESTIMATE SUMMARY

Project Title: [redacted] Transmission Control House Battery Monitors
Project Mgr/Lead: [redacted]
Project Number:CS00428
WO & Task #:80042113
Est. Revision # 00
Estimate Type - Station work

Estimate By: [redacted]
Date of Estimate:4/16/21
ISD:07/30/2021
Estimate #

Template Revision # 01.61

ESTIMATE SUMMARY

Estimate Type: Conceptual

WBS	Description	TOTAL	% of Directs	% of Total	Priors	2021	2022	2023	2024	2025	2026
1	ROW / Easements / Land purchases										
2	Environmental Approvals / Permits										
3	Outreach	$100	0.1%	0.1%		$100					
4	Siting Approvals / Permits	$300	0.4%	0.2%		$300					
5	Engineering / Design	$7,600	8.9%	4.8%		$7,600					
6	Materials (Eversource purchased)	$4,000	4.7%	2.5%		$4,000					
7	Construction (Incl matl's by contractors)	$54,100	63.3%	34.0%		$54,100					
8	Testing / Commissioning	$1,100	1.3%	0.7%		$1,100					
9	PMT Project Mgmt Team	$6,300	7.4%	4.0%		$6,300					
10	Removals										
11	Other										
12	Risks	$12,000	14.0%	7.5%		$12,000					
	Project Directs Total w/Risks	**$85,500**	100.0%	53.7%		**$85,500**					
13	Indirects/Overhead	$68,300		42.9%		$68,300					
14	AFUDC										
	Project Total - Baseline Budget	**$153,800**		96.6%		**$153,800**					
15	Contingency	$5,400		3.4%		$5,400					
	Project Total - Funding Approval Level	**$159,200**		100.0%		**$159,200**					
16	Reimbursables/Customer Contribution										
	Project Total (less reimbursables)	**$159,200**				**$159,200**					
		-									
	Amount of Escalation Included above										
6	Total materials - Eversource	$4,000				$4,000					
	Total materials - Contractor										
	Total materials	$4,000				$4,000					
	NOTE: Risk / Contingency is 12.3% of Project Total Costs (incl escal/indirects/AFUDC but excl reimb.)										

Estimate Range

-25%	-	50%
$119,000	-	**$239,000**

COMMENTS:

Project Scope:

[redacted]

Assumptions/Clarifications:
Indirect rates based on: 1T - CT . Station work

Inhouse resources will be used for Construction, LCE, SCADA, and Engineering.
PM will be outsourced.
No construction Rep will be needed.
Real Power will provide a UXIM monitor including any wiring to the battery with their installation services.
A Mobile battery cart will be provided while Real power is installing the battery tab washers.

RISKS

Potential Obstructions	$	6.000
Delays	$	6.000

Project Title [redacted] Transmission Control House Battery Monitors

Escalated Line Item Dollars

Project Number:C500428
Date of Estimate:4/18/21
Est. Revision # 00
Template Revision # 01.01

CSTXX-CONSTRUCTION	R		Prior actuals to date Mhrs	Prior actuals to date DOLLARS	2021 Mhrs	2021 DOLLARS	1 2022 Mhrs	1 2022 DOLLARS	2 2023 Mhrs	2 2023 DOLLARS	3 2024 Mhrs	3 2024 DOLLARS	4 2025 Mhrs	4 2025 DOLLARS	5 2026 Mhrs	5 2026 DOLLARS	TOTAL Mhrs	TOTAL DOLLARS
Electrical Construction	LT				[redacted]	$19,296											[redacted]	$19,296
General Construction	LT																	
SCADA / Automation	LT					$848												$848
Telecom - Field	LT																	
Construction Reps (internal)	LT																	
Support Switch/Tap	LT																	
Other (specify)	LT																	
Other (specify)	LT																	
Other (specify)	LT																	
LT Total						$20,144												$20,144
Employee Expenses	AE	5%				$1,007												$1,007
Construction Purchased Material	AM	1%				$522												$522
Outside Construction Vendor	AQ					$32,935												$32,935
Sales tax on Constr. Vendor																		
Vehicles (now in indirects section)	AV																	
Inspection services (Outside Vendor)	AQ																	
Construction Rep (Outside vendor)	AQ																	
Rents and Leases	BR																	
CSTXX Subtotal						$54,808												$54,808
Escalation						$ -		$ -		$ -		$ -		$ -		$ -		$ -
	P1																	
CSTXX Total						$54,808												$54,808
ENRXX-TG ENGINEERING/DESIGN																		
Project Services/Drafting	LT					$2,120												$2,120
T- Line Engineering/Design	LT																	
D- Street Engineering/Design	LT																	
Civil Engineering/Design	LT																	
Substation (T) Engineering/Design	LT																	
Substation (D) Engineering/Design	LT					$3,816												$3,816
Protection & Controls Engineering	LT					$848												$848
Survey Engineering	LT																	
SCADA / Automation Engineering	LT																	
Telecom Engineering	LT					$424												$424
Other - specify	LT																	
Other - specify	LT																	
LT Total						$7,208												$7,208
Employee Expenses	AE	5%				$360												$360
Contractor Engineering - T-Lines	AQ																	
Contractor Engineering - D-Street	AQ																	
Contractor Engineering - T -Station	AQ																	
Contractor Engineering - D-Station	AQ																	
Contractor Engineering - PSC	AQ																	
Contractor Engineering - Survey	AQ																	
Contractor Engineering - SCADA / Automatic	AQ																	
Contractor Engineering - Telecom	AQ																	
Contractor Engineering - Specify	AQ																	
Contractor Engineering - Specify	AQ																	
Contractor Engineering - Specify	AQ																	
Vehicles (now in Indirects section)	AV																	
ENRXX Subtotal			-			$7,568	-		-		-		-		-			$7,568
Escalation																		
	P1																	
ENRXX Total			-			$7,568	-		-		-		-		-			$7,568
LNDXX-TG LAND																		
Real Estate	LT																	
Employee Expenses	AE	5%																
Purchase Land	AM																	
Vehicles (now in Indirects section)	AV																	
Fees and Payments	BF																	
LNDXX Subtotal			-				-		-		-		-		-			
Escalation																		
	P1																	
LNDXX Total			-				-		-		-		-		-			
MATXX-TG MATERIAL																		
Eversource	AM					$3,400												$3,400
Outside Services	AM																	
	AM																	
Freight																		
Sales Tax Eversource/outside services		4%				$100												$100
Other																		
MATXX Subtotal						$3,500												$3,500
Escalation																		
	P1																	
MATXX Total						$3,500												$3,500
PSMXX-PROJECT MANAGER & SUPPORT																		
Project Management (PM)	LT																	
Project Planning/Cost (IP)	LT					$424												$424
Contracts/Purchasing (CP)	LT					$424												$424
System Planning	LT																	
Environmental	LT																	
SCS - Notification	LT					$7												$7
Legal	LT																	
Estimating	LT					$848												$848
Siting - Local Zoning	LT																	
Asset Management	LT					$848												$848
Other -	LT																	
Other -	LT																	
Other -	LT																	
Other -	LT																	
LT Total						$2,551												$2,551
Employee Expenses	AE	5%				$128												$128
Project Support Vendor - PM	AQ					$3,600	-		-		-		-		-			$3,600
Project Support Vendor - IP	AQ						-		-		-		-		-			
Project Support Vendor - CP	AQ						-		-		-		-		-			
Project Support Vendor - System Planning	AQ						-		-		-		-		-			
Project Support Vendor - Environmental	AQ						-		-		-		-		-			
Project Support Vendor - SCS - Notification	AQ					$130	-		-		-		-		-			$130
Project Support Vendor - Legal	AQ						-		-		-		-		-			
Project Support Vendor - Estimating	AQ						-		-		-		-		-			
Project Support Vendor - Siting - Local Zoning	AQ					$300	-		-		-		-		-			$300
Project Support Vendor - Asset Management	AQ						-		-		-		-		-			
Project Support Vendor - Other	AQ						-		-		-		-		-			
Project Support Vendor - Other	AQ						-		-		-		-		-			
Project Support Vendor - Other	AQ						-		-		-		-		-			
Project Support Vendor - Other	AQ						-		-		-		-		-			
Vehicles (now in Indirects section)	AV																	
Property or CW P tax large proj. allowance	BR																	
	BR																	
Fees and Payments - Environmental	BF																	
Fees and Payments - Siting	BF																	
Fees and Payments - Other	BF																	
PSMXX Subtotal			-			$6,709	-		-		-		-		-			$6,709
Escalation																		
	P1																	
PSMXX Total			-			$6,709	-		-		-		-		-			$6,709
REMXX-TG REMOVAL																		
Engineering/Design	LT																	
Internal Construction	LT																	
LT Total																		
Employee Expenses	AE	10%																
Outside Services	AQ																	
Contractor Labor	AQ																	
Vehicles (now in Indirects section)	AV																	
Rents and Leases	BR																	
REMXX Subtotal			-				-		-		-		-		-			
Escalation																		
	P1																	
REMXX Total			-				-		-		-		-		-			
TSTXX-TG TEST																		
Test / Field Engr. Labor (In House)	LT																	
Lead Commissioning Engr. (LCE) (internal)	AQ					$959												$959
Employee Expense	AE	10%				$99												$99
Test / Field Engr. Labor (contractor)	AQ																	
Lead Commissioning Engr. (LCE) (contactor)	AQ																	
Vehicles (now in Indirects section)	AV																	
TSTXX Subtotal						$1,058												$1,058
Escalation																		
	P1																	
TSTXX Total						$1,058												$1,058
SUBTOTAL PROJECT DIRECT COST			-			$73,473	-		-		-		-		-			$73,473
Risk																		
Risk						$12,000												$12,000
Risk Total						$12,000												$12,000
TOTAL PROJECT DIRECT COST			-			$85,473	-		-		-		-		-			$85,473
INDIRECTS																		
Non-Productive Time Allocation (Z9)	58	16.1%				$4,649												$4,649
Payroll Benefits Allocation (ZE) incl NPT	59	44.0%				$10,998												$10,998
Gen SVC CO Overhead (ZF) incl NPT	60	75.0%				$8,421												$8,421
E&S Allocations (Z)	61	45.0%				$41,231												$41,231
AS&E Allocations (ZJ)	62	9.7%				$969												$969
Stores Expense Allocation (ZC)	62																	
Lobby Stock																		
MDEC																		
Vehicles		7.5%				$2,317												$2,317
Indirects Subtotal	63					$68,295												$68,295
TOTAL PROJECT COST - Direct & Indirect / excl AFUDC)						$153,768												$153,768
AFUDC																		
AFUDC (ZK)																		
In Service Dollars																		
Cumulative ISS																		
AFUDC Subtotal																		
TOTAL PROJECT COST - Baseline Budget						$153,768												$153,768
Continoecv																		
Contingency						$5,409												$5,409
Other																		
Continoecv SubTotal						$5,409												$5,409
TOTAL PROJECT COST - Approved Funding						$159,167												$159,167
Reimbursables / Customer Contribution																		
Reimbursables / Customer Contribution (enter as negative)	59																	
TOTAL PROJECT COST						$159,167												$159,167

ESTIMATE SUMMARY

Project Title [redacted] Distribution Control House Battery Monitors
Project Mgr/Lead [redacted]
Project Number:CS00428
WO & Task #:80067152
Est. Revision # 00
Estimate Type - Station work

Estimate By: [redacted]
Date of Estimate:4/16/21
ISD:07/30/2021
Estimate #

Template Revision # 01.61

ESTIMATE SUMMARY

Estimate Type: Conceptual

WBS	Description	TOTAL	% of Directs	% of Total	Priors	2021	2022	2023	2024	2025	2026
1	ROW / Easements / Land purchases										
2	Environmental Approvals / Permits										
3	Outreach	$200	0.2%	0.1%		$200					
4	Siting Approvals / Permits	$400	0.4%	0.2%		$400					
5	Engineering / Design	$7,600	7.1%	3.3%		$7,600					
6	Materials (Eversource purchased)	$3,200	3.0%	1.4%		$3,200					
7	Construction (incl matl's by contractors)	$69,900	65.5%	30.0%		$69,900					
8	Testing / Commissioning	$1,100	1.0%	0.5%		$1,100					
9	PMT Project Mgmt Team	$6,300	5.9%	2.7%		$6,300					
10	Removals										
11	Other										
12	Risks	$18,000	16.9%	7.7%		$18,000					
	Project Directs Total w/Risks	**$106,700**	100.0%	45.7%		**$106,700**					
13	Indirects/Overhead	$118,400		50.8%		$118,400					
14	AFUDC	$500		0.2%		$500					
	Project Total - Baseline Budget	**$225,600**		96.7%		**$225,600**					
15	Contingency	$7,700		3.3%		$7,700					
	Project Total - Funding Approval Level	**$233,300**		100.0%		**$233,300**					
16	Reimbursables/Customer Contribution										
	Project Total (less reimbursables)	**$233,300**				**$233,300**					
		-									
	Amount of Escalation included above										
6	Total materials - Eversource	$3,200				$3,200					
	Total materials - Contractor										
	Total materials	$3,200				$3,200					
	NOTE: Risk / Contingency is 12.4% of Project Total Costs (incl escal/indirects/AFUDC but excl reimb.)										

Estimate Range	**-25%**	-	**50%**
	$175,000	-	**$350,000**

COMMENTS:

Project Scope:

[redacted]

Assumptions/Clarifications:

Indirect rates based on: 11 - CT . Station work

Inhouse resources will be used for Construction, LCE, SCADA, and Engineering.
PM will be outsourced.
No construction Rep will be needed.
Real Power will provide a UXIM monitor including any wiring to the battery with their installation services.
Environmental testing needed before drilling through walls

RISKS

Potential Obstructions	$ 6,000
Delays	$ 6,000
Lead/Asbestos in wall or ceiling	$ 6,000

Project Title [redacted] Distribution Control House Battery Monitors

Escalated Line Item Dollars

Project Number:C500428
Date of Estimate:4/18/21
Est. Revision # 00
Template Revision # 01.01

CSTXX-CONSTRUCTION	R		Prior actuals to date Mhrs	DOLLARS	2021 Mhrs	DOLLARS	1 2022 Mhrs	DOLLARS	2 2023 Mhrs	DOLLARS	3 2024 Mhrs	DOLLARS	4 2025 Mhrs	DOLLARS	5 2026 Mhrs	DOLLARS	TOTAL Mhrs	DOLLARS
Electrical Construction	LT					$33,788												$33,788
General Construction	LT																	
SCADA / Automation	LT					$848												$848
Telecom - Field	LT																	
Construction Reps (internal)	LT																	
Support Switch/Tap	LT																	
Other (specify)	LT																	
Other (specify)	LT																	
Other (specify)	LT																	
LT Total						$34,636												$34,636
Employee Expenses	AE	5%				$1,731												$1,731
Construction Purchased Material	AM	1%				$873												$873
Outside Construction Vendor	AO					$33,528												$33,528
Sales tax on Constr. Vendor																		
Vehicles (now in indirects section)	AV																	
Inspection services (Outside Vendor)	AO																	
Construction Rep (Outside vendor)	AO																	
Rents and Leases	BR																	
CSTXX Subtotal						$70,548												$70,548
Escalation						$ -		$ -		$ -		$ -		$ -		$ -		$ -
	P1																	
CSTXX Total						$70,548												$70,548
ENRXX-TG ENGINEERING/DESIGN																		
Project Services/Drafting	LT					$2,120												$2,120
T- Line Engineering/Design	LT																	
D- Street Engineering/Design	LT																	
Civil Engineering/Design	LT																	
Substation (T) Engineering/Design	LT																	
Substation (D) Engineering/Design	LT					$3,816												$3,816
Protection & Controls Engineering	LT					$848												$848
Survey Engineering	LT																	
SCADA / Automation Engineering	LT																	
Telecom Engineering	LT					$424												$424
Other - specify	LT																	
Other - specify	LT																	
LT Total						$7,208												$7,208
Employee Expenses	AE	5%				$360												$360
Contractor Engineering - T-Lines	AO																	
Contractor Engineering - D-Street	AO																	
Contractor Engineering - T -Station	AO																	
Contractor Engineering - D-Station	AO																	
Contractor Engineering - PSC	AO																	
Contractor Engineering - Survey	AO																	
Contractor Engineering - SCADA / Automatic	AO																	
Contractor Engineering - Telecom	AO																	
Contractor Engineering - Specify	AO																	
Contractor Engineering - Specify	AO																	
Contractor Engineering - Specify	AO																	
Vehicles (now in Indirects section)	AV																	
ENRXX Subtotal			-			$7,568	-		-		-		-		-			$7,568
Escalation																		
	P1																	
ENRXX Total			-			$7,568	-		-		-		-		-			$7,568
LNDXX-TG LAND																		
Real Estate	LT																	
Employee Expenses	AE	5%																
Purchase Land	AM																	
Vehicles (now in Indirects section)	AV																	
Fees and Payments	BF																	
LNDXX Subtotal			-				-		-		-		-		-			
Escalation																		
	P1																	
LNDXX Total			-				-		-		-		-		-			
MATXX-TG MATERIAL																		
Eversource	AM					$2,400												$2,400
Outside Services	AM																	
	AM																	
Freight																		
Sales Tax Eversource/outside services		4%				$100												$100
Other																		
MATXX Subtotal						$2,500												$2,500
Escalation																		
	P1																	
MATXX Total						$2,500												$2,500
PSMXX-PROJECT MANAGER & SUPPORT																		
Project Management (PM)	LT																	
Project Planning/Coat (IP)	LT					$424												$424
Contracts/Purchasing (C/P)	LT					$424												$424
System Planning	LT																	
Environmental	LT																	
SCS - Notification	LT					$8												$8
Legal	LT																	
Estimating	LT					$848												$848
Siting - Local Zoning	LT																	
Asset Management	LT					$848												$848
Other -	LT																	
Other -	LT																	
Other -	LT																	
Other -	LT																	
LT Total						$2,552												$2,552
Employee Expenses	AE	5%				$128												$128
Project Support Vendor - PM	AO					$3,600	-		-		-		-		-			$3,600
Project Support Vendor - IP	AO						-		-		-		-		-			
Project Support Vendor - C/P	AO						-		-		-		-		-			
Project Support Vendor - System Planning	AO						-		-		-		-		-			
Project Support Vendor - Environmental	AO						-		-		-		-		-			
Project Support Vendor - SCS - Notification	AO					$160	-		-		-		-		-			$160
Project Support Vendor - Legal	AO						-		-		-		-		-			
Project Support Vendor - Estimating	AO						-		-		-		-		-			
Project Support Vendor - Siting - Local Zoning	AO					$400	-		-		-		-		-			$400
Project Support Vendor - Asset Management	AO						-		-		-		-		-			
Project Support Vendor - Other	AO						-		-		-		-		-			
Project Support Vendor - Other	AO						-		-		-		-		-			
Project Support Vendor - Other	AO						-		-		-		-		-			
Vehicles (now in Indirects section)	AV																	
Property or CW P tax large proj. allowance	BR																	
	BR																	
Fees and Payments - Environmental	BF																	
Fees and Payments - Siting	BF																	
Fees and Payments - Other	BF																	
PSMXX Subtotal			-			$8,840	-		-		-		-		-			$8,840
Escalation																		
	P1																	
PSMXX Total			-			$8,840	-		-		-		-		-			$8,840
REMXX-TG REMOVAL																		
Engineering/Design	LT																	
Internal Construction	LT																	
LT Total																		
Employee Expenses	AE	10%																
Outside Services	AO																	
Contractor Labor	AO																	
Vehicles (now in Indirects section)	AV																	
Rents and Leases	BR																	
REMXX Subtotal			-				-		-		-		-		-			
Escalation																		
	P1																	
REMXX Total			-				-		-		-		-		-			
TSTXX-TG TEST																		
Test / Field Engr. Labor (In House)	LT																	
Lead Commissioning Engr. (LCE) (internal)	AO					$959												$959
Employee Expense	AE	10%				$99												$99
Test / Field Engr. Labor (contractor)	AO																	
Lead Commissioning Engr. (LCE) (contactor)	AO																	
Vehicles (now in Indirects section)	AV																	
TSTXX Subtotal						$1,058												$1,058
Escalation																		
	P1																	
TSTXX Total						$1,058												$1,058
SUBTOTAL PROJECT DIRECT COST			-			$88,544	-		-		-		-		-			$88,544
Risk																		
Risk						$18,000												$18,000
Risk Total						$18,000												$18,000
TOTAL PROJECT DIRECT COST			-			$106,544	-		-		-		-		-			$106,544
INDIRECTS																		
Non-Productive Time Allocation (Z9)	58	16.1%				$8,827												$8,827
Payroll Benefits Allocation (ZE) incl NPT	59	44.0%				$18,024												$18,024
Gen SVC CO Overhead (ZF) incl NPT	60	75.0%				$8,422												$8,422
E&S Allocations (Z)	61	66.0%				$63,979												$63,979
AS&E Allocations (ZJ)	62	1.2%				$2,322												$2,322
Stores Expense Allocation (ZC)	63	8.0%				$192												$192
Lobby Stock																		
MO&C		5.0%				$5,961												$5,961
Vehicles		28.0%				$12,702												$12,702
	63																	
Indirects Subtotal						$118,429												$118,429
TOTAL PROJECT COST - Direct & Indirect / excl AFUDC)						$224,973												$224,973
AFUDC																		
AFUDC (ZK)						$451	0		0		0		0		0			$451
In Service Dollars																		
Cumulative ISS																		
AFUDC Subtotal						$451												$451
TOTAL PROJECT COST - Baseline Budget						$225,424												$225,424
Continoecv																		
Contingency						$7,686												$7,686
Other																		
Continoecv SubTotal						$7,686												$7,686
TOTAL PROJECT COST - Approved Funding						$233,110												$233,110
Reimbursables / Customer Contribution																		
Reimbursables / Customer Contribution (enter as negative)	59																	
TOTAL PROJECT COST						$233,110												$233,110

