EVERSOURCE

Operations Project Authorization Form

Approved on June 22, 2023 EPAC

Link to Meeting Minutes

Project Title: Replace Mobile Transformer 71MX	**Project Number: CS00593**
Date Prepared: 06/15/2023	**Company:** Eversource CT
Organization: Asset Management	**Class(es) of Plant:** D SS
Project Initiator: [redacted]	**Project Category:** Stations - Transformers
Managing Organization: Transmission / Major Projects	**Schedule ID#: 80275493**
Project Manager: [redacted]	**Project Type:** Specific
Project Sponsor: [redacted]	**Capital Investment part of original Op Plan:** Yes
Estimated in service date: September 2025	**Emergency Related Request?** No
Eng./Constr. Resources Budgeted? Yes	**Facility Type** (check all that apply)**:** ☐ PTF ☐ non-PTF ☒ Distribution ☐ N/A (General Plant)
Total Capital Request: $4.892M	**Authorization Type:** Full Funding

[1] Executive Summary

This Project Authorization Form (PAF) is requesting full funding in the amount of $4.892M to replace the 71MX mobile transformer and associated cable trailer. The 71MX mobile transformer (T6725), a 30MVA 115/28.8/23/14.4kV unit manufactured in 1995, was damaged in mid-2021 when the 71MX trailer jackknifed during transit, rendering it out of service. Details of the damage can be found in the Background section below. The mobile transformer and trailer will be scrapped by the Investment Recovery group.

Demands on the mobile transformer fleet are increasing. It is critical that the loss of this unit be remedied as soon as possible:

- Eversource is currently planning substation projects to install [redacted] in Connecticut and Massachusetts before the end of 2025 and mobile transformer support is expected to be needed for system reliability during many of the transformer projects.
- Single Contingency Line Loss (SCLL) criteria has become increasingly conservative, requiring more mobile transformer deployments, for both transformer maintenance and replacements.

- The rate of transformer failure has increased due to age and asset condition, which places a higher demand on the mobile transformer fleet to support emergent failures.
- Mobile transformers will be required to meet increasingly stringent system planning restoration time criteria, as required by Distribution system planning guide (DSPG)
- Mobile transformer usage has grown dramatically in the past few years. Usage has grown from two (2) deployments in 2016 for the fleet to ten (10) or more in 2020 and 2021, with some units in service almost every day of the year.

Initial funding of $75K was approved for this project in PowerPlan on May 31, 2022. To date, minimal budget has been spent and the project was approved at SDC on August 31, 2022. The new unit will be identical to the 78MX mobile transformer which is currently being manufactured by Delta-Star under project # CS00486. This will save time and engineering costs.

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[2] PROJECT COSTS SUMMARY

Note: Dollar values are in thousands

Line item Category	Prior Authorized	Actuals to Date	2023	2024	2025	2026	2027	Total
1. ROW / Easements / Land Acquisition	$	$	$	$	$	$	$	$
2. Environmental Approvals / Permits	$	$	$	$	$	$	$	$
3. Outreach	$	$	$	$	$	$	$	$
4. Siting Approvals / Permits	$	$	$	$	$	$	$	$
5. Engineering / Design	$	$	$2	$15	$8	$	$	$25
6. Materials (Eversource purchased)	$	$	$	$743	$3,033	$	$	$3,776
7. Construction (incl matl's by contractors)	$	$1	$	$	$10	$	$	$11
8. Testing / Commissioning	$	$	$	$	$37	$	$	$37
9. Project Mgmt. Team	$	$1	$14	$6	$8	$	$	$28
10. Removals	$	$	$	$	$	$	$	$
11. Other	$	$	$	$	$	$	$	$
12. Risks	$	$	$	$250	$60	$	$	$310
SUBTOTAL DIRECTS W/ RISKS	**$75**	**$1**	**$16**	**$1,014**	**$3,156**	**$**	**$**	**$4,188**
13. Indirects/Overhead	$	$0	$20	$102	$378	$	$	$500
14. AFUDC	$	$0	$1	$38	$31	$	$	$71
PROJECT TOTAL – BASELINE BUDGET	**$75**	**$2**	**$38**	**$1,155**	**$3,565**	**$**	**$**	**$4,759**
15. Contingency	$	$	$1	$27	$106	$	$	$133
TOTAL CAPITAL REQUEST	**$75**	**$2**	**$38**	**$1,181**	**$3,671**	**$**	**$**	**$4,892**
16. Reimbursables/Customer Contribution	$	$	$	$	$	$	$	$
PROJECT TOTAL (LESS REIMBURSABLES)	**$75**	**$2**	**$38**	**$1,181**	**$3,671**	**$**	**$**	**$4,892**
O&M	$	$	$	$	$	$	$	$
TOTAL REQUEST	**$75**	**$2**	**$38**	**$1,181**	**$3,671**	**$**	**$**	**$4,892**