Activity ID	Activity Name	Original Duration	Start	Finish	Predecessors	Successors	Activity Flag	DEPT - DEPARTMENT	Resources
405364 [redacted] T- (New House) - Battery Monitoring Installation (		152	04/01/2021 00 A	11/04/2021 16					
405364.01 INITIALIZATION AND SCOPE DEVELOPEMENT		98	04/01/2021 00 A	08/18/2021 16					
A3720	Project Start	0	04/01/2021 00 A			PI0060			
405364.01.08 Project Initiation		66	04/01/2021 08 A	07/02/2021 16					
405364.01.08.01 Initial Stage - Feasibility (0-15% defined)		15	04/01/2021 08 A	04/21/2021 16 A					[redacted]
PI0060	Develop Concept Document (0-15%)	15	04/01/2021 08 A	04/21/2021 16 A	A3720	PI0070		ENG.ST.SS.ELE	
PI0070	Concept Document Approved	0		04/21/2021 16 A	PI0060	SE1320, ST3001	ES-CONCPT	ENG.ST.SS.ELEC	
405364.01.08.02 Project Conceptual Stage (15-40% defined)		11	04/22/2021 08 A	05/06/2021 16 A					
405364.01.08.02.01 Preliminary Engineering		11	04/22/2021 08 A	05/06/2021 16 A					
SE1320	Prelim Engineering (Plan, Layout, Gen Amgmnt, OneLine, ID Matl, Permits)	10	04/22/2021 08 A	05/05/2021 16 A	PI0070	PAF1010, ST3001, PAF1000, PAF1030	ES-PRELIM	ENG.ST.SS.ELEC	
ST3001	Scope Document Created and Approved (15-40%)	1	05/06/2021 08 A	05/06/2021 16 A	SE1320, PI0070	PAF1010	ENG-SCOPE	ENG.ST.SS.ELEC	
405364.01.08.03 Project Authorization		40	04/01/2021 08 A	07/02/2021 16					
405364.01.08.03.01 EPAC Process		40	04/01/2021 08 A	07/02/2021 16					
PAF1000	Draft & Route Initial Funding EPAC	1	04/01/2021 08 A	04/01/2021 16 A	SE1320	PAF1010		ENG.AM.ENG	
PAF1010	Create Full Funding Estimate (+/- 25% Full Funding)	1	05/07/2021 08 A	05/07/2021 16 A	SE1320, ST3001, PAF1000	SE1330, PAF1020		ENG.ST.SS.ELEC	
PAF1020	ESDC Approves P2 Cost Estimates	0		05/07/2021 16 A	PAF1010	PAF1030	EST-FULL	ENG.ST.SS.ELE	
PAF1030	Prepare Full Funding PAF for EPAC and Internal Review	10	05/10/2021 08 A	05/14/2021 16 A	PAF1020, SE1320	PAF1050	PAF Submit	ENG.AM.ENG	
PAF1050	Submit Full Funding PAF Draft to EPAC	5	05/17/2021 08 A	05/17/2021 16 A	PAF1030	PAF1040		ENG.AM.ENG	
PAF1040	EPAC Full Funding Meeting	0		05/26/2021 16	PAF1050	PAF1060, PAF1070	EPAC-F		
PAF1070	Incorporate Full Funding PAF EPAC Comments	1	05/27/2021 08	05/27/2021 16	PAF1040	PAF1060		ENG.AM.ENG	
PAF1060	Route Full Funding EPAC, Sign-offs, PowerPlan Approval	15	05/28/2021 08	06/18/2021 16	PAF1040, PAF1070	PAF1080	PPA-FF	ENG.AM.ENG	
PAF1080	WO # Created	10	06/21/2021 08	07/02/2021 16	PAF1060	PR3530, PR3520, PR3510, PR3500, PR3440, PR3480,	PPA-FF		
405364.01.11 T-Minus Milestones		94	05/17/2021 08 A	08/18/2021 16					

TASK filter: All Activities

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Activity ID	Activity Name	Original Duration	Start	Finish	Predecessors	Successors	Activity Flag	DEPT - DEPARTMENT	Resources
405364.01.11.02	**Electrical T-Milestones**	94	05/17/2021 08 A	08/18/2021 16					
405364.01.11.02.1	**T-Minus Milestones Phase A**	94	05/17/2021 08 A	08/18/2021 16					
AT1301	A-T-13.01 Commissioning Plan Complete	0		05/17/2021 08 A		AT3002		ENG.ST.SUBTE	
AT1811	A-T-18.11 70% Design / Engineering Completed	0		05/28/2021 16	SE1330	AT3002	70%	ENG.ST.SS	
AT0814	A-T-08.14 Construction Contracts / PSA in Place	0		06/20/2021 16		AT3002		SITE	
AT0805E	A-T-08.05E IFC - Electrical (AG) w/BOM	0		06/20/2021 16	SE1340	AT3002		ENG.ST.SS	
AT0203	A-T-02.03 Go / No-Go [CAN] Construction Authorization Notice Form Complete	0		08/01/2021 16		AT3002		PROJ	
AT3002	T-00_Installation Battery Monitoring System Start (De-Energize)	0	08/16/2021 08*		AT0203, AT0814, AT1811, AT1301, AT0401, AT0805E	CN8500		CONS	
AT0401	AT-04_Monitor - Material Delivered	0		08/18/2021 16	PR3450, SE1340	AT3002		PURC	
405364.04	**SITING APPROVALS AND PERMITS**	11	05/03/2021 08 A	05/17/2021 16					
405364.04.05	**Compliance Regulatory & Non-Regulatory**	11	05/03/2021 08 A	05/17/2021 16					
A3700	N/R (PER TC 05-03-21) Prepare Compliance Matrix Non-Regulatory Commitments	1	05/03/2021 08 A	05/03/2021 16 A			COM	CONS	
A3710	N/R (PER TC 05-03-21) Prepare Compliance MatrixRegulatory	1	05/03/2021 08 A	05/03/2021 16 A			REG	CONS	
PPR630	C A N [go / no go] Submitted & Approved	1	05/17/2021 08	05/17/2021 16				PM	
405364.05	**ENGINEERING AND DESIGN**	20	05/17/2021 08	06/14/2021 16					
405364.05.02	**Electrical Engineering**	20	05/17/2021 08	06/14/2021 16					
405364.05.02.01	**Electrical Engineering 70% Design**	10	05/17/2021 08	05/28/2021 16					
SE1330	ES Engineering Engineering Creates Detail Engineering	10	05/17/2021 08	05/28/2021 16	PAF1010	SE1340, AT1811	ES-DTL	ENG.ST.SS.ELEC	
405364.05.02.02	**Electrical Engineering IFC Design**	10	06/01/2021 08	06/14/2021 16					
SE1340	ES Engineering Creates & Releases IFC Engineering	10	06/01/2021 08	06/14/2021 16	SE1330	AT0401, AT0805E	ES-IFC	ENG.ST.SS.ELEC	
405364.06	**MATERIAL**	66	05/17/2021 08 A	08/18/2021 16					
405364.06.02	**Electrial Material**	66	05/17/2021 08 A	08/18/2021 16					
405364.06.02.01	**Electrical Material**	66	05/17/2021 08 A	08/18/2021 16					
405364.06.02.01.01	**Battery**	1	05/17/2021 08 A	05/17/2021 16 A					
PR3420	N/R - PO Issued - Battery	1	05/17/2021 08 A	05/17/2021 16 A	PR3500, PAF1080	PR3430		PURC	
PR3430	N/R - Manufacture/ Fabricate/ Deliver Battery	1	05/17/2021 08 A	05/17/2021 16 A	PR3420			PURC	
PR3500	N/R - DR Issued - Battery	1	05/17/2021 08 A	05/17/2021 16 A	PAF1080	PR3420	DR-AGMAT	ENG.ST.SS.ELE	

TASK filter: All Activities

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Activity ID	Activity Name	Original Duration	Start	Finish	Predecessors	Successors	Activity Flag	DEPT - DEPARTMENT	Resources
405364.06.02.01.02 Battery Monitor		32	07/06/2021 08	08/18/2021 16					[redacted]
PR3520	DR Issued - Battery Monitor and Installation	1	07/06/2021 08	07/06/2021 16	PAF1080	PR3440	DR-AGMAT	ENG.ST.SS.ELE	
PR3440	PO Issued - Battery Monitor and Installation	1	07/07/2021 08	07/07/2021 16	PR3520, PAF1080	PR3450		PURC	
PR3450	Manufacture/ Fabricate/ Deliver Battery Monitor	30	07/08/2021 08	08/18/2021 16	PR3440	AT0401		PURC	
405364.06.02.01.03 Battery Charger		1	05/17/2021 08 A	05/17/2021 16 A					
PR3460	N/R - PO Issued - Battery Charger	1	05/17/2021 08 A	05/17/2021 16 A	PR3510, PAF1080	PR3470		PURC	
PR3470	N/R - Manufacture/ Fabricate/ Deliver Battery charger	1	05/17/2021 08 A	05/17/2021 16 A	PR3460			PURC	
PR3510	N/R - DR Issued - Battery Charger	1	05/17/2021 08 A	05/17/2021 16 A	PAF1080	PR3460	DR-AGMAT	ENG.ST.SS.ELE	
405364.06.02.01.04 Misc Electrical Material		17	07/06/2021 08	07/28/2021 16					
PR3530	DR Issued - Misc. Electrical Material including Jct Box	1	07/06/2021 08	07/06/2021 16	PAF1080	PR3480	DR-AGMAT	ENG.ST.SS.ELE	
PR3480	PO Issued - Misc. Electrical Material including Jct Box	1	07/07/2021 08	07/07/2021 16	PR3530, PAF1080	PR3490		PURC	
PR3490	MFG and Ship Misc. Electrical Material	15	07/08/2021 08	07/28/2021 16	PR3480			PURC	
405364.07 CONSTRUCTION		73	05/17/2021 08 A	08/27/2021 16					
405364.07.02 Electrical Construction		73	05/17/2021 08 A	08/27/2021 16					
405364.07.02.03 Equipment		73	05/17/2021 08 A	08/27/2021 16					
405364.07.02.03.01 [redacted]		73	05/17/2021 08 A	08/27/2021 16					
405364.07.02.03.01.01 Battery Monitoring Installation - Southington 4C		10	08/16/2021 08	08/27/2021 16					
CN8500	Battery Monitoring Installation Works & Testing	10	08/16/2021 08	08/27/2021 16	AT3002	CN8510		ENG.ENGR.FIE	
CN8510	Constr Compl (Field In Service Date)	0		08/27/2021 16	CN8500	XL5840		CONS	
405364.07.02.03.01.02 Battery Installation - Southington 4C		15	05/17/2021 08 A	05/17/2021 16 A					
CN8520	N/R - Battery Installation Works & Testing	15	05/17/2021 08 A	05/17/2021 16 A		CN8530		ENG.ENGR.FIE	
CN8530	N/R - Constr Compl (Field In Service Date)	0		05/17/2021 08 A	CN8520	XL5840		CONS	
405364.10 PROJECT CLOSE OUT		47	08/27/2021 16	11/04/2021 16					
405364.10.1 As-Built Drawings		15	08/30/2021 08	09/20/2021 16					
XL5200	As-Built Drawings Notify by Transmittal to Field if Package Received is Complete	5	08/30/2021 08	09/03/2021 16	XL5840	XL5210	ES-ASB	ENG.ST.SS.ELE	
XL5210	As-Built Drawings Field Review Complete Drawings and Notify Acceptance	5	09/07/2021 08	09/13/2021 16	XL5200	XL5220, XL5870	EXC	ENG.ENGR.FIEL	
XL5220	As-Built Drawings Field Notify Drawing Acceptance and Print Drawings Filed	5	09/14/2021 08	09/20/2021 16	XL5210	XL5850	EXC	ENG.ENGR.FIE	
XL5870	TD707 Completed and Filed	5	09/14/2021 08	09/20/2021 16	XL5210	XL5850	EXC	ENG.ST.SS.ELE	
405364.10.09 Work Order / Financial Close Out		47	08/27/2021 16	11/04/2021 16					
405364.10.09.01 Station [redacted]		45	08/27/2021 16	11/02/2021 16					
405364.10.09.01.01 Close Out		45	08/27/2021 16	11/02/2021 16					

TASK filter: All Activities

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Activity ID	Activity Name	Original Duration	Start	Finish	Predecessors	Successors	Activity Flag	DEPT - DEPARTMENT	Resources
XL5840	In Service Date	0		08/27/2021 16*	CN8510, CN8530	XL5850, XL5200	ISD	PM	
XL5850	Final Inspection, AsBuilts submitted, TD707 Punchlist Work	30	09/21/2021 08	11/02/2021 16	XL5840, XL5220, XL5870	XL5860	EXC	PM	
XL5860	Close Out Complete	0		11/02/2021 16	XL5850		EXC	PM	
405364.10.09.39	**CLOSE OUT**	5	10/29/2021 08	11/04/2021 16					
405364.10.09.39.01	**Units of Property**	5	10/29/2021 08	11/04/2021 16					
XL5270	PM/ Engr/ Plant Acct Develop Prelim UOP & UOR List(s)	5	10/29/2021 08*	11/04/2021 16		XL5280		PM	[redacted]
XL5280	Review UOP, compl forms, fwrd to Plant Acctng, enter in wrkbk	5	10/29/2021 08	11/04/2021 16	XL5270	AT0602		PM	
AT0602	Units of Property issued to Plant Accounting	0		11/04/2021 16	XL5280			PM	

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Activity ID	Activity Name	Original Duration	Start	Finish	Predecessors	Successors	Activity Flag	DEPT - DEPARTMENT	Resources
CS00483	**[redacted]D- (Old House) - Battery Monitoring Installation**	152	04/01/2021 00 A	11/04/2021 16					
CS00483.01	**INITIALIZATION AND SCOPE DEVELOPEMENT**	98	04/01/2021 00 A	08/18/2021 16					
A3720	Project Start	0	04/01/2021 00 A			PI0060			
CS00483.01.08	**Project Initiation**	66	04/01/2021 08 A	07/02/2021 16					
CS00483.01.08.01	**Initial Stage - Feasibility (0-15% defined)**	15	04/01/2021 08 A	04/21/2021 16 A					
PI0060	Develop Concept Document (0-15%)	15	04/01/2021 08 A	04/21/2021 16 A	A3720	PI0070		ENG.ST.SS.ELE	
PI0070	Concept Document Approved	0		04/21/2021 16 A	PI0060	SE1320, ST3001	ES-CONCPT	ENG.ST.SS.ELEC	
CS00483.01.08.02	**Project Conceptual Stage (15-40% defined)**	11	04/22/2021 08 A	05/06/2021 16 A					
CS00483.01.08.02.01	**Preliminary Engineering**	11	04/22/2021 08 A	05/06/2021 16 A					
SE1320	Prelim Engineering (Plan, Layout, Gen Amgmnt, OneLine, ID Matl, Permits)	10	04/22/2021 08 A	05/05/2021 16 A	PI0070	PAF1010, ST3001, PAF1000, PAF1030	ES-PRELIM	ENG.ST.SS.ELEC	
ST3001	Scope Document Created and Approved (15-40%)	1	05/06/2021 08 A	05/06/2021 16 A	SE1320, PI0070	PAF1010	ENG-SCOPE	ENG.ST.SS.ELEC	
CS00483.01.08.03	**Project Authorization**	40	04/01/2021 08 A	07/02/2021 16					
CS00483.01.08.03.01	**EPAC Process**	40	04/01/2021 08 A	07/02/2021 16					
PAF1000	Draft & Route Initial Funding EPAC	1	04/01/2021 08 A	04/01/2021 16 A	SE1320	PAF1010		ENG.AM.ENG	
PAF1010	Create Full Funding Estimate (+/- 25% Full Funding)	1	05/07/2021 08 A	05/07/2021 16 A	SE1320, ST3001, PAF1000	SE1330, PAF1020		ENG.ST.SS.ELEC	
PAF1020	ESDC Approves P2 Cost Estimates	0		05/07/2021 16 A	PAF1010	PAF1030	EST-FULL	ENG.ST.SS.ELE	
PAF1030	Prepare Full Funding PAF for EPAC and Internal Review	10	05/10/2021 08 A	05/14/2021 16 A	PAF1020, SE1320	PAF1050	PAF Submit	ENG.AM.ENG	
PAF1050	Submit Full Funding PAF Draft to EPAC	5	05/17/2021 08 A	05/17/2021 16 A	PAF1030	PAF1040		ENG.AM.ENG	
PAF1040	EPAC Full Funding Meeting	0		05/26/2021 16	PAF1050	PAF1060, PAF1070	EPAC-F		
PAF1070	Incorporate Full Funding PAF EPAC Comments	1	05/27/2021 08	05/27/2021 16	PAF1040	PAF1060		ENG.AM.ENG	
PAF1060	Route Full Funding EPAC, Sign-offs, PowerPlan Approval	15	05/28/2021 08	06/18/2021 16	PAF1040, PAF1070	PAF1080	PPA-FF	ENG.AM.ENG	
PAF1080	WO # Created	10	06/21/2021 08	07/02/2021 16	PAF1060	PR3530, PR3520, PR3510, PR3500, PR3440, PR3480,	PPA-FF		
CS00483.01.11	**T-Minus Milestones**	94	05/17/2021 08 A	08/18/2021 16					

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Activity ID	Activity Name	Original Duration	Start	Finish	Predecessors	Successors	Activity Flag	DEPT - DEPARTMENT	Resources
CS00483.01.11.02 Electrical T-Milestones		94	05/17/2021 08 A	08/18/2021 16					
CS00483.01.11.02.1 T-Minus Milestones Phase A		94	05/17/2021 08 A	08/18/2021 16					
AT1301	A-T-13.01 Commissioning Plan Complete	0		05/17/2021 08 A		AT3002		ENG.ST.SUBTE	
AT1811	A-T-18.11 70% Design / Engineering Completed	0		05/28/2021 16	SE1330	AT3002	70%	ENG.ST.SS	
AT0814	A-T-08.14 Construction Contracts / PSA in Place	0		06/20/2021 16		AT3002		SITE	
AT0805E	A-T-08.05E IFC - Electrical (AG) w/BOM	0		06/20/2021 16	SE1340	AT3002		ENG.ST.SS	
AT0203	A-T-02.03 Go / No-Go [CAN] Construction Authorization Notice Form Complete	0		08/01/2021 16		AT3002		PROJ	
AT3002	T-00_Installation Battery Monitoring System Start (De-Energize)	0	08/16/2021 08*		AT0203, AT0814, AT1811, AT1301, AT0401, AT0805E	CN8500		CONS	
AT0401	AT-04_Monitor - Material Delivered	0		08/18/2021 16	PR3450, SE1340	AT3002		PURC	
CS00483.04 SITING APPROVALS AND PERMITS		11	05/03/2021 08 A	05/17/2021 16					
CS00483.04.05 Compliance Regulatory & Non-Regulatory		11	05/03/2021 08 A	05/17/2021 16					
A3700	N/R (PER TC 05-03-21) Prepare Compliance Matrix Non-Regulatory Commitments	1	05/03/2021 08 A	05/03/2021 16 A			COM	CONS	
A3710	N/R (PER TC 05-03-21) Prepare Compliance MatrixRegulatory	1	05/03/2021 08 A	05/03/2021 16 A			REG	CONS	
PPR630	C A N [go / no go] Submitted & Approved	1	05/17/2021 08	05/17/2021 16				PM	
CS00483.05 ENGINEERING AND DESIGN		20	05/17/2021 08	06/14/2021 16					
CS00483.05.02 Electrical Engineering		20	05/17/2021 08	06/14/2021 16					
CS00483.05.02.01 Electrical Engineering 70% Design		10	05/17/2021 08	05/28/2021 16					
SE1330	ES Engineering Engineering Creates Detail Engineering	10	05/17/2021 08	05/28/2021 16	PAF1010	SE1340, AT1811	ES-DTL	ENG.ST.SS.ELEC	
CS00483.05.02.02 Electrical Engineering IFC Design		10	06/01/2021 08	06/14/2021 16					
SE1340	ES Engineering Creates & Releases IFC Engineering	10	06/01/2021 08	06/14/2021 16	SE1330	AT0401, AT0805E	ES-IFC	ENG.ST.SS.ELEC	
CS00483.06 MATERIAL		66	05/17/2021 08 A	08/18/2021 16					
CS00483.06.02 Electrial Material		66	05/17/2021 08 A	08/18/2021 16					
CS00483.06.02.01 Electrical Material		66	05/17/2021 08 A	08/18/2021 16					
CS00483.06.02.01.01 Battery		1	05/17/2021 08 A	05/17/2021 16 A					
PR3420	N/R - PO Issued - Battery	1	05/17/2021 08 A	05/17/2021 16 A	PR3500, PAF1080	PR3430		PURC	
PR3430	N/R - Manufacture/ Fabricate/ Deliver Battery	1	05/17/2021 08 A	05/17/2021 16 A	PR3420			PURC	
PR3500	N/R - DR Issued - Battery	1	05/17/2021 08 A	05/17/2021 16 A	PAF1080	PR3420	DR-AGMAT	ENG.ST.SS.ELE	

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Activity ID	Activity Name	Original Duration	Start	Finish	Predecessors	Successors	Activity Flag	DEPT - DEPARTMENT	Resources
CS00483.06.02.01.02 Battery Monitor		32	07/06/2021 08	08/18/2021 16					[redacted]
PR3520	DR Issued - Battery Monitor and Installation	1	07/06/2021 08	07/06/2021 16	PAF1080	PR3440	DR-AGMAT	ENG.ST.SS.ELE	
PR3440	PO Issued - Battery Monitor and Installation	1	07/07/2021 08	07/07/2021 16	PR3520, PAF1080	PR3450		PURC	
PR3450	Manufacture/ Fabricate/ Deliver Battery Monitor	30	07/08/2021 08	08/18/2021 16	PR3440	AT0401		PURC	
CS00483.06.02.01.03 Battery Charger		1	05/17/2021 08 A	05/17/2021 16 A					
PR3460	N/R - PO Issued - Battery Charger	1	05/17/2021 08 A	05/17/2021 16 A	PR3510, PAF1080	PR3470		PURC	
PR3470	N/R - Manufacture/ Fabricate/ Deliver Battery charger	1	05/17/2021 08 A	05/17/2021 16 A	PR3460			PURC	
PR3510	N/R - DR Issued - Battery Charger	1	05/17/2021 08 A	05/17/2021 16 A	PAF1080	PR3460	DR-AGMAT	ENG.ST.SS.ELE	
CS00483.06.02.01.04 Misc Electrical Material		17	07/06/2021 08	07/28/2021 16					
PR3530	DR Issued - Misc. Electrical Material including Jct Box	1	07/06/2021 08	07/06/2021 16	PAF1080	PR3480	DR-AGMAT	ENG.ST.SS.ELE	
PR3480	PO Issued - Misc. Electrical Material including Jct Box	1	07/07/2021 08	07/07/2021 16	PR3530, PAF1080	PR3490		PURC	
PR3490	MFG and Ship Misc. Electrical Material	15	07/08/2021 08	07/28/2021 16	PR3480			PURC	
CS00483.07 CONSTRUCTION		73	05/17/2021 08 A	08/27/2021 16					
CS00483.07.02 Electrical Construction		73	05/17/2021 08 A	08/27/2021 16					
CS00483.07.02.03 Equipment		73	05/17/2021 08 A	08/27/2021 16					
CS00483.07.02.03.01 [redacted]		73	05/17/2021 08 A	08/27/2021 16					
CS00483.07.02.03.01.01 Battery Monitoring Installation - [redacted]		10	08/16/2021 08	08/27/2021 16					
CN8500	Battery Monitoring Installation Works & Testing	10	08/16/2021 08	08/27/2021 16	AT3002	CN8510		ENG.ENGR.FIE	
CN8510	Constr Compl (Field In Service Date)	0		08/27/2021 16	CN8500	XL5840		CONS	
CS00483.07.02.03.01.02 Battery Installation - [redacted]		15	05/17/2021 08 A	05/17/2021 16 A					
CN8520	N/R - Battery Installation Works & Testing	15	05/17/2021 08 A	05/17/2021 16 A		CN8530		ENG.ENGR.FIE	
CN8530	N/R - Constr Compl (Field In Service Date)	0		05/17/2021 08 A	CN8520	XL5840		CONS	
CS00483.10 PROJECT CLOSE OUT		47	08/27/2021 16	11/04/2021 16					
CS00483.10.1 As-Built Drawings		15	08/30/2021 08	09/20/2021 16					
XL5200	As-Built Drawings Notify by Transmittal to Field if Package Received is Complete	5	08/30/2021 08	09/03/2021 16	XL5840	XL5210	ES-ASB	ENG.ST.SS.ELE	
XL5210	As-Built Drawings Field Review Complete Drawings and Notify Acceptance	5	09/07/2021 08	09/13/2021 16	XL5200	XL5220, XL5870	EXC	ENG.ENGR.FIEL	
XL5220	As-Built Drawings Field Notify Drawing Acceptance and Print Drawings Filed	5	09/14/2021 08	09/20/2021 16	XL5210	XL5850	EXC	ENG.ENGR.FIE	
XL5870	TD707 Completed and Filed	5	09/14/2021 08	09/20/2021 16	XL5210	XL5850	EXC	ENG.ST.SS.ELE	
CS00483.10.09 Work Order / Financial Close Out		47	08/27/2021 16	11/04/2021 16					
CS00483.10.09.01 Station [redacted]		45	08/27/2021 16	11/02/2021 16					
CS00483.10.09.01.01 Close Out		45	08/27/2021 16	11/02/2021 16					

TASK filter: All Activities

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Activity ID	Activity Name	Original Duration	Start	Finish	Predecessors	Successors	Activity Flag	DEPT - DEPARTMENT	Resources
XL5840	In Service Date	0		08/27/2021 16*	CN8510, CN8530	XL5850, XL5200	ISD	PM	
XL5850	Final Inspection, AsBuilts submitted, TD707 Punchlist Work	30	09/21/2021 08	11/02/2021 16	XL5840, XL5220, XL5870	XL5860	EXC	PM	
XL5860	Close Out Complete	0		11/02/2021 16	XL5850		EXC	PM	
CS00483.10.09.39 CLOSE OUT		5	10/29/2021 08	11/04/2021 16					
CS00483.10.09.39.01 Units of Property		5	10/29/2021 08	11/04/2021 16					
XL5270	PM/ Engr/ Plant Acct Develop Prelim UOP & UOR List(s)	5	10/29/2021 08*	11/04/2021 16		XL5280		PM	[redacted]
XL5280	Review UOP, compl forms, fwrd to Plant Acctng, enter in wrkbk	5	10/29/2021 08	11/04/2021 16	XL5270	AT0602		PM	
AT0602	Units of Property issued to Plant Accounting	0		11/04/2021 16	XL5280			PM	

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Constructability Review Form: **Substation**

Project Title: Battery Monitor – [redacted]	☐	Prior Constructability Review Performed?
	☐	Program Related Site Specific Review?
Project Numbers(s): CS00428(D) 405229(T)	**Project Constructability Phase:**	
Date(s) of Constructability Review: **03/18/2021**	☐ Conceptual Engineering Design ☒ Preliminary Engineering Design ☐ Detailed Engineering Design	
Project Scope Statement: Battery Monitor installation **Review of Battery Monitor Installations with Real Power & Construction**		

Department Review/Walkdown Attendees*:

Required [X]	Attended [X]	Department	Name	Required [X]	Attended [X]	Department	Name
☒	☒	Project Management	[redacted]	☒	☒	S/S Engineering	[redacted]
☐	☒	Civil Construction		☒	☒	S/S Engineering	
☐	☐	Asset Management		☒	☒	S/S Engineering	
☒	☒	S/S Technical / LCE		☐	☐	P&C Engineering	
☐	☐	Constr. Management		☐	☐	Civil Engineering	
☐	☐	Test/LCE		☐	☐	Telecom	
☐	☐	S/S Operations**		☐	☐	Environmental	
☐	☐	Field Engineering		☐	☐	Real Estate	
☐	☐	Siting		☐	☐		
☐	☐	Safety		☐	☐	Real Power	
☐	☐	SCADA		☐	☐	Real Power	

*** Sign-off in the table above for the Detailed Engineering Design Constructability Review indicates that all Action Items/Concerns from prior Constructability Reviews have been mitigated/resolved as documented in this form. Not every department is required to attend walkdowns for every project but should be consulted for project impact considerations**

** Internal Eversource Substation Operations must be included in the review even if external construction resources are planned

[Project Manager] certifies that this review was performed to completeness, that all applicable departments were informed of the project and have had opportunity to provide input to this review:

[redacted] *4/20/2021*

Name / Signature *Date*

EVERSOURCE

Constructability Review Form: **Substation**

Documents available for use prior to Constructability Review					
[X]	Document	[X]	Document	[X]	Document
☒	Initial Scope -Birdseye site plan -General Arrangement	☐	Preliminary Drawings -Civil Site Drawing -Electrical Drawing -Section Drawings	☒	Prints in hand for marking up -Panel Front/Read View -Control Enclosure Layout -Floor / Wall Plans
☒	Detailed Scope Document	☐	Proposed Schedule	☐	Construction Sequence/Timeline
☐	Previous Notes / Comments / Observations	☒	Major Material / Equipment List	☐	Replace / Reuse of equipment

Action Items and Resolutions:

Item No.	Const. Review Action Item/Concern	Design Resolution/Mitigation:
1	**Length of cable between batteries and control cabinets**	**Minimize length by using wall pentrations**
2	**Wall penetrations and lead paint**	**Have paint sampled by environmental testing co.**
3		
4		
5		

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
A	**Engineering & Asset Management**		
1	**Scope of Work** - Is scope adequately developed and sufficiently detailed for intended deliverable? - Any complimentary projects or other adjacent obsolete equipment for inclusion? - Any overlapping projects that could impact work/outages? - Consider Physical Installation, P&C Scope, Civil Scope, Engineering studies, Design standard adherence - Any remote station impacts? - Engineering Estimates for Design and Technical Support? (EE and EOC) Total Project	☐	Battery Monitor installation including review of wall space for monitor and junction box, review security cabinet and communication (SCADA) cabinet for available points. Determine if battery cart is required.

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
2	**Materials Identified/Ordered** -Any concerns with BOM/Major Materials? Review BOM lead times and project need dates -Specialty Major Materials: Identify Specialty Equipment & Materials potentials - temporary/replacement - long lead items? -Any Materials needed to facilitate construction access?	☐	Battery Monitor will be longest lead item, all other equipment should be readily available. Review length of runs for new cable.
3	**Control House** - Review Unmapped equipment interferences, Control/Battery Enclosure Layout, HVAC System (if equipment added), space for new or modified equipment, AC / DC station breaker availability and service loading, Panel Space, Expansion, one-line and/or riser type panelboard drawings, other..	☐	Reviewed AC panel spacing if Battery Cart is needed. Security Cabinet has available space (115kV).
4	**Ratings & Dimensions** for Major Equipment. Any concerns upon field review? Equipment Rating One Line (and/or equipment thermal ratings tables) - Review for any errors in field	X	
5	**Wall, Fence, Gate, and Foundation Considerations** -Any permanent / temporary alterations or relocations required? -Pre-Project Sound Measurements Needed? Sound Walls? -Take measurements for Foundation quantities, dimensions and concrete volumes -CIP Review/Ballistic needs. Any Physical Security Requirement Consideration? -Assess condition of existing yard equipment foundations and viability for reuse (if proposed) -Review station expansion areas (if needed) for structures, old foundations, etc. -Any Steel Structural Plan Considerations? -Any impacts to construction plan?	X	
6	**Below Grade / Enclosure Raceway** - If possible, evaluate existing raceway and review spacing requirements. Review for any subsurface investigation needs or potential below grade obstructions. GPR/test pits needed? Geotechnical Investigation - is soil boring or resistivity investigation needed?	X	

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
7	**Underground Obstructions** -Drawing review concerns? -Is preconstruction or test excavation needed? -Is reuse of underground control cables / Conduits /replace Non-Shielded Cable feasible (if applicable) -Are spare conduits available? Are they useable? -Review if any areas will need to be plated for increased load bearing for equipment access (i.e. large Xfmr, etc.)	X	
8	**Grounding Plan (Ground Grid)** - Will footprint impact layout or other equipment? Identify locations to improve grounding. Impacts to foundations and ground grid plans. Observations on wetlands or ability to perform tests	X	
9	Nomenclature / Switching One-Line Diagram -Any obvious deviations from diagrams provided?	X	
10	BPS Separation Requirements - Is this BPS Substation? Y/N (part of PAF) - Changes to pre-existing BPS standards?	☐	Identify if Primary & Backup are separated and maintain separation.
11	IEC 61850 Substation Automation and Communication Requirements - Any Impacts/Retrofit needed?	X	
12	Any Upgrades to ES Standards - Is retrofit needed to bring up to ES standards? Can that be done?	X	
B	**Construction**		
1	**Any safety hazards specific to the facility? i.e. Low Bus, Deterioration, etc.**	☐	Identify if Lead Paint or ACM flooring of other tiles.
2	**Prior known Site Specific Conditions** -Common or Obvious station Issues -Missing scope items that could impact costs?	X	
3	**Identify/Consider Required Depts for Construction?** -Who is constructor: Internal vs External Resources -S/S Ops, GO, Test, Field Engineering, etc	☐	Consult with Internal Construction and Area Work Centers or District for construction. Real Power to install Battery Monitors

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
	-Specialty Contractors Required? -Required Oversite Needed - Estimated level of CR and LCE support needed		Wall drilling may be needed, screen for lead paint.
4	**Site Plan, Access, and Temporary Construction Facilities:** -Confirm maintenance access for proposed new or replaced equipment -Verify clear footprint for yard equipment / Property Plan -General access to site, can areas outside substation be utilized? -Substation Entry Plan (driveway and drive path modifications) - Identification of Unique Requirements, i.e. (access bridges, station service, etc.) -Site Development Plan (grading and drainage) with Cut/Fill -Existing Rock Conditions? Potential Impacts (rock quantity)? -Any police details needed for deliveries, restricted hours, and/or need for extended hour approvals -Any Sanitary Civil Requirements? (Septic tanks, etc) -Review turning radius for delivery trucks (if critical) -Any Substation Access and site/yard access Limitations? -Office Trailer Needs: Facilities, Utilities, Restroom, Container, Dumpster Space -Weather impacts to Site (Snow Placement) -Identify Material Laydown and Security -Where will new vs removed equipment go? -Construction permit for trailers outside substation fence?	X	
5	Unique Equipment Considerations: Gas insulated substation, Gas insulated line, Gas insulated bus, Pass Breaker, Statcom, Sync Condenser	X	

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
6	**Outage & Energization Plan and Construction Sequence:** *Review electrical working clearances for equipment during construction, Detailed look at protection zone changes, Locked sequence or random outages, Outage durations minimized.* ***Considerations:*** -Approach Distances – Outage Requirements to maintain electrical clearances throughout proposed installation -Distribution Clearances -Clearance Holder Assignments -Drawings vs Field Conditions -Outage boundaries and interconnections -Phased approach needs for additional mobilizations -Verify outage sequence supports the planned construction sequence and timeline. (Lead Commissioning Engineer "LCE", Substation Operations, and Outage Planner input) -Any design alterations or considerations to Eliminate SCLL Conditions, Reduce Recall Time, Reduce Outage durations, Special Conditions -Additional outage requirements: Railroad Catenaries, Fiber outage, SCADA outage, Relay permissions -Seasonal or weather conditions impacts	X	
7	**Equipment Testing & Acceptance** -Grounding plans / Resources? Will we need grounds hung? -Hi-pot testing and where will the equipment be set up?	☐	S/S Tech Engineering to commission and Real Power to test
8	Need for mobile generator and where connected (if needed)	X	
9	Need for mobile battery and where connected (if needed)	☐	Portable Battery is needed in New Control House.
10	OT work required or Notable Permit Conditions (special hours)?	X	
11	Coordination of boundaries/seams (Identification of point of demarcation for connection to existing equipment and/or for coordination with other municipalities)	X	

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
C	**Environmental**		
1	Soil Pre-Characterization or Grab Sampling Completed/Planned	X	
2	**Desktop investigation and EAD Review** -Required Permits -Stormwater Considerations -Dewatering requirements -Wetland and buffer review	X	
3	Risk or presence of PCB's/Asbestos/Lead/SF6	☐	Review if Lead Paint or ACM are present
4	Transformer Spill Containment Recommended?	X	
5	Expanding Footprint / New Buildings or future Expansion Plans? (Enviro Impact)	X	
6	Environmental oversight considerations? (Inspection type/Interval)	X	
7	Environmental mitigations - Any matting or seasonal needs? Review D&M Plan with CR.	X	
D	**Siting, S&CS, and T&D Real Estate**		
1	**Any regulatory concerns or approvals needed?** - Consider scope/design alterations to mitigate concerns - Consider Visual screening considerations (feasibility or location) -Zoning Relief and Permits required	X	
2	**Neighbor/Abutter impacts:** - Any noise, visual impacts, or sensitive abutters - Any changes to lighting or additional lighting needed?	X	
3	Review for roadway, gate access, trailers, equip height, noise, weekend/night work, or any potential public disturbance related to work	X	
4	Installation within Eversource Rights - Is Rights and Restrictions Review required?	X	
5	Expanding Footprint / New Buildings or future Expansion Plans?	X	
6	Proposed Equipment on same property? - Any Encroachments	X	

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
F	**Protection & Controls**		
1	Panel Graphic additions and/or Modifications	X	
2	Space on existing panels for new equipment? (front & rear of panel fronts)	X	
3	Panel fronts conform to drawings	X	
4	Access to bring new panels into control enclosure	X	
5	Nameplate list and location of nameplates	X	
6	Verifies that relays and meters that will be an interconnected project work are as shown on the drawings.	X	
7	Temporary protection, relays, control cable needed? How long will they be required?	X	
8	Will relay setting changes be needed? Any additional outage requirements for changes?	X	
G	**Telecom Engineering**		
1	Review telecom equipment in existing control enclosure	☐	Review for available SCADA Points
2	Review path to get telecom circuits into the station and paths within the control house. Determine whether new underground duct or overhead tray work is needed.	☐	Review path within substation
3	Review current or proposed Telecom equipment power connections and validate with P&C any need for system 1 and system 2 separation.	X	
4	Review current Telecom fiber diversity and validate with P&C any fiber diversity requirements.	X	
5	Review and list any remote station impacts/updates	X	
6	Confirm whether correct interface equipment is available (i.e.) for fiber termination or multiplexor termination	☐	Available Spares reviewed
7	Confirm whether existing communications cabinets are enough to support additional telecommunications equipment installed	☐	Review internet switches

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
8	Review space for any required additional communications cabinets which may be required to support additional telecommunications equipment installed	X	
9	Review third party Telecommunications at substation and confirm whether additional capacity or Ground Potential Rise protection is required	X	

Photos

(Ex. Equipment control cabinet, Breakers, MODs, CCVTs, PTs, Transformers)

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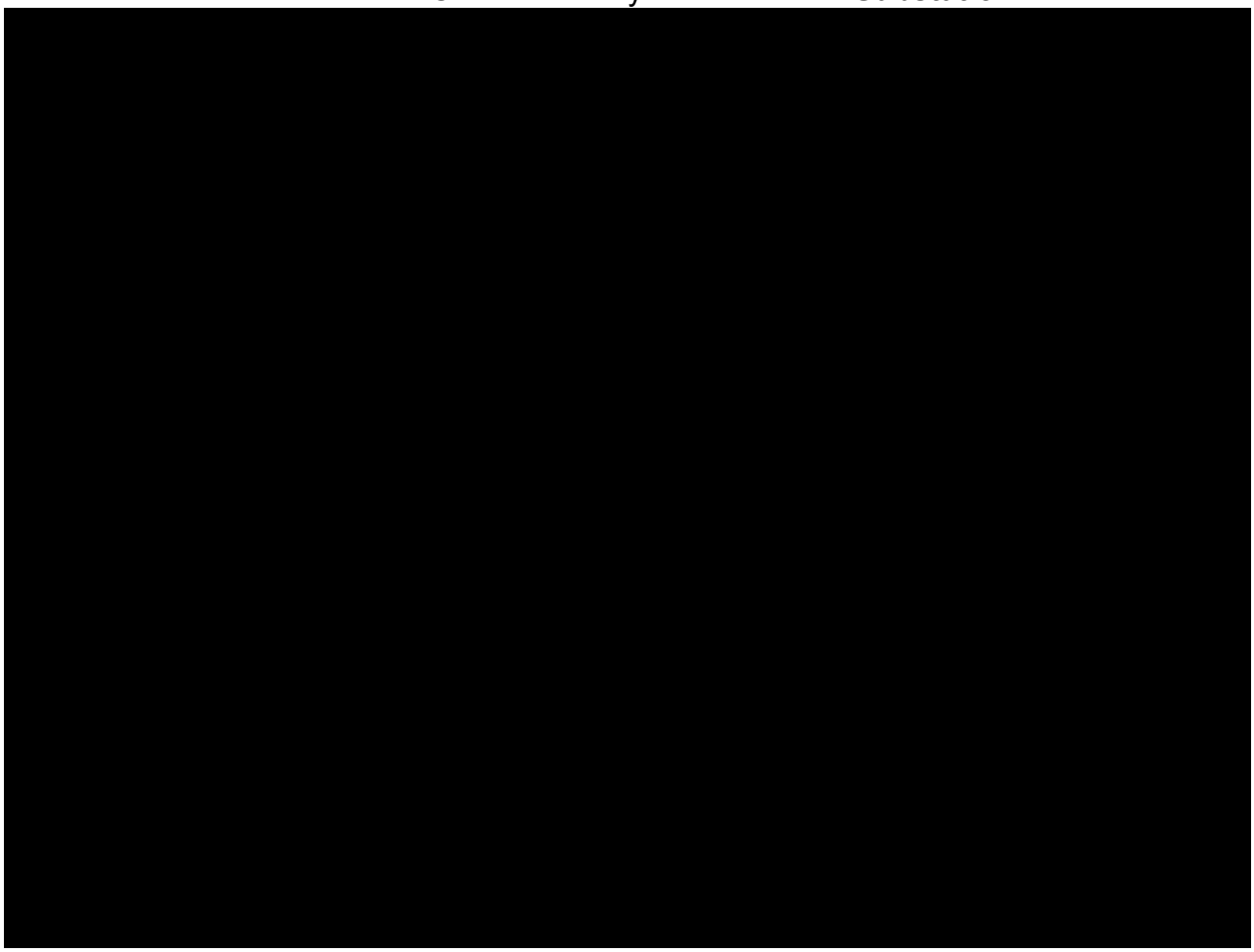
Constructability Review Form: **Substation**



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Constructability Review Form: **Substation**



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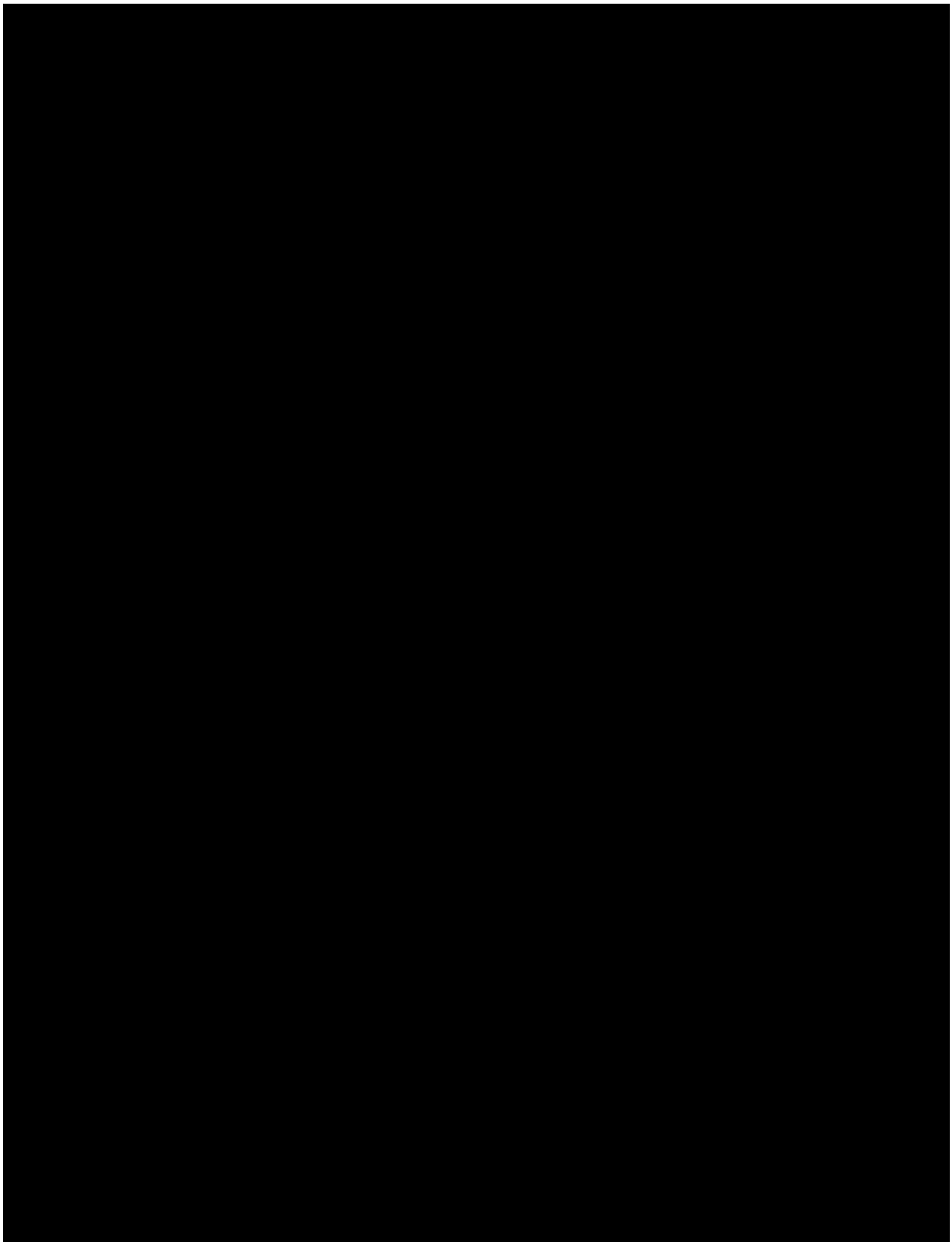
Constructability Review Form: **Substation**



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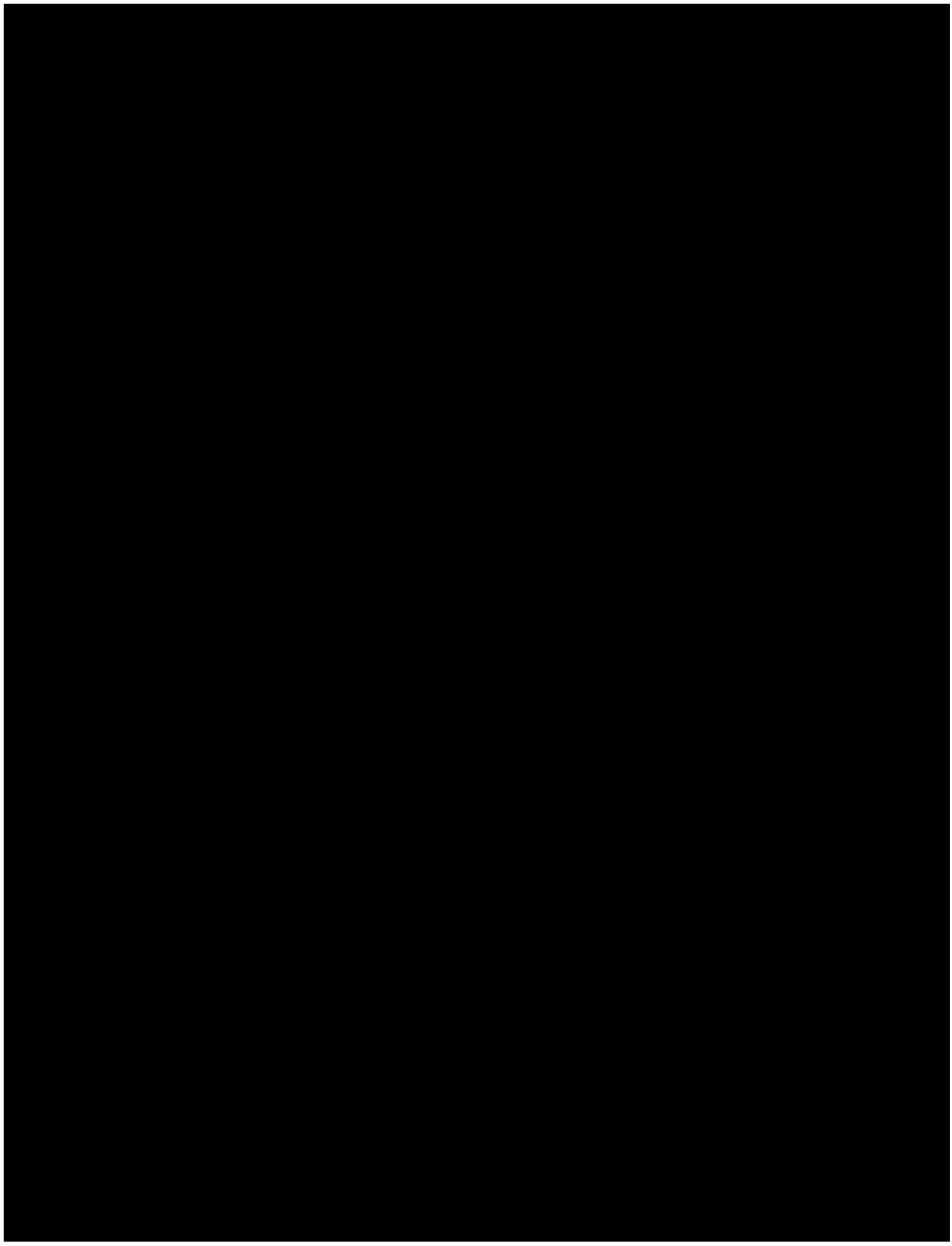

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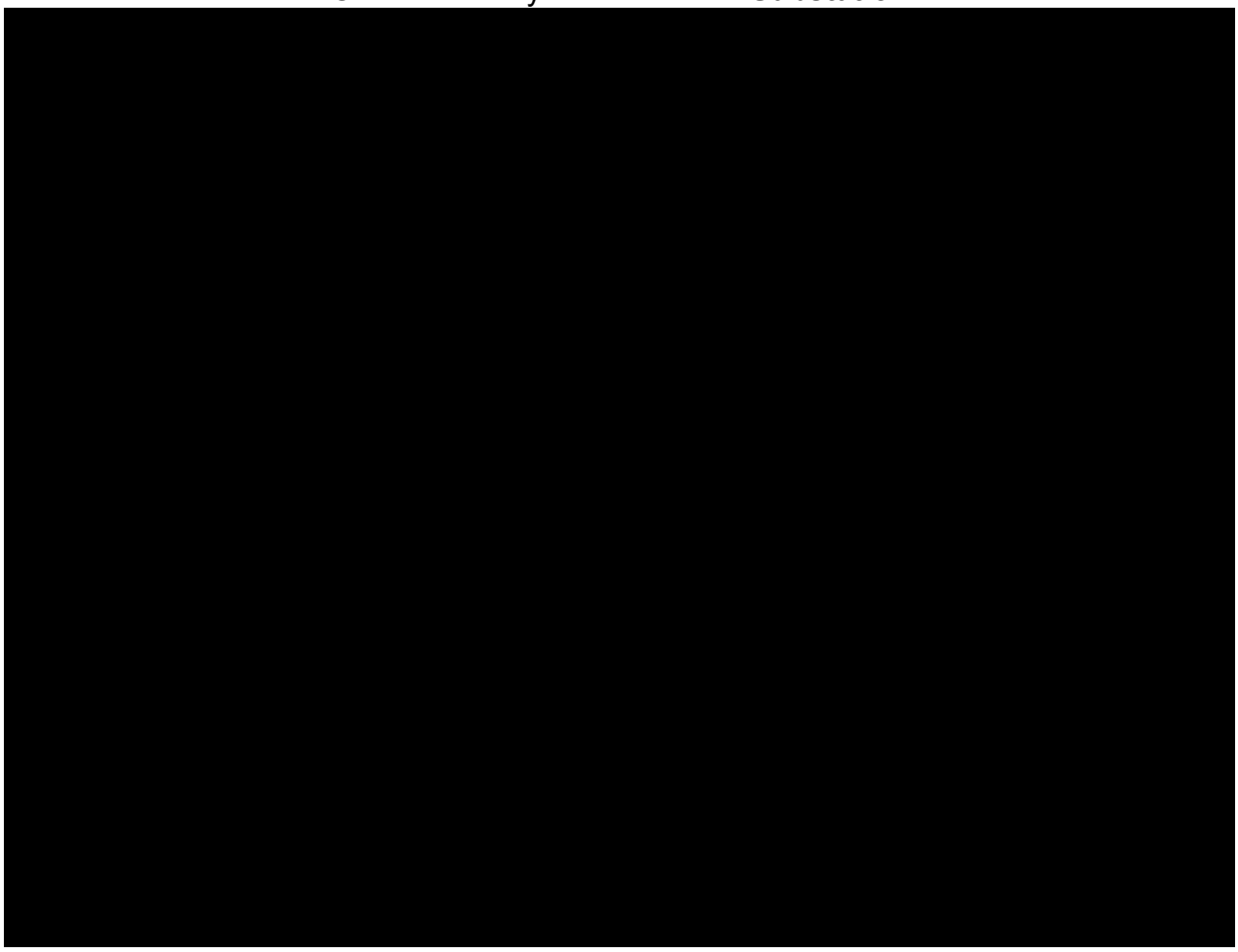

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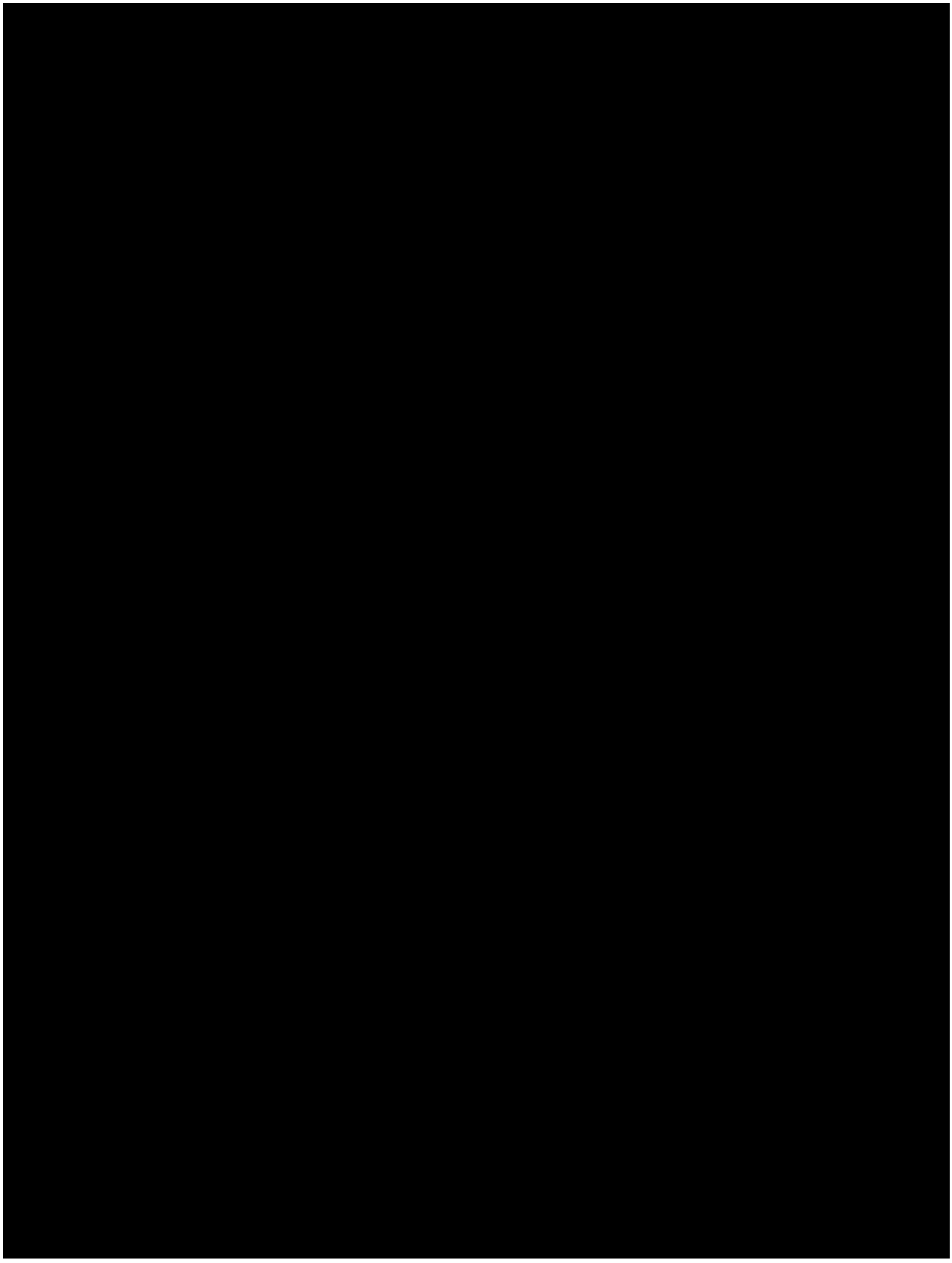
Constructability Review Form: **Substation**



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Constructability Review Form: **Substation**

Project Title: Battery Monitor – [redacted]	☐	Prior Constructability Review Performed?
	☐	Program Related Site Specific Review?
Project Numbers(s): CS00428(D) 405229(T)	**Project Constructability Phase:**	
Date(s) of Constructability Review: **03/18/2021**	☐ Conceptual Engineering Design ☒ Preliminary Engineering Design ☐ Detailed Engineering Design	
Project Scope Statement: Battery Monitor installation **Review of Battery Monitor Installations with Real Power & Construction**		

Department Review/Walkdown Attendees*:

Required [X]	Attended [X]	Department	Name	Required [X]	Attended [X]	Department	Name
☒	☒	Project Management	[redacted]	☒	☒	S/S Engineering	[redacted]
☐	☒	Civil Construction		☒	☒	S/S Engineering	
☐	☐	Asset Management		☒	☒	S/S Engineering	
☒	☒	S/S Technical / LCE		☐	☐	P&C Engineering	
☐	☐	Constr. Management		☐	☐	Civil Engineering	
☐	☐	Test/LCE		☐	☐	Telecom	
☐	☐	S/S Operations**		☐	☐	Environmental	
☐	☐	Field Engineering		☐	☐	Real Estate	
☐	☐	Siting		☐	☐		
☐	☐	Safety		☐	☐	Real Power	
☐	☐	SCADA		☐	☐	Real Power	

*** Sign-off in the table above for the Detailed Engineering Design Constructability Review indicates that all Action Items/Concerns from prior Constructability Reviews have been mitigated/resolved as documented in this form. Not every department is required to attend walkdowns for every project but should be consulted for project impact considerations**

** Internal Eversource Substation Operations must be included in the review even if external construction resources are planned

[Project Manager] certifies that this review was performed to completeness, that all applicable departments were informed of the project and have had opportunity to provide input to this review:

[redacted] _____ *4/20/2021*

Name / Signature *Date*

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Constructability Review Form: **Substation**

Documents available for use prior to Constructability Review					
[X]	Document	[X]	Document	[X]	Document
☒	Initial Scope -Birdseye site plan -General Arrangement	☐	Preliminary Drawings -Civil Site Drawing -Electrical Drawing -Section Drawings	☒	Prints in hand for marking up -Panel Front/Read View -Control Enclosure Layout -Floor / Wall Plans
☒	Detailed Scope Document	☐	Proposed Schedule	☐	Construction Sequence/Timeline
☐	Previous Notes / Comments / Observations	☒	Major Material / Equipment List	☐	Replace / Reuse of equipment

Action Items and Resolutions:

Item No.	Const. Review Action Item/Concern	Design Resolution/Mitigation:
1	**Length of cable between batteries and control cabinets**	**Minimize length by using wall pentrations**
2	**Wall penetrations and lead paint**	**Have paint sampled by environmental testing co.**
3		
4		
5		

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
A	**Engineering & Asset Management**		
1	**Scope of Work** - Is scope adequately developed and sufficiently detailed for intended deliverable? - Any complimentary projects or other adjacent obsolete equipment for inclusion? - Any overlapping projects that could impact work/outages? - Consider Physical Installation, P&C Scope, Civil Scope, Engineering studies, Design standard adherence - Any remote station impacts? - Engineering Estimates for Design and Technical Support? (EE and EOC) Total Project	☐	Battery Monitor installation including review of wall space for monitor and junction box, review security cabinet and communication (SCADA) cabinet for available points. Determine if battery cart is required.

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
2	**Materials Identified/Ordered** -Any concerns with BOM/Major Materials? Review BOM lead times and project need dates -Specialty Major Materials: Identify Specialty Equipment & Materials potentials - temporary/replacement - long lead items? -Any Materials needed to facilitate construction access?	☐	Battery Monitor will be longest lead item, all other equipment should be readily available. Review length of runs for new cable.
3	**Control House** - Review Unmapped equipment interferences, Control/Battery Enclosure Layout, HVAC System (if equipment added), space for new or modified equipment, AC / DC station breaker availability and service loading, Panel Space, Expansion, one-line and/or riser type panelboard drawings, other..	☐	Reviewed AC panel spacing if Battery Cart is needed. Security Cabinet has available space (115kV).
4	**Ratings & Dimensions** for Major Equipment. Any concerns upon field review? Equipment Rating One Line (and/or equipment thermal ratings tables) - Review for any errors in field	X	
5	**Wall, Fence, Gate, and Foundation Considerations** -Any permanent / temporary alterations or relocations required? -Pre-Project Sound Measurements Needed? Sound Walls? -Take measurements for Foundation quantities, dimensions and concrete volumes -CIP Review/Ballistic needs. Any Physical Security Requirement Consideration? -Assess condition of existing yard equipment foundations and viability for reuse (if proposed) -Review station expansion areas (if needed) for structures, old foundations, etc. -Any Steel Structural Plan Considerations? -Any impacts to construction plan?	X	
6	**Below Grade / Enclosure Raceway** - If possible, evaluate existing raceway and review spacing requirements. Review for any subsurface investigation needs or potential below grade obstructions. GPR/test pits needed? Geotechnical Investigation - is soil boring or resistivity investigation needed?	X	

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
7	**Underground Obstructions** -Drawing review concerns? -Is preconstruction or test excavation needed? -Is reuse of underground control cables / Conduits /replace Non-Shielded Cable feasible (if applicable) -Are spare conduits available? Are they useable? -Review if any areas will need to be plated for increased load bearing for equipment access (i.e. large Xfmr, etc.)	X	
8	**Grounding Plan (Ground Grid)** - Will footprint impact layout or other equipment? Identify locations to improve grounding. Impacts to foundations and ground grid plans. Observations on wetlands or ability to perform tests	X	
9	Nomenclature / Switching One-Line Diagram -Any obvious deviations from diagrams provided?	X	
10	BPS Separation Requirements - Is this BPS Substation? Y/N (part of PAF) - Changes to pre-existing BPS standards?	☐	Identify if Primary & Backup are separated and maintain separation.
11	IEC 61850 Substation Automation and Communication Requirements - Any Impacts/Retrofit needed?	X	
12	Any Upgrades to ES Standards - Is retrofit needed to bring up to ES standards? Can that be done?	X	
B	**Construction**		
1	**Any safety hazards specific to the facility? i.e. Low Bus, Deterioration, etc.**	☐	Identify if Lead Paint or ACM flooring of other tiles.
2	**Prior known Site Specific Conditions** -Common or Obvious station Issues -Missing scope items that could impact costs?	X	
3	**Identify/Consider Required Depts for Construction?** -Who is constructor: Internal vs External Resources -S/S Ops, GO, Test, Field Engineering, etc	☐	Consult with Internal Construction and Area Work Centers or District for construction. Real Power to install Battery Monitors

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
	-Specialty Contractors Required? -Required Oversite Needed - Estimated level of CR and LCE support needed		Wall drilling may be needed, screen for lead paint.
4	**Site Plan, Access, and Temporary Construction Facilities:** -Confirm maintenance access for proposed new or replaced equipment -Verify clear footprint for yard equipment / Property Plan -General access to site, can areas outside substation be utilized? -Substation Entry Plan (driveway and drive path modifications) - Identification of Unique Requirements, i.e. (access bridges, station service, etc.) -Site Development Plan (grading and drainage) with Cut/Fill -Existing Rock Conditions? Potential Impacts (rock quantity)? -Any police details needed for deliveries, restricted hours, and/or need for extended hour approvals -Any Sanitary Civil Requirements? (Septic tanks, etc) -Review turning radius for delivery trucks (if critical) -Any Substation Access and site/yard access Limitations? -Office Trailer Needs: Facilities, Utilities, Restroom, Container, Dumpster Space -Weather impacts to Site (Snow Placement) -Identify Material Laydown and Security -Where will new vs removed equipment go? -Construction permit for trailers outside substation fence?	X	
5	Unique Equipment Considerations: Gas insulated substation, Gas insulated line, Gas insulated bus, Pass Breaker, Statcom, Sync Condenser	X	

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
6	**Outage & Energization Plan and Construction Sequence:** *Review electrical working clearances for equipment during construction, Detailed look at protection zone changes, Locked sequence or random outages, Outage durations minimized.* ***Considerations:*** -Approach Distances – Outage Requirements to maintain electrical clearances throughout proposed installation -Distribution Clearances -Clearance Holder Assignments -Drawings vs Field Conditions -Outage boundaries and interconnections -Phased approach needs for additional mobilizations -Verify outage sequence supports the planned construction sequence and timeline. (Lead Commissioning Engineer "LCE", Substation Operations, and Outage Planner input) -Any design alterations or considerations to Eliminate SCLL Conditions, Reduce Recall Time, Reduce Outage durations, Special Conditions -Additional outage requirements: Railroad Catenaries, Fiber outage, SCADA outage, Relay permissions -Seasonal or weather conditions impacts	X	
7	**Equipment Testing & Acceptance** -Grounding plans / Resources? Will we need grounds hung? -Hi-pot testing and where will the equipment be set up?	☐	S/S Tech Engineering to commission and Real Power to test
8	Need for mobile generator and where connected (if needed)	X	
9	Need for mobile battery and where connected (if needed)	☐	Portable Battery is needed in New Control House, cart not needed in Old Control House.
10	OT work required or Notable Permit Conditions (special hours)?	X	
11	Coordination of boundaries/seams (Identification of point of demarcation for connection to existing equipment and/or for coordination with other municipalities)	X	

EVERSOURCE

Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
C	**Environmental**		
1	Soil Pre-Characterization or Grab Sampling Completed/Planned	X	
2	**Desktop investigation and EAD Review** -Required Permits -Stormwater Considerations -Dewatering requirements -Wetland and buffer review	X	
3	Risk or presence of PCB's/Asbestos/Lead/SF6	☐	Review if Lead Paint or ACM are present
4	Transformer Spill Containment Recommended?	X	
5	Expanding Footprint / New Buildings or future Expansion Plans? (Enviro Impact)	X	
6	Environmental oversight considerations? (Inspection type/Interval)	X	
7	Environmental mitigations - Any matting or seasonal needs? Review D&M Plan with CR.	X	
D	**Siting, S&CS, and T&D Real Estate**		
1	**Any regulatory concerns or approvals needed?** - Consider scope/design alterations to mitigate concerns - Consider Visual screening considerations (feasibility or location) -Zoning Relief and Permits required	X	
2	**Neighbor/Abutter impacts:** - Any noise, visual impacts, or sensitive abutters - Any changes to lighting or additional lighting needed?	X	
3	Review for roadway, gate access, trailers, equip height, noise, weekend/night work, or any potential public disturbance related to work	X	
4	Installation within Eversource Rights - Is Rights and Restrictions Review required?	X	
5	Expanding Footprint / New Buildings or future Expansion Plans?	X	
6	Proposed Equipment on same property? - Any Encroachments	X	

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Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
F	**Protection & Controls**		
1	Panel Graphic additions and/or Modifications	X	
2	Space on existing panels for new equipment? (front & rear of panel fronts)	X	
3	Panel fronts conform to drawings	X	
4	Access to bring new panels into control enclosure	X	
5	Nameplate list and location of nameplates	X	
6	Verifies that relays and meters that will be an interconnected project work are as shown on the drawings.	X	
7	Temporary protection, relays, control cable needed? How long will they be required?	X	
8	Will relay setting changes be needed? Any additional outage requirements for changes?	X	
G	**Telecom Engineering**		
1	Review telecom equipment in existing control enclosure	☐	Review for available SCADA Points
2	Review path to get telecom circuits into the station and paths within the control house. Determine whether new underground duct or overhead tray work is needed.	☐	Review path within substation
3	Review current or proposed Telecom equipment power connections and validate with P&C any need for system 1 and system 2 separation.	X	
4	Review current Telecom fiber diversity and validate with P&C any fiber diversity requirements.	X	
5	Review and list any remote station impacts/updates	X	
6	Confirm whether correct interface equipment is available (i.e.) for fiber termination or multiplexor termination	☐	Available Spares reviewed
7	Confirm whether existing communications cabinets are enough to support additional telecommunications equipment installed	☐	Review internet switches

EVERSOURCE

Constructability Review Form: **Substation**

	Key Review Item Description	N/A or No Concern	Review Notes, Concerns, or Additional Info Needed
8	Review space for any required additional communications cabinets which may be required to support additional telecommunications equipment installed	X	
9	Review third party Telecommunications at substation and confirm whether additional capacity or Ground Potential Rise protection is required	X	

Photos

(Ex. Equipment control cabinet, Breakers, MODs, CCVTs, PTs, Transformers)

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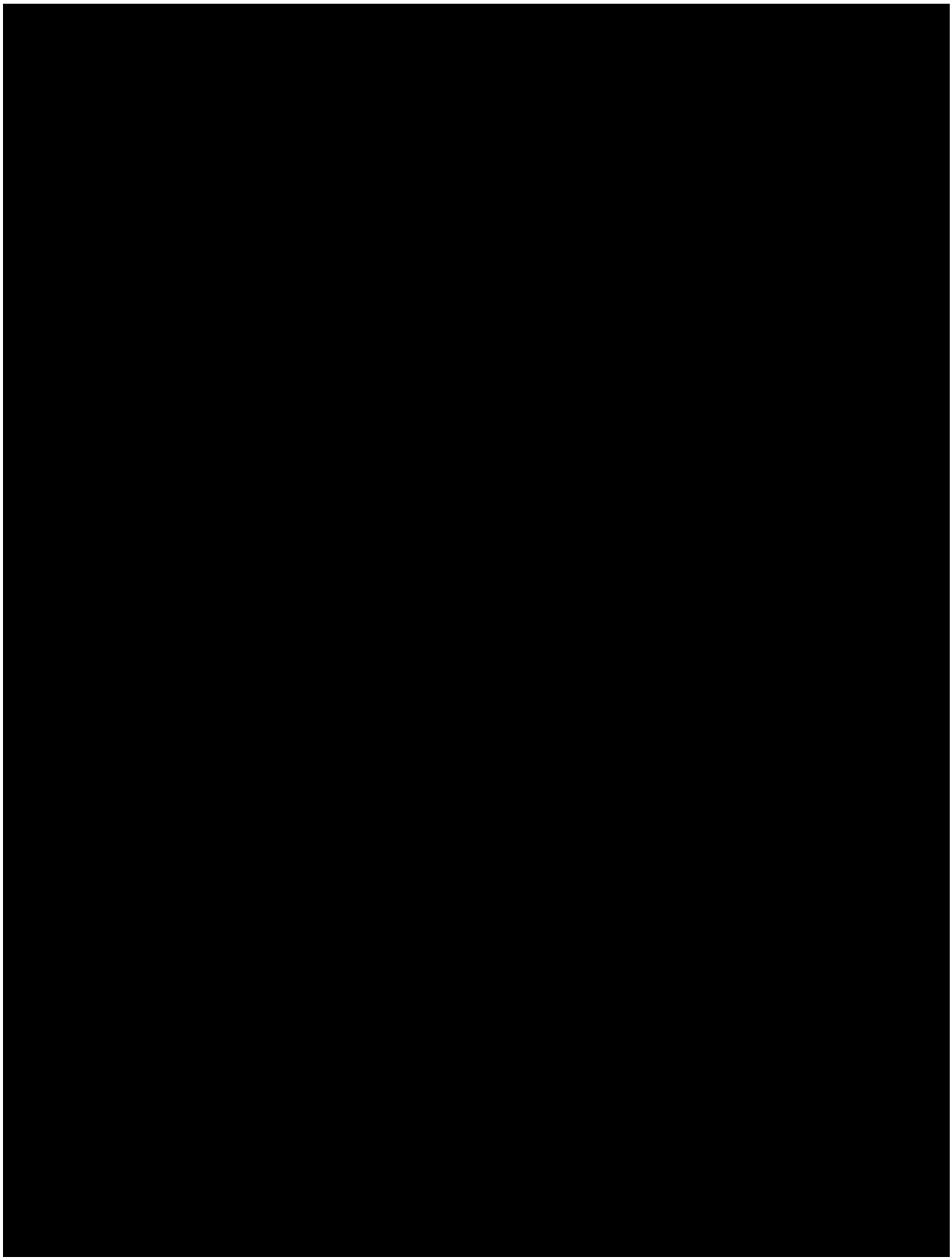
Constructability Review Form: **Substation**



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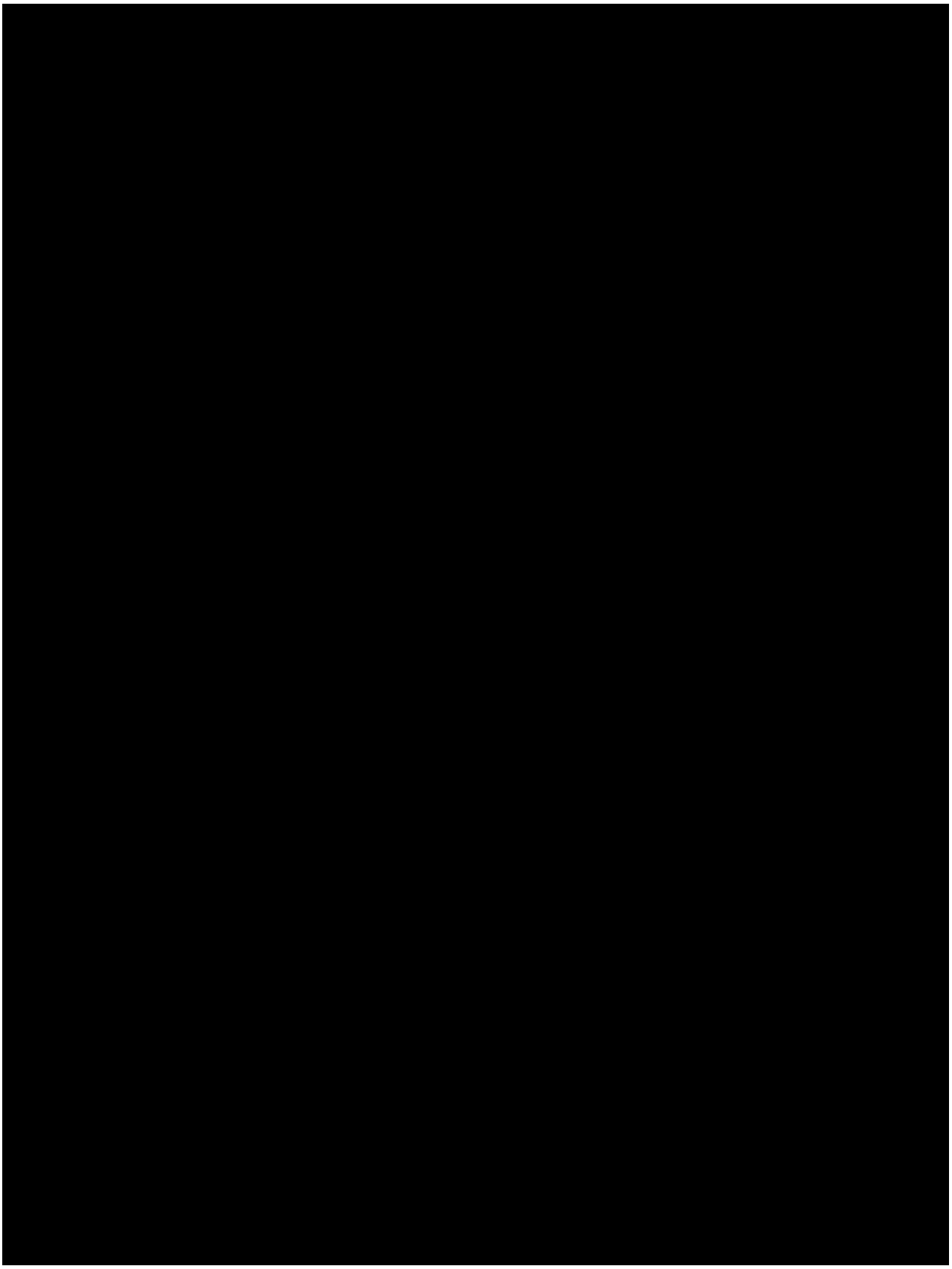

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Constructability Review Form: **Substation**



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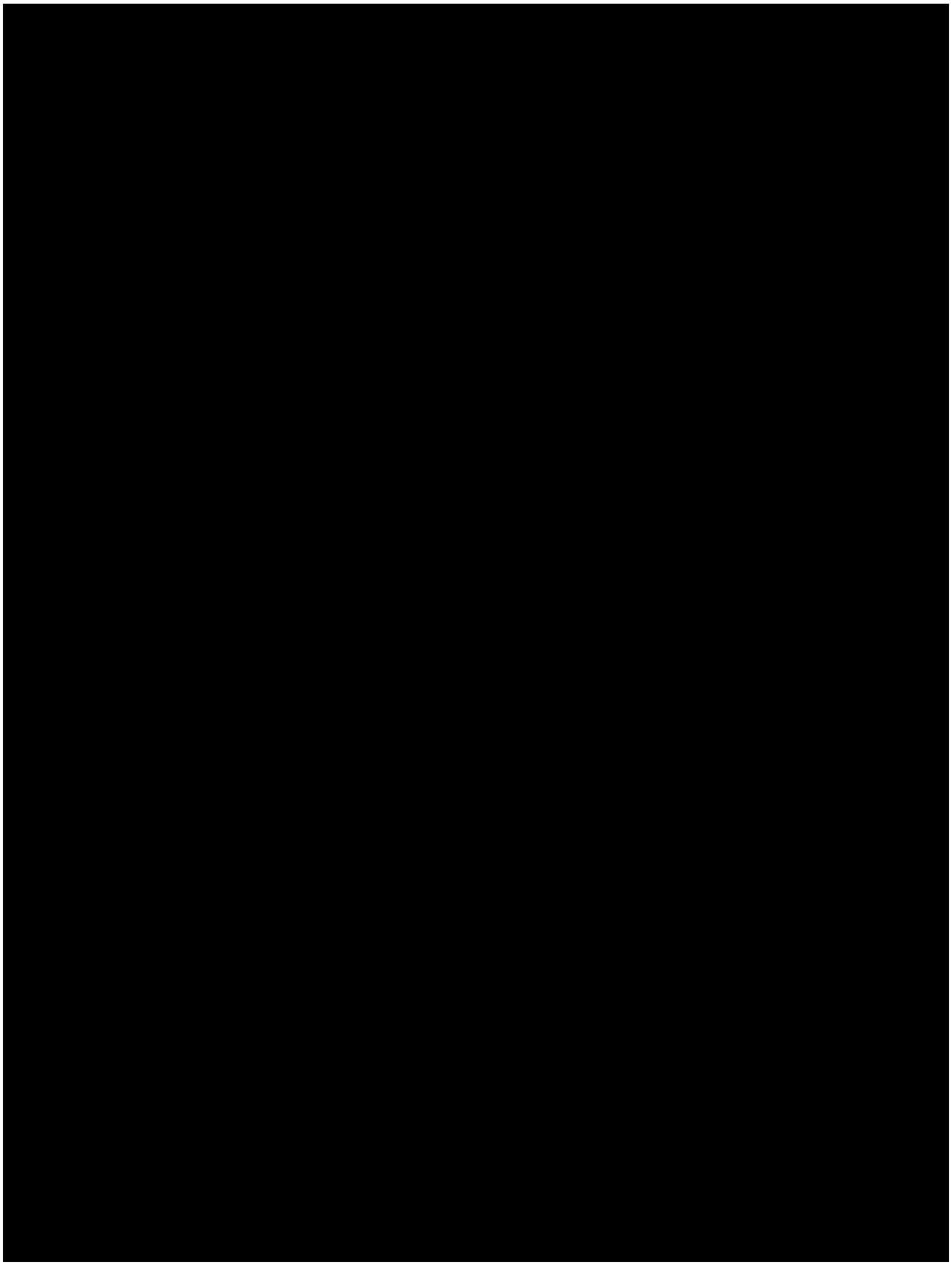

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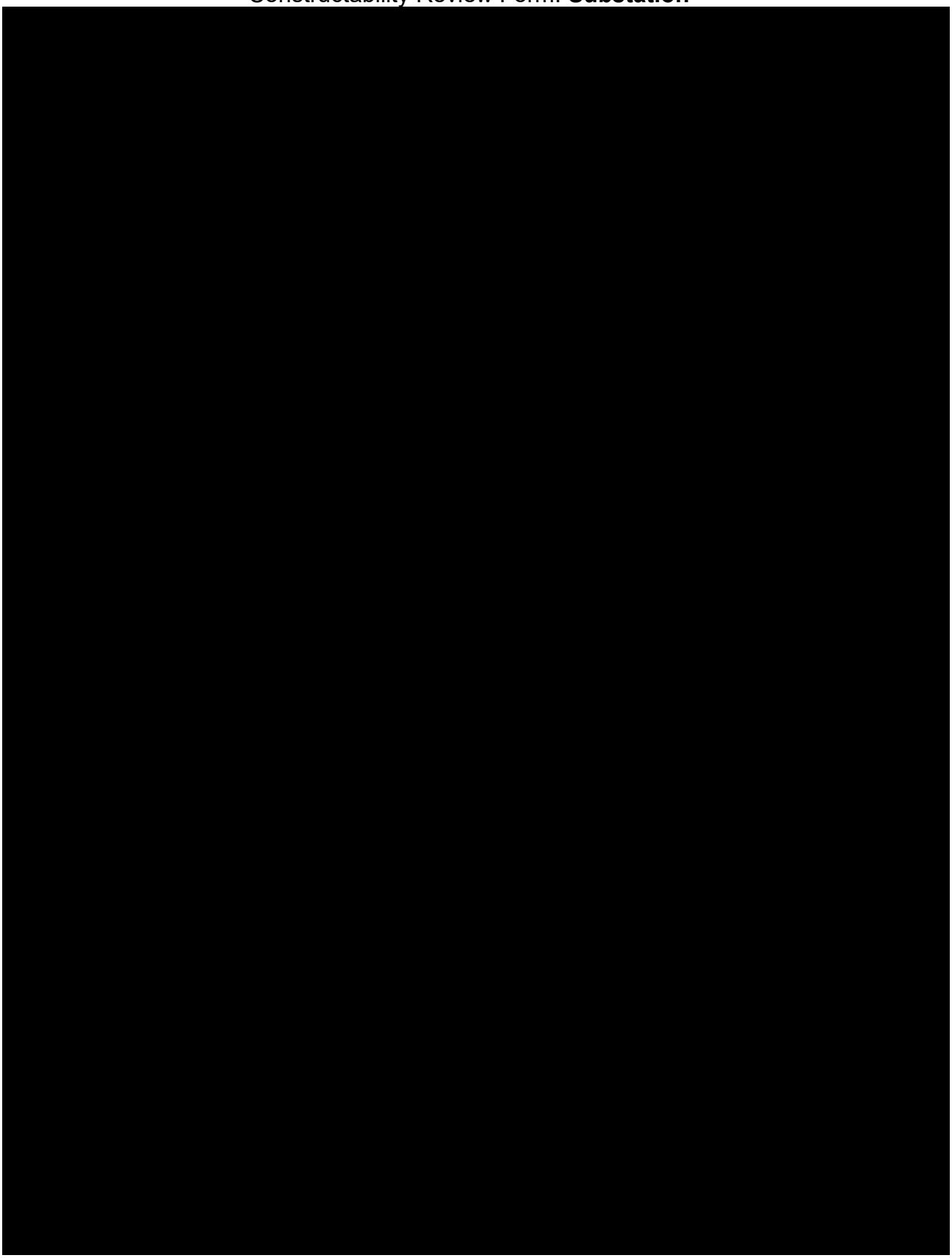

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Operations Program Level Project Authorization Form

Approved at May 26, 2021 EPAC
Link to Meeting Minutes

Date Prepared: 05/17/2021	**Program Title: BES Battery Monitor Installation Program**
Companies: Eversource CT, WMA, NH, EMA	**Project Number (by state):** **Distribution - 20346 (EMA), CS00428 (CT), WS00080 (WMA), NS00002 (NH)** **Transmission - 21163 (EMA), 405229 (CT), 405230 (WMA), T1431A (NH)**
Organization: Asset Management	**Class(es) of Plant: D SS and T SS**
Project Initiator: [redacted]	**Project Category: Stations - Monitoring - Batteries**
Project Manager: [redacted]	**Project Type: Program**
Project Sponsor: [redacted]	**Project Purpose: Install Battery Monitors at BES Stations**
Estimated in service date: December 2023 for full program	**If Transmission Project: PTF/Non-PTF?** **See associated Program Release Forms**
Eng. / Constr. Resources Budgeted? Yes	**Capital Investment Part of Original Operating Plan? Yes**
Authorization Type: Program Approval	**O&M Expenses Part of the Original Operating Plan?** **See associated Program Release Forms**
Initial Funding Request: N/A	**Estimated Program Value (by State):** **CT D $4.7M ($116K Unit cost/monitor) – T $.7M ($93K Unit cost/monitor)** **EMA D $/Unit TBD – T $/Unit TBD** **NH D $/Unit TBD) – T $.4M ($100K Unit cost/monitor)** **WMA D $/Unit TBD – T $.6M ($120K Unit cost/monitor)**

Financial Requirements:

Project Authorization

ERM: _____

FP&A: _____

Executive Summary

Revision History

- Rev_0: Total number of stations and systems updated. CT Transmission and Distribution, NH Transmission and WMA Transmission unitized costs established. Unitized costs for the remaining territories will be brought for approval in subsequent revisions.

This Program Level Project Authorization Form (PAF) request establishes a Program that will install Bulk Electric Substation (BES) Battery Monitors for all remaining Eversource (ES) BES

batteries. North American Electric Reliability Corporation (NERC) Std. PRC-005-2 requires periodic maintenance and testing practices of BES system protection elements which includes station batteries. This includes various visual and physical inspections, as well as measurement and analysis of cell and connection resistance to determine any potential issues. The latter test consists of multiple measurements of each cell (typically 60 per bank) at hundreds of stations company-wide each year. The battery monitoring program will design and install battery monitors at all remaining Transmission and Distribution BES substations to maintain compliance more efficiently with NERC Standard PRC-005-2. The installation of battery monitors will alleviate annual testing (voltage and ohmic measurements) as required by PRC-005 and provide a more comprehensive overview of system health.

Over 100 Eversource CT, WMA, EMA, and NH BES system sites rely on approximately 230 battery systems that support BES relay protection systems. The Program had a total of $400K ($50K each - Distribution (EMA, CT, WMA and NH; $50K each for Transmission (EMA, CT, WMA and NH) of initial funding approved in PowerPlan between December 2020 and February 2021. The approved Initial Funding Request (IFR) provides for $100K each for CT/WMA/EMA/NH regions to perform constructability reviews ($30K), engineering evaluations ($30K), project management ($20K), and cost estimating and PAF development support ($20K). In accordance with the IFR, 123 un-monitored BES battery systems at 100 substations were identified across all three (3) states. Currently nine (9) stations with ten (10) systems have been removed from this Program due to completion of the work as part of other projects. Also, WMA added two (2) stations with two (2) systems that were not included in the original list at the time of the IFR. The current total is 93 stations with 115 systems. This Program is modeled after the TPS-16-164-T (Legacy NU, Transmission only) program completed in 2018 by using a region-based unitized scope cost. See attached Table 1 for a list of the stations included in the Program.

The funds approved for the IFR Program PAF will be used to develop individual project releases for full funding to complete the remaining battery monitor installations at all project sites not considered in the 2018 Program initiative. Some sites will require multiple monitor installations on Distribution Assets, with some on Transmission Assets. However, most sites require monitoring on Distribution Assets only in this Program.

EVERSOURCE

Financial Unit Cost Evaluation (CT Distribution Substation Monitors)

Note: Dollar values are in thousands and are unit level costs for Program PAFs

Line item Category	Year 1	Total
1. ROW / Easements / Land Acquisition		
2. Environmental Approvals / Permits		
3. Outreach		
4. Siting Approvals / Permits		
5. Engineering / Design	$8	$8
6. Materials (Eversource purchased)	$3	$3
7. Construction (incl matl's by contractors)	$37	$37
8. Testing / Commissioning	$1	$1
9. Project Mgmt Team	$6	$6
10. Removals		
11. Other		
12. Risks	$9	$9
SUBTOTAL DIRECTS W/ RISKS	**$64**	**$64**
13. Indirects/Overhead	$47	$47
14. AFUDC	$1	$1
PROJECT TOTAL – BASELINE BUDGET	**$112**	**$112**
15. Contingency	$5	$5
TOTAL CAPITAL REQUEST	**$116**	**$116**
16. Reimbursables/Customer Contribution		
PROJECT TOTAL (LESS REIMBURSABLES)	**$116**	**$116**
O&M		
Total Request	**$116**	**$116**

Unit Breakout Costs

Note: Dollar values are in thousands

Line item Category	Year 1	Total
ST Labor	$12	$12
OT Labor		
Outside Services Labor	$29	$29
Materials*	$13	$13
Removals		
Other	$14	$14
Indirects	47	47
AFUDC	$1	$1
TOTAL REQUEST	**$116**	**$116**

*All materials including Eversource purchased and outside service purchased. Note that outside service purchased material included in construction in unit cost evaluation above.

Financial Unit Cost Evaluation (CT Transmission Substation Monitors)

Note: Dollar values are in thousands and are unit level costs for Program PAFs

Line item Category	Year 1	Total
1. ROW / Easements / Land Acquisition		
2. Environmental Approvals / Permits		
3. Outreach		
4. Siting Approvals / Permits		
5. Engineering / Design	$8	$8
6. Materials (Eversource purchased)	$2	$2
7. Construction (incl matl's by contractors)	$27	$27
8. Testing / Commissioning	$1	$1
9. Project Mgmt Team	$6	$6
10. Removals		
11. Other		
12. Risks	$6	$6
SUBTOTAL DIRECTS W/ RISKS	**$50**	**$50**
13. Indirects/Overhead	$40	$40
14. AFUDC	$0	$0
PROJECT TOTAL – BASELINE BUDGET	**$90**	**$90**
15. Contingency	$3	$3
TOTAL CAPITAL REQUEST	**$93**	**$93**
16. Reimbursables/Customer Contribution		
PROJECT TOTAL (LESS REIMBURSABLES)	**$93**	**$93**
O&M		
Total Request	**$93**	**$93**

Unit Breakout Costs

Note: Dollar values are in thousands

Line item Category	Year 1	Total
ST Labor	$22	$22
OT Labor		
Outside Services Labor	$19	$19
Materials*	$2	$2
Removals		
Other	$10	$10
Indirects	$40	$40
AFUDC	$0	$0
TOTAL REQUEST	**$93**	**$93**

*All materials including Eversource purchased and outside service purchased. Note that outside service purchased material included in construction in unit cost evaluation above.

Financial Unit Cost Evaluation (NH Transmission Substation Monitors)

Note: Dollar values are in thousands and are unit level costs for Program PAFs

Line item Category	Year 1	Total
13. ROW / Easements / Land Acquisition		
14. Environmental Approvals / Permits		
15. Outreach		
16. Siting Approvals / Permits		
17. Engineering / Design	$13	$13
18. Materials (Eversource purchased)		
19. Construction (incl matl's by contractors)	$28	$28
20. Testing / Commissioning	$2	$2
21. Project Mgmt Team	$5	$5
22. Removals		
23. Other		
24. Risks	$6	$6
SUBTOTAL DIRECTS W/ RISKS	**$55**	**$55**
13. Indirects/Overhead	$42	$42
14. AFUDC	1	1
PROJECT TOTAL – BASELINE BUDGET	**$98**	**$98**
15. Contingency	$2	$2
TOTAL CAPITAL REQUEST	**$100**	**$100**
16. Reimbursables/Customer Contribution		
PROJECT TOTAL (LESS REIMBURSABLES)	**$100**	**$100**
O&M		
Total Request	**$100**	**$100**

Unit Breakout Costs

Note: Dollar values are in thousands

Line item Category	Year 1	Total
ST Labor	$20	$20
OT Labor		
Outside Services Labor	$20	$20
Materials*	$8	$8
Removals		
Other	$9	$9
Indirects	$42	$42
AFUDC		
TOTAL REQUEST	**$100**	**$100**

*All materials including Eversource purchased and outside service purchased. Note that outside service purchased material included in construction in unit cost evaluation above.

Financial Unit Cost Evaluation (WMA Transmission Substation Monitors)

Note: Dollar values are in thousands and are unit level costs for Program PAFs

Line item Category	Year 1	Total
25. ROW / Easements / Land Acquisition		
26. Environmental Approvals / Permits		
27. Outreach		
28. Siting Approvals / Permits		
29. Engineering / Design	$29	$29
30. Materials (Eversource purchased)	$1	$1
31. Construction (incl matl's by contractors)	$21	$21
32. Testing / Commissioning		
33. Project Mgmt Team	$17	$17
34. Removals		
35. Other		
36. Risks	$5	$5
SUBTOTAL DIRECTS W/ RISKS	**$73**	**$73**
13. Indirects/Overhead	$45	$45
14. AFUDC	0	0
PROJECT TOTAL – BASELINE BUDGET	**$119**	**$119**
15. Contingency	$2	$2
TOTAL CAPITAL REQUEST	**$120**	**$120**
16. Reimbursables/Customer Contribution		
PROJECT TOTAL (LESS REIMBURSABLES)	**$120**	**$120**
O&M		
Total Request	**$120**	**$120**

Unit Breakout Costs

Note: Dollar values are in thousands

Line item Category	Year 1	Total
ST Labor	$30	$30
OT Labor		
Outside Services Labor	$30	$30
Materials*	$8	$8
Removals		
Other	$8	$8
Indirects	$45	$45
AFUDC		
TOTAL REQUEST	**$120**	**$120**

*All materials including Eversource purchased and outside service purchased. Note that outside service purchased material included in construction in unit cost evaluation above.

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: N/A

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

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

Is there an ARO associated with this project? TBD

Are there other environmental cleanup costs associated with this project? TBD

Technical Justification:

Project Need Statement:

Install battery monitoring at all remaining BES stations system wide to maintain compliance and have real-time data to support NERC Std PRC-005-2.

Project Objectives:

Design and install battery monitors at all remaining Eversource Transmission and Distribution BES substations to maintain compliance more efficiently with NERC Std PRC-005-2. Design will include a review of the associated station batteries for age-related replacement, as well as an evaluation of the associated control houses for environmental needs (i.e. hydrogen detection and evacuation) and will be included in station releases as a necessary variance to the established unit cost.

Measurements of internal resistance can be taken remotely, offering consistent values to accurately trend the health of the batteries, while removing inconsistencies due to human factors (different measurement points, general human error, etc.). Minimum and maximum limits can also be set for values such as voltage, current, and internal resistance. The monitors can provide notifications to users, which can then be addressed using a targeted approach. The program will comply with NERC standards and increase system reliability.

While installing battery monitors is the primary objective of the program, a review of batteries reaching end of life conditions will also be considered at each station. Battery systems are considered obsolete at 20 years of age; due to that fact, batteries aged 15 years or older will be scheduled for replacement, evaluated for capacity, and replaced under separate funding. Through review of initial locations identified by the regional project teams, a unitized cost will be generated for “monitor installation only” for both Distribution and Transmission projects within each region. CT Transmission and Distribution unitized costs are included in this Revision 0. Releases will be issued under the Program on a station by station basis.

Replacement batteries, environmental concerns (i.e. hydrogen detection and evacuation) will be addressed as needed at each station. Necessary upgrades to the control houses evaluated include the need for: air conditioning, heating, hydrogen detection, and fire alarms. Any environmental enhancements needed will be included in the scope of the project as a variance to the unitized monitor cost.

Project Scope

There are 115 monitor installations remaining to complete. The unitized cost for CT Distribution was based on the estimate for [redacted] In choosing this estimate eleven (11) Distribution substation estimates in this program in CT were evaluated and it most represents the typical scope and costs. The unitized cost for CT Transmission was based on the estimate for [redacted] (T). This estimate includes two (2) monitor systems. For unit cost purposes all estimated costs are divided in half except for Project Management, Engineering, since these costs are relatively fixed per station. In choosing the unit value for CT T the unit cost was also

compared to two other estimates for upcoming Transmission releases in NH and WMA along with actual costs incurred in the previous monitor program in 2018.

The unitized cost for NH Transmission was based on the estimate for Curtisville. The unitized cost for WMA Transmission was based on the estimate for W Springfield 8C. This estimate includes two (2) monitor systems. For unit cost purposes all estimated costs are divided in half except for Project Management, Engineering, since these costs are relatively fixed per station.

The installation unit cost is for the Alber Xplorer Industrial Monitor (UXIM) System for all remaining ES installations. This Program Level PAF will include updated unitized costs for the remaining three (3) Regions. Dollar authorization for these costs shall be through submission of Program Revisions.

Background / Justification

The battery monitoring program will design and install battery monitors at all remaining Transmission and Distribution BES substations to maintain compliance more efficiently with NERC Standard PRC-005-2. The installation of battery monitors will alleviate annual testing (voltage and ohmic measurements) as required by PRC-005 and provide a more comprehensive overview of system health.

Business Process and / or Technical Improvements

The installation of battery monitors will alleviate annual testing (voltage and ohmic measurements) as required by PRC-005 and provide a more comprehensive overview of system health.

Alternatives Considered with Cost Estimates

The “Do Nothing” approach was not acceptable with the modeled program TPS-16-164-T and applied as well to this new program. The installation of the BES battery monitoring system will result in O&M savings. Also, there is an expectation of improved DC system reliability and a resultant improvement in system protection reliability.

Project Schedule
It is anticipated to complete the entire replacement program by Q4 2023 or earlier.

Milestone/Phase Name	Estimated Date
Preliminary scope developed (All Regions)	~~Q4 2020~~ Complete
First Project Releases presented to EPAC	May 2021
Program Level PAF with all Unit Costs Approved	Sep 2021
Begin Construction	Aug 2021
Program ISD	Dec 2023

Regulatory Approvals

Not applicable

Risks and Risk Mitigation Plans

Risk allocation is included in the Program unitized cost estimates for the following:

- Potential obstructions
- Delays
- Environmental remediation (lead/asbestos in wall or ceiling)

Risks will be evaluated for each station and allocation and mitigation plans included in the Releases.

Contingency

- There is $3.3K – D and $5.4K - T of contingency included in the CT unitized costs.
- There is $2K - T of contingency included in the NH T unitized costs.
- There is $2K - T of contingency included in the WMA T unitized costs.

Individual Program Releases will include contingency as needed.

References

1. North American Electric Reliability Corporation (NERC) Std. PRC-005-2
2. Eversource TPS-16-164-T, BES Battery Monitoring (T-Only)
3. BES Battery Monitor Installation Program PAF Rev_0

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

- Table 1 - Substations to be Addressed for the Overall Program
- Attachment A1 – [redacted] Distribution Control House Eversource Estimate Template rev 1.61

- Attachment A2 - [redacted] Transmission Control House Eversource Estimate Template rev 1.61
- Attachment A3 – West Brookfield 14H Transmission Control House Eversource Estimate Template rev 1.61
- Attachment A4 – Curtisville Transmission Control House Eversource Estimate Template rev 1.61
- Attachment A5 – West Springfield 8C Transmission Control House Eversource Estimate Template rev 1.61
- Attachment B – TPS-16-T_TOnly_BES_Battery_Monitoring_042516

TABLE 1 - SUBSTATIONS TO BE ADDRESSED FOR OVERALL PROGRAM

[redacted]



* Two (2) batteries
** Three (3) batteries
*** Four (4) batteries

Red text indicates stations added to the program since the IFR approval.

Blue stations removed from the program since the IFR approval due to scope inclusion in other projects

ESTIMATE SUMMARY

Project Title [redacted] Distribution Control House Battery Monitors
Project Mgr/Lead [redacted]
Project Number:CS00428
WO & Task #:80067152
Est. Revision # 00
Estimate Type - Station work

Estimate By: [redacted]
Date of Estimate:4/16/21
ISD:07/30/2021
Estimate #

Template Revision # 01.61

ESTIMATE SUMMARY

Estimate Type: Conceptual

WBS	Description	TOTAL	% of Directs	% of Total	Priors	2021	2022	2023	2024	2025	2026
1	ROW / Easements / Land purchases										
2	Environmental Approvals / Permits										
3	Outreach	$200	0.2%	0.1%		$200					
4	Siting Approvals / Permits	$400	0.4%	0.2%		$400					
5	Engineering / Design	$7,600	7.1%	3.3%		$7,600					
6	Materials (Eversource purchased)	$3,200	3.0%	1.4%		$3,200					
7	Construction (incl matl's by contractors)	$69,900	65.5%	30.0%		$69,900					
8	Testing / Commissioning	$1,100	1.0%	0.5%		$1,100					
9	PMT Project Mgmt Team	$6,300	5.9%	2.7%		$6,300					
10	Removals										
11	Other										
12	Risks	$18,000	16.9%	7.7%		$18,000					
	Project Directs Total w/Risks	**$106,700**	100.0%	45.7%		**$106,700**					
13	Indirects/Overhead	$118,400		50.8%		$118,400					
14	AFUDC	$500		0.2%		$500					
	Project Total - Baseline Budget	**$225,600**		96.7%		**$225,600**					
15	Contingency	$7,700		3.3%		$7,700					
	Project Total - Funding Approval Level	**$233,300**		100.0%		**$233,300**					
16	Reimbursables/Customer Contribution										
	Project Total (less reimbursables)	**$233,300**				**$233,300**					
		-									
	Amount of Escalation included above										
6	Total materials - Eversource	$3,200				$3,200					
	Total materials - Contractor										
	Total materials	$3,200				$3,200					
	NOTE: Risk / Contingency is 12.4% of Project Total Costs (incl escal/indirects/AFUDC but excl reimb.)										

Estimate Range	**-25%**	-	**50%**
	$175,000	-	**$350,000**

COMMENTS:

Project Scope:

[redacted]

Assumptions/Clarifications:
Indirect rates based on: 11 - CT . Station work

Inhouse resources will be used for Construction, LCE, SCADA, and Engineering.
PM will be outsourced.
No construction Rep will be needed.
Real Power will provide a UXIM monitor including any wiring to the battery with their installation services.
Environmental testing needed before drilling through walls

RISKS

Potential Obstructions	$ 6,000
Delays	$ 6,000
Lead/Asbestos in wall or ceiling	$ 6,000

Project Title [redacted] Distribution Control House Battery Monitors

Escalated Line Item Dollars

Project Number:C500428
Date of Estimate:4/18/21
Est. Revision # 00
Template Revision # 01.01

CSTXX-CONSTRUCTION	R		Prior actuals to date Mhrs	Prior actuals to date DOLLARS	2021 Mhrs	2021 DOLLARS	1 2022 Mhrs	1 2022 DOLLARS	2 2023 Mhrs	2 2023 DOLLARS	3 2024 Mhrs	3 2024 DOLLARS	4 2025 Mhrs	4 2025 DOLLARS	5 2026 Mhrs	5 2026 DOLLARS	TOTAL Mhrs	TOTAL DOLLARS
Electrical Construction	LT					$33,788												$33,788
General Construction	LT																	
SCADA / Automation	LT					$848												$848
Telecom - Field	LT																	
Construction Reps (internal)	LT																	
Support Switch/Tap	LT																	
Othr (specify)	LT																	
Other (specify)	LT																	
Other (specify)	LT																	
LT Total						$34,636												$34,636
Employee Expenses	AE	5%				$1,731												$1,731
Construction Purchased Material	AM	1%				$873												$873
Outside Construction Vendor	AQ					$33,528												$33,528
Sales tax on Constr. Vendor																		
Vehicles (now in indirects section)	AV																	
Inspection services (Outside Vendor)	AQ																	
Construction Rep (Outside vendor)	AQ																	
Rents and Leases	BR																	
CSTXX Subtotal						$70,548												$70,548
Escalation						$ -		$ -		$ -		$ -		$ -		$ -		$ -
	P1																	
CSTXX Total						$70,548												$70,548
ENRXX-TG ENGINEERING/DESIGN																		
Project Services/Drafting	LT					$2,120												$2,120
T- Line Engineering/Design	LT																	
D- Street Engineering/Design	LT																	
Civil Engineering/Design	LT																	
Substation (T) Engineering/Design	LT																	
Substation (D) Engineering/Design	LT					$3,816												$3,816
Protection & Controls Engineering	LT					$848												$848
Survey Engineering	LT																	
SCADA / Automation Engineering	LT																	
Telecom Engineering	LT					$424												$424
Other - specify	LT																	
Other - specify	LT																	
LT Total						$7,208												$7,208
Employee Expenses	AE	5%				$360												$360
Contractor Engineering - T-Lines	AQ																	
Contractor Engineering - D-Street	AQ																	
Contractor Engineering - T -Station	AQ																	
Contractor Engineering - D-Station	AQ																	
Contractor Engineering - P&C	AQ																	
Contractor Engineering - Survey	AQ																	
Contractor Engineering - SCADA / Automatic	AQ																	
Contractor Engineering - Telecom	AQ																	
Contractor Engineering - Specify	AQ																	
Contractor Engineering - Specify	AQ																	
Contractor Engineering - Specify	AQ																	
Vehicles (now in Indirects section)	AV																	
ENRXX Subtotal			-			$7,568	-	-	-	-	-	-	-	-	-	-		$7,568
Escalation																		
	P1																	
ENRXX Total			-			$7,568	-	-	-	-	-	-	-	-	-	-		$7,568
LNDXX-TG LAND																		
Real Estate	LT																	
Employee Expenses	AE	5%																
Purchase Land	AM																	
Vehicles (now in Indirects section)	AV																	
Fees and Payments	BF																	
LNDXX Subtotal			-				-	-	-	-	-	-	-	-	-	-		
Escalation																		
	P1																	
LNDXX Total			-				-	-	-	-	-	-	-	-	-	-		
MATXX-TG MATERIAL																		
Eversource	AM					$2,400												$2,400
Outside Services	AM																	
	AM																	
Freight																		
Sales Tax Eversouce/outside services		4%				$100												$100
Other																		
MATXX Subtotal						$2,500												$2,500
Escalation																		
	P1																	
MATXX Total						$2,500												$2,500
PSMXX-PROJECT MANAGER & SUPPORT																		
Project Management (PM)	LT																	
Project Planning/Coat (IP)	LT					$424												$424
Contracts/Purchasing (C/P)	LT					$424												$424
System Planning	LT																	
Environmental	LT																	
SCS - Notification	LT					$8												$8
Legal	LT																	
Estimating	LT					$848												$848
Siting - Local Zoning	LT																	
Asset Management	LT					$848												$848
Other -	LT																	
Other -	LT																	
Other -	LT																	
Other -	LT																	
LT Total						$2,552												$2,552
Employee Expenses	AE	5%				$128												$128
Project Support Vendor - PM	AQ					$3,600	-	-	-	-	-	-	-	-	-	-		$3,600
Project Support Vendor - IP	AQ						-	-	-	-	-	-	-	-	-	-		
Project Support Vendor - C/P	AQ						-	-	-	-	-	-	-	-	-	-		
Project Support Vendor - System Planning	AQ						-	-	-	-	-	-	-	-	-	-		
Project Support Vendor - Environmental	AQ						-	-	-	-	-	-	-	-	-	-		
Project Support Vendor - SCS - Notification	AQ					$160	-	-	-	-	-	-	-	-	-	-		$160
Project Support Vendor - Legal	AQ						-	-	-	-	-	-	-	-	-	-		
Project Support Vendor - Estimating	AQ						-	-	-	-	-	-	-	-	-	-		
Project Support Vendor - Siting - Local Zoning	AQ					$400	-	-	-	-	-	-	-	-	-	-		$400
Project Support Vendor - Asset Management	AQ						-	-	-	-	-	-	-	-	-	-		
Project Support Vendor - Other	AQ						-	-	-	-	-	-	-	-	-	-		
Project Support Vendor - Other	AQ						-	-	-	-	-	-	-	-	-	-		
Project Support Vendor - Other	AQ						-	-	-	-	-	-	-	-	-	-		
Project Support Vendor - Other	AQ						-	-	-	-	-	-	-	-	-	-		
Vehicles (now in Indirects section)	AV																	
Property or CW P tax large proj. allowance	BR																	
	BR																	
Fees and Payments - Environmental	BF																	
Fees and Payments - Siting	BF																	
Fees and Payments - Other	BF																	
PSMXX Subtotal			-			$8,840	-	-	-	-	-	-	-	-	-	-		$8,840
Escalation																		
	P1																	
PSMXX Total			-			$8,840	-	-	-	-	-	-	-	-	-	-		$8,840
REMXX-TG REMOVAL																		
Engineering/Design	LT																	
Internal Construction	LT																	
LT Total																		
Employee Expenses	AE	10%																
Outside Services	AQ																	
Contractor Labor	AQ																	
Vehicles (now in Indirects section)	AV																	
Rents and Leases	BR																	
REMXX Subtotal			-				-	-	-	-	-	-	-	-	-	-		
Escalation																		
	P1																	
REMXX Total			-				-	-	-	-	-	-	-	-	-	-		
TSTXX-TG TEST																		
Test / Field Engr. Labor (In House)	LT																	
Lead Commissioning Engr. (LCE) (internal)	AQ					$959												$959
Employee Expense	AE	10%				$99												$99
Test / Field Engr. Labor (contractor)	AQ																	
Lead Commissioning Engr. (LCE) (contactor)	AQ																	
Vehicles (now in Indirects section)	AV																	
TSTXX Subtotal						$1,058												$1,058
Escalation																		
	P1																	
TSTXX Total						$1,058												$1,058
SUBTOTAL PROJECT DIRECT COST			-			$88,544	-	-	-	-	-	-	-	-	-	-		$88,544
Risk																		
Risk						$18,000												$18,000
Risk Total						$18,000												$18,000
TOTAL PROJECT DIRECT COST			-			$106,544	-	-	-	-	-	-	-	-	-	-		$106,544
INDIRECTS																		
Non-Productive Time Allocation (Z9)	58	16.1%				$6,827												$6,827
Payroll Benefits Allocation (ZE) incl NPT	59	44.0%				$18,024												$18,024
Gen SVC CO Overhead (ZF) incl NPT	60	75.0%				$8,422												$8,422
E&S Allocations (Z)	61	66.0%				$63,979												$63,979
AS&E Allocations (ZJ)	62	1.2%				$2,322												$2,322
Stores Expense Allocation (ZC)	63	8.0%				$192												$192
Lobby Stock																		
MCHC		5.0%				$5,961												$5,961
Vehicles		28.0%				$12,702												$12,702
	63																	
Indirects Subtotal						$118,429												$118,429
TOTAL PROJECT COST - Direct & Indirect / excl AFUDC						$224,973												$224,973
AFUDC																		
AFUDC (ZK)						$451	0	0	0	0	0	0	0	0	0	0	0	$451
In Service Dollars																		
Cumulative ISS																		
AFUDC Subtotal						$451												$451
TOTAL PROJECT COST - Baseline Budget						$225,424												$225,424
Continoecv																		
Contingency						$7,686												$7,686
Other																		
Continoecv SubTotal						$7,686												$7,686
TOTAL PROJECT COST - Approved Funding						$233,110												$233,110
Reimbursables / Customer Contribution																		
Reimbursables / Customer Contribution (enter as negative)	59																	
TOTAL PROJECT COST						$233,110												$233,110

ESTIMATE SUMMARY

Project Title [redacted] Transmission Control House Battery Monitors
Project Mgr/Lead [redacted]
Project Number:CS00428
WO & Task #:80042113
Est. Revision # 00
Estimate Type - Station work

Estimate By: [redacted]
Date of Estimate:4/16/21
ISD:07/30/2021
Estimate #

Template Revision # 01.61

ESTIMATE SUMMARY

Estimate Type: Conceptual

WBS	Description	TOTAL	% of Directs	% of Total	Priors	2021	2022	2023	2024	2025	2026
1	ROW / Easements / Land purchases										
2	Environmental Approvals / Permits										
3	Outreach	$100	0.1%	0.1%		$100					
4	Siting Approvals / Permits	$300	0.4%	0.2%		$300					
5	Engineering / Design	$7,600	8.9%	4.8%		$7,600					
6	Materials (Eversource purchased)	$4,000	4.7%	2.5%		$4,000					
7	Construction (Incl matl's by contractors)	$54,100	63.3%	34.0%		$54,100					
8	Testing / Commissioning	$1,100	1.3%	0.7%		$1,100					
9	PMT Project Mgmt Team	$6,300	7.4%	4.0%		$6,300					
10	Removals										
11	Other										
12	Risks	$12,000	14.0%	7.5%		$12,000					
	Project Directs Total w/Risks	**$85,500**	100.0%	53.7%		**$85,500**					
13	Indirects/Overhead	$68,300		42.9%		$68,300					
14	AFUDC										
	Project Total - Baseline Budget	**$153,800**		96.6%		**$153,800**					
15	Contingency	$5,400		3.4%		$5,400					
	Project Total - Funding Approval Level	**$159,200**		100.0%		**$159,200**					
16	Reimbursables/Customer Contribution										
	Project Total (less reimbursables)	**$159,200**				**$159,200**					
		-									
	Amount of Escalation Included above										
6	Total materials - Eversource	$4,000				$4,000					
	Total materials - Contractor										
	Total materials	$4,000				$4,000					
	NOTE: Risk / Contingency is 12.3% of Project Total Costs (incl escal/indirects/AFUDC but excl reimb.)										

Estimate Range

-25%	-	50%
$119,000	-	**$239,000**

COMMENTS:

Project Scope:

[redacted]

Assumptions/Clarifications:
Indirect rates based on: 1T - CT . Station work

Inhouse resources will be used for Construction, LCE, SCADA, and Engineering.
PM will be outsourced.
No construction Rep will be needed.
Real Power will provide a UXIM monitor including any wiring to the battery with their installation services.
A Mobile battery cart will be provided while Real power is installing the battery tab washers.

RISKS

Potential Obstructions	$	6.000
Delays	$	6.000

Project Title [redacted] Transmission Control House Battery Monitors

Escalated Line Item Dollars

Project Number:C500428
Date of Estimate:4/18/21
Est. Revision # 00
Template Revision # 01.01

CSTXX-CONSTRUCTION	R		Prior actuals to date Mhrs	Prior actuals to date DOLLARS	[redacted]	2021 Mhrs	2021 DOLLARS	1 2022 Mhrs	2022 DOLLARS	2 2023 Mhrs	2023 DOLLARS	3 2024 Mhrs	2024 DOLLARS	4 2025 Mhrs	2025 DOLLARS	5 2026 Mhrs	2026 DOLLARS	TOTAL Mhrs	TOTAL DOLLARS
Electrical Construction	LT						$19,296												$19,296
General Construction	LT																		
SCADA / Automation	LT						$848												$848
Telecom - Field	LT																		
Construction Reps (Internal)	LT																		
Support Switch/Tap	LT																		
Other (specify)	LT																		
Other (specify)	LT																		
Other (specify)	LT																		
LT Total							$20,144												$20,144
Employee Expenses	AE	5%					$1,007												$1,007
Construction Purchased Material	AM	1%					$522												$522
Outside Construction Vendor	AQ						$32,935												$32,935
Sales tax on Constr. Vendor																			
Vehicles (now in Indirects section)	AV																		
Inspection services (Outside Vendor)	AQ																		
Construction Rep (Outside vendor)	AQ																		
Rents and Leases	BR																		
CSTXX Subtotal							$54,808												$54,808
Escalation							$ -		$ -		$ -		$ -		$ -		$ -		$ -
	P1																		
CSTXX Total							$54,808												$54,808
ENRXX-TG ENGINEERING/DESIGN																			
Project Services/Drafting	LT						$2,120												$2,120
T- Line Engineering/Design	LT																		
D- Street Engineering/Design	LT																		
Civil Engineering/Design	LT																		
Substation (T) Engineering/Design	LT																		
Substation (D) Engineering/Design	LT						$3,816												$3,816
Protection & Controls Engineering	LT						$848												$848
Survey Engineering	LT																		
SCADA / Automation Engineering	LT																		
Telecom Engineering	LT						$424												$424
Other - specify	LT																		
Other - specify	LT																		
LT Total							$7,208												$7,208
Employee Expenses	AE	5%					$360												$360
Contractor Engineering - T-Lines	AQ																		
Contractor Engineering - D-Street	AQ																		
Contractor Engineering - T -Station	AQ																		
Contractor Engineering - D-Station	AQ																		
Contractor Engineering - P&C	AQ																		
Contractor Engineering - Survey	AQ																		
Contractor Engineering - SCADA / Automatic	AQ																		
Contractor Engineering - Telecom	AQ																		
Contractor Engineering - Specify	AQ																		
Contractor Engineering - Specify	AQ																		
Contractor Engineering - Specify	AQ																		
Vehicles (now in Indirects section)	AV																		
ENRXX Subtotal			-				$7,568	-		-		-		-		-			$7,568
Escalation																			
	P1																		
ENRXX Total			-				$7,568	-		-		-		-		-			$7,568
LNDXX-TG LAND																			
Real Estate	LT																		
Employee Expenses	AE	5%																	
Purchase Land	AM																		
Vehicles (now in Indirects section)	AV																		
Fees and Payments	BF																		
LNDXX Subtotal			-					-		-		-		-		-			
Escalation																			
	P1																		
LNDXX Total			-					-		-		-		-		-			
MATXX-TG MATERIAL																			
Eversource	AM						$3,400												$3,400
Outside Services	AM																		
	AM																		
Freight																			
Sales Tax Eversource/outside services		4%					$100												$100
Other																			
MATXX Subtotal							$3,500												$3,500
Escalation																			
	P1																		
MATXX Total							$3,500												$3,500
PSMXX-PROJECT MANAGER & SUPPORT																			
Project Management (PM)	LT																		
Project Planning/Cost (IP)	LT						$424												$424
Contracts/Purchasing (C/P)	LT						$424												$424
System Planning	LT																		
Environmental	LT																		
SCS - Notification	LT						$7												$7
Legal	LT																		
Estimating	LT						$848												$848
Siting - Local Zoning	LT																		
Asset Management	LT						$848												$848
Other -	LT																		
Other -	LT																		
Other -	LT																		
Other -	LT																		
LT Total							$2,551												$2,551
Employee Expenses	AE	5%					$128												$128
Project Support Vendor - PM	AQ						$3,600	-		-		-		-		-			$3,600
Project Support Vendor - IP	AQ							-		-		-		-		-			
Project Support Vendor - C/P	AQ							-		-		-		-		-			
Project Support Vendor - System Planning	AQ							-		-		-		-		-			
Project Support Vendor - Environmental	AQ							-		-		-		-		-			
Project Support Vendor - SCS - Notification	AQ						$130	-		-		-		-		-			$130
Project Support Vendor - Legal	AQ							-		-		-		-		-			
Project Support Vendor - Estimating	AQ							-		-		-		-		-			
Project Support Vendor - Siting - Local Zoning	AQ						$300	-		-		-		-		-			$300
Project Support Vendor - Asset Management	AQ							-		-		-		-		-			
Project Support Vendor - Other	AQ							-		-		-		-		-			
Project Support Vendor - Other	AQ							-		-		-		-		-			
Project Support Vendor - Other	AQ							-		-		-		-		-			
Project Support Vendor - Other	AQ							-		-		-		-		-			
Vehicles (now in Indirects section)	AV																		
Property or CW P tax large proj. allowance	BR																		
	BR																		
Fees and Payments - Environmental	BF																		
Fees and Payments - Siting	BF																		
Fees and Payments - Other	BF																		
PSMXX Subtotal			-				$8,709	-		-		-		-		-			$8,709
Escalation																			
	P1																		
PSMXX Total			-				$8,709	-		-		-		-		-			$8,709
REMXX-TG REMOVAL																			
Engineering/Design	LT																		
Internal Construction	LT																		
LT Total																			
Employee Expenses	AE	10%																	
Outside Services	AQ																		
Contractor Labor	AQ																		
Vehicles (now in Indirects section)	AV																		
Rents and Leases	BR																		
REMXX Subtotal			-					-		-		-		-		-			
Escalation																			
	P1																		
REMXX Total			-					-		-		-		-		-			
TSTXX-TG TEST																			
Test / Field Engr. Labor (In House)	LT																		
Lead Commissioning Engr. (LCE) (Internal)	AQ						$959												$959
Employee Expense	AE	10%					$99												$99
Test / Field Engr. Labor (contractor)	AQ																		
Lead Commissioning Engr. (LCE) (contactor)	AQ																		
Vehicles (now in Indirects section)	AV																		
TSTXX Subtotal							$1,058												$1,058
Escalation																			
	P1																		
TSTXX Total							$1,058												$1,058
SUBTOTAL PROJECT DIRECT COST			-				$73,473	-		-		-		-		-			$73,473
Risk																			
Risk							$12,000												$12,000
Risk Total							$12,000												$12,000
TOTAL PROJECT DIRECT COST			-				$85,473	-		-		-		-		-			$85,473
INDIRECTS																			
Non-Productive Time Allocation (Z9)	58	16.1%					$4,649												$4,649
Payroll Benefits Allocation (ZE) incl NPT	59	44.0%					$10,898												$10,898
Gen SVC CO Overhead (ZF) incl NPT	60	75.0%					$8,421												$8,421
E&S Allocations (Z)	61	45.0%					$41,231												$41,231
AS&E Allocations (ZJ)	62	9.7%					$969												$969
Stores Expense Allocation (ZC)	62																		
Lobby Stock																			
MCHC																			
Vehicles		7.5%					$2,317												$2,317
Indirects Subtotal	63						$69,295												$69,295
TOTAL PROJECT COST - Direct & Indirect / excl AFUDC)							$153,758												$153,758
AFUDC																			
AFUDC (ZK)																			
In Service Dollars																			
Cumulative ISS																			
AFUDC Subtotal																			
TOTAL PROJECT COST - Baseline Budget							$153,758												$153,758
Continoecv																			
Contingency							$5,409												$5,409
Other																			
Continoecv SubTotal							$5,409												$5,409
TOTAL PROJECT COST - Approved Funding							$159,167												$159,167
Reimbursables / Customer Contribution																			
Reimbursables / Customer Contribution (enter as negative)	59																		
TOTAL PROJECT COST							$159,167												$159,167

ESTIMATE SUMMARY

Project Title:West Brookfield 14H Battery Monitor
Project Mgr/Lead [redacted]
Project Number:CS00458
WO & Task #:
Est. Revision # 00
Estimate Type - Station work

Estimate By: [redacted]
Date of Estimate:4/19/21
ISD:08/20/2021
Estimate #

Template Revision # 01.61

ESTIMATE SUMMARY

Estimate Type: Planning

WBS	Description	TOTAL	% of Directs	% of Total	Priors	2021	2022	2023	2024	2025	2026
1	ROW / Easements / Land purchases										
2	Environmental Approvals / Permits										
3	Outreach	$100	0.2%	0.1%		$100					
4	Siting Approvals / Permits	$300	0.5%	0.3%		$300					
5	Engineering / Design	$7,600	11.9%	6.5%		$7,600					
6	Materials (Eversource purchased)	$3,000	4.7%	2.6%		$3,000					
7	Construction (incl matl's by contractors)	$36,600	57.2%	31.4%		$36,600					
8	Testing / Commissioning	$1,100	1.7%	0.9%		$1,100					
9	PMT Project Mgmt Team	$6,300	9.8%	5.4%		$6,300					
10	Removals										
11	Other										
12	Risks	$9,000	14.1%	7.7%		$9,000					
	Project Directs Total w/Risks	**$64,000**	100.0%	54.9%		**$64,000**					
13	Indirects/Overhead	$46,900		40.2%		$46,900					
14	AFUDC	$900		0.8%		$900					
	Project Total - Baseline Budget	**$111,800**		95.9%		**$111,800**					
15	Contingency	$4,800		4.1%		$4,800					
	Project Total - Funding Approval Level	**$116,600**		100.0%		**$116,600**					
16	Reimbursables/Customer Contribution										
	Project Total (less reimbursables)	**$116,600**				**$116,600**					
		-									
	Amount of Escalation included above										
6	Total materials - Eversource	$3,000				$3,000					
	Total materials - Contractor	$9,900				$9,900					
	Total materials	$12,900				$12,900					
	NOTE: Risk / Contingency is 13.4% of Project Total Costs (incl escal/indirects/AFUDC but excl reimb.)										

Estimate Range	**-25%**	-	**25%**
	$87,000	-	**$146,000**

COMMENTS:

Project Scope:

[redacted]

Assumptions/Clarifications:

Indirect rates based on: 11 - CT . Station work

Inhouse resources will be used for LCE & Engineering.
PM & SCADA will be outsourced.
Construction will be Outsourced/Inhouse combination
Construction Rep will not be needed.
Real Power will provide a UXIM monitor including any wiring to the battery with their installation services.
A Mobile battery cart will be provided while Real power is installing the battery tab washers by Inhouse resources.

RISKS

Potential Obstructions	$	4,500
Delays	$	4,500

Project Title:West Brookfield 14H Battery Monitor

Escalated Line Item Dollars

Project Number:C500468
Date of Estimate:4/15/21
Est. Revision # 00
Template Revision # 01.01

CSTXX-CONSTRUCTION	R		Prior actuals to date Mhrs	Prior actuals to date DOLLARS	2021 Mhrs	2021 DOLLARS	1 2022 Mhrs	2022 DOLLARS	2 2023 Mhrs	2023 DOLLARS	3 2024 Mhrs	2024 DOLLARS	4 2025 Mhrs	2025 DOLLARS	5 2026 Mhrs	2026 DOLLARS	TOTAL Mhrs	TOTAL DOLLARS
Electrical Construction	LT					$2,144												$2,144
General Construction	LT																	
SCADA / Automation	LT					$424												$424
Telecom - Field	LT																	
Construction Reps (internal)	LT																	
Support Switch/Tap	LT																	
Other (specify)	LT																	
Other (specify)	LT																	
Other (specify)	LT																	
LT Total						$2,568												$2,568
Employee Expenses	AE	5%				$128												$128
Construction Purchased Material	AM	1%				$261												$261
Outside Construction Vendor	AQ					$23,967												$23,967
Sales tax on Constr. Vendor																		
Vehicles (now in Indirects section)	AV																	
Inspection services (Outside Vendor)	AQ																	
Construction Rep (Outside vendor)	AQ																	
Rents and Leases	BR																	
CSTXX Subtotal						$26,924												$26,924
Escalation						$ -		$ -		$ -		$ -		$ -		$ -		$ -
	P1																	
CSTXX Total						$26,924												$26,924
ENRXX-TG ENGINEERING/DESIGN																		
Project Services/Drafting	LT					$2,120												$2,120
T- Line Engineering/Design	LT																	
D- Street Engineering/Design	LT																	
Civil Engineering/Design	LT																	
Substation (T) Engineering/Design	LT																	
Substation (D) Engineering/Design	LT					$3,816												$3,816
Protection & Controls Engineering	LT					$848												$848
Survey Engineering	LT																	
SCADA / Automation Engineering	LT																	
Telecom Engineering	LT					$424												$424
Other - specify	LT																	
Other - specify	LT																	
LT Total						$7,208												$7,208
Employee Expenses	AE	5%				$360												$360
Contractor Engineering - T-Lines	AQ																	
Contractor Engineering - D-Street	AQ																	
Contractor Engineering - T -Station	AQ																	
Contractor Engineering - D-Station	AQ																	
Contractor Engineering - P&C	AQ																	
Contractor Engineering - Survey	AQ																	
Contractor Engineering - SCADA / Automatic	AQ																	
Contractor Engineering - Telecom	AQ																	
Contractor Engineering - Specify	AQ																	
Contractor Engineering - Specify	AQ																	
Contractor Engineering - Specify	AQ																	
Vehicles (now in Indirects section)	AV																	
ENRXX Subtotal			-			$7,568	-	-	-		-		-		-			$7,568
Escalation																		
	P1																	
ENRXX Total			-			$7,568	-	-	-		-		-		-			$7,568
LNDXX-TG LAND																		
Real Estate	LT																	
Employee Expenses	AE	5%																
Purchase Land	AM																	
Vehicles (now in Indirects section)	AV																	
Fees and Payments	BF																	
LNDXX Subtotal			-				-	-	-		-		-		-			
Escalation																		
	P1																	
LNDXX Total			-				-	-	-		-		-		-			
MATXX-TG MATERIAL																		
Eversource	AM					$2,200												$2,200
Outside Services	AM					$9,900												$9,900
	AM																	
Freight																		
Sales Tax Eversource/outside services		4%				$500												$500
Other																		
MATXX Subtotal						$12,600												$12,600
Escalation																		
	P1																	
MATXX Total						$12,600												$12,600
PSMXX-PROJECT MANAGER & SUPPORT																		
Project Management (PM)	LT																	
Project Planning/Cost (IP)	LT					$424												$424
Contracts/Purchasing (CP)	LT					$424												$424
System Planning	LT																	
Environmental	LT																	
SCS - Notification	LT					$5												$5
Legal	LT																	
Estimating	LT					$848												$848
Siting - Local Zoning	LT																	
Asset Management	LT					$848												$848
Other -	LT																	
Other -	LT																	
Other -	LT																	
Other -	LT																	
LT Total						$2,549												$2,549
Employee Expenses	AE	5%				$127												$127
Project Support Vendor - PM	AQ					$3,600	-	-	-		-		-		-			$3,600
Project Support Vendor - IP	AQ						-	-	-		-		-		-			
Project Support Vendor - CP	AQ						-	-	-		-		-		-			
Project Support Vendor - System Planning	AQ						-	-	-		-		-		-			
Project Support Vendor - Environmental	AQ						-	-	-		-		-		-			
Project Support Vendor - SCS - Notification	AQ					$90	-	-	-		-		-		-			$90
Project Support Vendor - Legal	AQ						-	-	-		-		-		-			
Project Support Vendor - Estimating	AQ						-	-	-		-		-		-			
Project Support Vendor - Siting - Local Zoning	AQ					$300	-	-	-		-		-		-			$300
Project Support Vendor - Asset Management	AQ						-	-	-		-		-		-			
Project Support Vendor - Other	AQ						-	-	-		-		-		-			
Project Support Vendor - Other	AQ						-	-	-		-		-		-			
Project Support Vendor - Other	AQ						-	-	-		-		-		-			
Project Support Vendor - Other	AQ						-	-	-		-		-		-			
Vehicles (now in Indirects section)	AV																	
Property or CW P tax large proj. allowance	BR																	
	BR																	
Fees and Payments - Environmental	BF																	
Fees and Payments - Siting	BF																	
Fees and Payments - Other	BF																	
PSMXX Subtotal			-			$8,666	-	-	-		-		-		-		2	$8,666
Escalation																		
	P1																	
PSMXX Total			-			$8,666	-	-	-		-		-		-		2	$8,666
REMXX-TG REMOVAL																		
Engineering/Design	LT																	
Internal Construction	LT																	
LT Total																		
Employee Expenses	AE	10%																
Outside Services	AQ																	
Contractor Labor	AQ																	
Vehicles (now in Indirects section)	AV																	
Rents and Leases	BR																	
REMXX Subtotal			-				-	-	-		-		-		-			
Escalation																		
	P1																	
REMXX Total			-				-	-	-		-		-		-			
TSTXX-TG TEST																		
Test / Field Engr. Labor (In House)	LT																	
Lead Commissioning Engr. (LCE) (internal)	AQ					$959												$959
Employee Expense	AE	10%				$99												$99
Test / Field Engr. Labor (contractor)	AQ																	
Lead Commissioning Engr. (LCE) (contactor)	AQ																	
Vehicles (now in Indirects section)	AV																	
TSTXX Subtotal						$1,058												$1,058
Escalation																		
	P1																	
TSTXX Total						$1,058												$1,058
SUBTOTAL PROJECT DIRECT COST			-			$54,646	-	-	-		-		-		-		5	$54,646
Risk																		
Risk						$9,000												$9,000
Risk Total						$9,000												$9,000
TOTAL PROJECT DIRECT COST			-			$63,646	-	-	-		-		-		-		5	$63,646
INDIRECTS																		
Non-Productive Time Allocation (ZB)	58	16.1%				$2,004												$2,004
Payroll Benefits Allocation (ZE) incl NPT	59	44.0%				$1,901												$1,901
Gen SVC CO Overhead (ZF) incl NPT	60	75.0%				$8,419												$8,419
E&S Allocations (ZI)	61	50.0%				$26,747												$26,747
AS&E Allocations (ZJ)	62	1.3%				$1,173												$1,173
Stores Expense Allocation (ZC)	62	8.0%				$176												$176
Lobby Stock																		
MO&C		5.0%				$2,809												$2,809
Vehicles		28.0%				$3,728												$3,728
	63																	
Indirects Subtotal						$46,957												$46,957
TOTAL PROJECT COST - Direct & Indirect / excl AFUDC						$110,703												$110,703
AFUDC																		
AFUDC (ZK)						$857	0	0	0		0		0		0		0	$857
In Service Dollars																		
Cumulative ISS																		
AFUDC Subtotal						$857												$857
TOTAL PROJECT COST - Baseline Budget						$111,560												$111,560
Continoecy																		
Contingency						$4,753												$4,753
Other																		
Continoecy SubTotal						$4,753												$4,753
TOTAL PROJECT COST - Approved Funding						$116,343												$116,343
Reimbursables / Customer Contribution																		
Reimbursables / Customer Contribution (enter as negative)	59																	
TOTAL PROJECT COST						$116,343												$116,343

ESTIMATE SUMMARY

Project Title: Battery Monitor Installation - Curtisville, NH
Project Mgr/Lead: [redacted]
Project Number: T431A
WO & Task #: 80038958
Est. Revision # 00
Estimate Type - Station work

Estimate By: [redacted]
Date of Estimate: 5/25/2021
ISD:12/31/2021
Estimate # P-21-356

Template Revision # 01.64

ESTIMATE SUMMARY

Estimate Type: Planning

WBS	Description	TOTAL	% of Directs	% of Total	Priors	2021	2022	2023	2024	2025	2026
1	ROW / Easements / Land purchases										
2	Environmental Approvals / Permits										
3	Outreach	$100	0.2%	0.1%		$100					
4	Siting Approvals / Permits	$200	0.4%	0.2%		$200					
5	Engineering / Design	$13,000	23.8%	13.0%	$4,100	$8,900					
6	Materials (Eversource purchased)	$300	0.5%	0.3%		$300					
7	Construction (incl matl's by contractors)	$28,400	52.0%	28.3%		$28,400					
8	Testing / Commissioning	$1,600	2.9%	1.6%		$1,600					
9	PMT Project Mgmt Team	$5,500	10.1%	5.5%	$1,000	$4,500					
10	Removals										
11	Other										
12	Risks	$5,500	10.1%	5.5%		$5,500					
	Project Directs Total w/Risks	**$54,600**	100.0%	54.5%	**$5,100**	**$49,500**					
13	Indirects/Overhead	$42,000		41.9%	$4,000	$38,000					
14	AFUDC	$1,300		1.3%		$1,300					
	Project Total - Baseline Budget	**$97,900**		97.7%	**$9,100**	**$88,800**					
15	Contingency	$2,300		2.3%		$2,300					
	Project Total - Funding Approval Level	**$100,200**		100.0%	**$9,100**	**$91,100**					
16	Reimbursables/Customer Contribution										
	Project Total (less reimbursables)	**$100,200**			**$9,100**	**$91,100**					
		-									
	Amount of Escalation included above										
6	Total materials - Eversource	$300				$300					
	Total materials - Contractor	$7,400				$7,400					
	Total materials	$7,700				$7,700					
	NOTE: Risk / Contingency is 8.4% of Project Total Costs (incl escal/indirects/AFUDC but excl reimb.)										

Estimate Range	**-25%**	-	**25%**
	$75,000	-	**$125,000**

COMMENTS:

[redacted]

Assumptions/Clarifications:

Indirect rates based on: 6D - NH . Station work

Alber UXIMe battery monitor will be installed in addition to the existing ARGA battery monitor
Alber monitor wiring will connect in existing ARGA junction box - no need for new junction box
Monitor will be connected to battery with harnesses provided by Alber
Data collected by monitor will be sent to a dedicated server on PI historian system via Ethernet connection
Monitor is powered through the battery harness connections and does not require a DC power feed from the DC panelboard
Battery alarms will be wired directly to the RTU for SCADA
One Alber monitor trouble alarm will be sent to the ESCC
Mobile battery trailer is required during installation of the new monitor
In service date of 12/31/2021 provided in the Estimate Request Form - 5/10/2021
Engineering and project management support will be performed by Eversource personnel
Construction Rep performed by Eversource personnel
LCE performed by Eversource personnel
Electrical contractors will install wiring and the Alber monitor - see Real Power, Inc. quote dated 2/24/2021, proposal #2329
Electrical contractors will test connections to battery, alarms and commission monitoring system - see Real Power, Inc. quote dated 2/24/2021, proposal #2329
Construction schedule, engineering responsibilities and scope provided in Project Scope Document - Rev. #1 dated 4/2/2021
Panduit and alarm cables to be installed ahead of Real Power, Inc. company installing the new Alber monitor by contractors
Outages not required
No additional costs for battery cart
All work will be installed to Eversource Bookshelf latest standards and procedures
Prior costs from Power Plan dated 5/19/2021
Distribution Asset per Estimate Request Form dated 5/10/2021

RISKS

Potential Obstructions	$	2.000
Work Delays	$	2.000
Design development	$	1.500

Project Title: Battery Monitor Installation - Curtisville, NH

Escalated Line Item Dollars

Project Number: T431A
Date of Estimate: 5/5/2021
Ref: Revision # 00
Template Revision # 01.04

			Prior actuals to date		2021		2022 (1)		2023 (2)		2024 (3)		2025 (4)		2026 (5)		TOTAL	
CSTXX-CONSTRUCTION	R		Mhrs	DOLLARS	Mhrs	DOLLARS	Mhrs	DOLLARS	Mhrs	DOLLARS	Mhrs	DOLLARS	Mhrs	DOLLARS	Mhrs	DOLLARS	Mhrs	DOLLARS
Electrical Construction	LT																	
General Construction	LT																	
SCADA / Automation	LT																	
Telecom - Field	LT																	
Construction Reps (Internal)	LT					$2,544												$2,544
Support Switch/Tap	LT																	
Other (specify)	LT																	
Other (specify)	LT																	
Other (specify)	LT																	
LT Total						$2,544												$2,544
Employee Expenses	AE	5%				$127												$127
Construction Purchased Material	AM	1%				$184												$184
Outside Construction Vendor	AO					$18,367												$18,367
Sales tax on Constr. Vendor																		
Vehicles (now in Indirects section)	AV																	
Inspection services (Outside Vendor)	AO																	
Construction Reps (Outside vendor)	AO																	
Rents and Leases	BR																	
CSTXX Subtotal						$21,222												$21,222
Escalation						$ -		$ -		$ -		$ -		$ -		$ -		$ -
	P1																	
CSTXX Total						$21,222												$21,222
ENRXX-TG ENGINEERING/DESIGN																		
Project Services/Drafting	LT					$1,595												$1,595
T- Line Engineering/Design	LT																	
D- Street Engineering/Design	LT																	
CMI Engineering/Design	LT																	
Substation (T) Engineering/Design	LT																	
Substation (D) Engineering/Design	LT			$4,073		$1,595												$5,769
Protection & Controls Engineering	LT					$1,595												$1,595
Survey Engineering	LT																	
SCADA / Automation Engineering	LT					$1,272												$1,272
Telecom Engineering	LT					$1,272												$1,272
Other - Electric System Control Center (ESCC)	LT					$848												$848
Other - specify	LT																	
LT Total				$4,073		$8,480												$12,553
Employee Expenses	AE	5%				$424												$424
Contractor Engineering - T-Lines	AO																	
Contractor Engineering - D-Street	AO																	
Contractor Engineering - T -Station	AO																	
Contractor Engineering - D-Station	AO																	
Contractor Engineering - PSC	AO																	
Contractor Engineering - Survey	AO																	
Contractor Engineering - SCADA / Automation	AO																	
Contractor Engineering - Telecom	AO																	
Contractor Engineering - Specify	AO																	
Contractor Engineering - Specify	AO																	
Contractor Engineering - Specify	AO																	
Vehicles (now in Indirects section)	AV																	
ENRXX Subtotal			-	$4,073		$8,904	-	-	-	-	-	-	-	-				$12,977
Escalation																		
	P1																	
ENRXX Total			-	$4,073		$8,904	-	-	-	-	-	-	-	-				$12,977
LNDXX-TG LAND																		
Real Estate	LT																	
Employee Expenses	AE	5%																
Purchase Land	AM																	
Vehicles (now in Indirects section)	AV																	
Fees and Payments	BF																	
LNDXX Subtotal			-				-	-	-	-	-	-	-	-				
Escalation																		
	P1																	
LNDXX Total			-				-	-	-	-	-	-	-	-				
MATXX-TG MATERIAL																		
Substation	AM					$67												$67
Outside Services	AM					$7,400												$7,400
	AM																	
Freight																		
Sales Tax Eversource/outside services																		
Other																		
MATXX Subtotal						$7,467												$7,467
Escalation																		
	P1																	
MATXX Total						$7,467												$7,467
PSMXX-PROJECT MANAGER & SUPPORT																		
Project Management (PM)	LT			$1,038		$1,695												$2,734
Project Planning/Cost (P)	LT					$424												$424
Contracts/Purchasing (C/P)	LT					$424												$424
System Planning	LT																	
Environmental	LT																	
SCS - Notification	LT					$4												$4
Legal	LT																	
Estimating	LT					$848												$848
Siting - Local Zoning	LT																	
Asset Management	LT					$848												$848
Other -	LT																	
Other -	LT																	
Other -	LT																	
Other -	LT																	
LT Total				$1,038		$4,244												$5,282
Employee Expenses	AE	5%				$212												$212
Project Support Vendor - PM	AO						-	-	-	-	-	-						
Project Support Vendor - IP	AO						-	-	-	-	-	-						
Project Support Vendor - C/P	AO						-	-	-	-	-	-						
Project Support Vendor - System Planning	AO						-	-	-	-	-	-						
Project Support Vendor - Environmental	AO						-	-	-	-	-	-						
Project Support Vendor - SCS - Notification	AO					$70	-	-	-	-	-	-						$70
Project Support Vendor - Land	AO						-	-	-	-	-	-						
Project Support Vendor - Estimating	AO						-	-	-	-	-	-						
Project Support Vendor - Siting - Local Zoning	AO					$200	-	-	-	-	-	-						$200
Project Support Vendor - Asset Management	AO						-	-	-	-	-	-						
Project Support Vendor - Other	AO						-	-	-	-	-	-						
Project Support Vendor - Other	AO						-	-	-	-	-	-						
Project Support Vendor - Other	AO						-	-	-	-	-	-						
Project Support Vendor - Other	AO						-	-	-	-	-	-						
Vehicles (now in Indirects section)	AV																	
Property or CWIP tax lapse prot. allowance	BR																	
	BR																	
Fees and Payments - Environmental	BF																	
Fees and Payments - Siting	BF																	
Fees and Payments - Other	BF																	
PSMXX Subtotal			-	$1,038		$4,726	-	-	-	-	-	-	-	-				$5,764
Escalation																		
	P1																	
PSMXX Total			-	$1,038		$4,726	-	-	-	-	-	-	-	-				$5,764
REMXX-TG REMOVAL																		
Engineering/Design	LT																	
Internal Construction	LT																	
LT Total																		
Employee Expenses	AE	10%																
Outside Services	AO																	
Contractor Labor	AO																	
Vehicles (now in Indirects section)	AV																	
Rents and Leases	BR																	
REMXX Subtotal			-				-	-	-	-	-	-	-	-				
Escalation																		
	P1																	
REMXX Total			-				-	-	-	-	-	-	-	-				
TSTXX-TG TEST																		
Test / Field Engr. Labor (In House)	LT																	
Lead Commissioning Engr. (LCE) (Internal)	AO					$1,483												$1,483
Employee Expenses	AE	10%				$148												$148
Test / Field Engr. Labor (contractor)	AO																	
Lead Commissioning Engr. (LCE) (contractor)	AO																	
Vehicles (now in Indirects section)	AV																	
TSTXX Subtotal						$1,631												$1,631
Escalation																		
	P1																	
TSTXX Total						$1,631												$1,631
SUBTOTAL PROJECT DIRECT COST			-	$5,111		$43,960	-	-	-	-	-	-	-	-				$49,061
Risk																		
Risk						$5,500												$5,500
Risk Total						$5,500												$5,500
TOTAL PROJECT DIRECT COST			-	$5,111		$49,460	-	-	-	-	-	-	-	-				$54,561
INDIRECTS																		
Non-Productive Time Allocation (ZNP)	58	15.0%		$700		$2,513												$3,213
Payroll Benefits Allocation (ZPB) Incl NPT	59	35.0%		$963		$1,369												$2,252
Gen SVC CO Overhead (ZGS) Incl NPT	60	75.0%		$1,550		$10,974												$12,524
E&S Allocations (ZEB,ZEL,ZES)	61	30.0%		$816		$15,079												$15,895
AS&E Allocations (ZAS)	62	2.0%		$45		$1,478												$1,523
Stores Expense Allocation (ZST)	62	0.0%				$4												$4
Lobby Stock																		
MDEC (ZMI)		4.0%				$2,039												$2,039
Vehicles (ZVE)		26.7%				$4,476												$4,476
	63																	
Indirects Subtotal				$3,974		$37,952												$41,926
TOTAL PROJECT COST - Direct & Indirect (exc AFUDC)				$9,085		$87,402												$96,487
AFUDC																		
AFUDC (ZX)				$22		$1,272	0	0	0	0	0	0	0	0	0	0		$1,294
In Service Dollars																		
Cumulative ISS																		
AFUDC Subtotal				$22		$1,272												$1,294
TOTAL PROJECT COST - Baseline Budget				$9,107		$88,674												$97,781
Contingency																		
Contingency						$2,275												$2,275
Other																		
Contingency SubTotal						$2,275												$2,275
TOTAL PROJECT COST - Approved Funding				$9,107		$90,949												$100,056
Reimbursables / Customer Contribution																		
Reimbursables / Customer Contribution (enter as negative)																		
	59																	
TOTAL PROJECT COST				$9,107		$90,949												$100,056