Detail other costs, project risk items and their allocations:

Risk	Allocation
1. Severe weather, delays, OT	$60
2. Design Development	$85
3. Materials arrive late or defective	$165
4.	$
5.	$
Total	$310

Explain unique payment provisions, if applicable:

Payment to vendor will be as follows:

30% upon drawing approval

30% upon start of manufacturing

30% upon Factory Acceptance Testing (FAT)

10% upon shipment

Identify and detail any unique O&M impacts resulting from this project:

The 71MX mobile transformer and cable trailer will have a six (6) year warranty per the agreement with the vendor.

Unit will be maintained by internal crews with O&M costs similar to existing units.

[3] TECHNICAL JUSTIFICATION

Project Need, Objective and Justification

Demands on the mobile transformer fleet are increasing. It is critical that the loss of this 71MX unit be remedied as soon as possible:

- Eversource is currently planning substation projects to install [redacted] in Connecticut and Massachusetts before the end of 2025, and mobile transformer support is expected to be needed for system reliability during many of the transformer projects.

- Single Contingency Line Loss (SCLL) criteria has become increasingly conservative, requiring more mobile transformer deployments, for both transformer maintenance and replacements.

- The rate of transformer failure has increased due to age and asset condition, which places a higher demand on the mobile transformer fleet to support emergent failures.

- Mobile transformers will be required to meet increasingly stringent system planning restoration time criteria, as required by SYSPLAN-010.

- Mobile transformer usage has grown dramatically in the past few years. Usage has grown from two (2) deployments in 2016 for the fleet to ten (10) or more in 2020 and 2021, with some units in service almost every day of the year. In 2022, there were four (4) deployments as shown in Table 3.

Table 1: 71MX Transformer Ratings

Unit	In Service Date	MVA	Primary kV	Secondary kV			Vendor
71MX	1995	30	115	28.8	23	14.4*	Delta-Star
* 14.4kV units can also be used for 13.8kV service							

Table 2: Number of mobiles in Eversource CT and WMA system. Replacing 71MX would add one (1) unit configured to support each of these voltages.

Primary	Secondary	Number of In-Service XFMRs	Number of Mobiles Configured to Support
115kV	27.6kV	25	3
115kV	23kV	90	4
115kV	13.8kV	105	4

The usage of the existing mobile fleet has been increasing for the past few years. Tables 3 and 4 show the increasing deployments and days in service for the 71MX unit:

Table 3: Number of Deployments for the fleet including future scheduled deployments

Unit	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Grand Total**
66MX	1	1	2	2	2	3	2	13
67MX				2	4	3	1	10
70MX	1		1	2	3	3	1	11
71MX		2		2	1	2		7
Grand Total	**2**	**3**	**3**	**8**	**10**	**11**	**4**	**41**

Table 4: Total Days in Service for the 71MX and other units (2023 projections), note that 71MX was fully deployed in 2020 and that trend would have continued had the unit not been damaged.

Unit	2016	2017	2018	2019	2020	2021	2022	2023	Grand Total
66MX	26	82	144	82	180	195	126	150	985
67MX				94	288	216	161	181	940
70MX	163		130	323	363	138	284	333	1734
71MX		79		84	365	89			617
Grand Total	189	161	274	583	1196	638	571	664	4276

As mentioned above, there are numerous transformer replacement projects being developed. Many of these will require mobile transformer deployments that are not accounted for in the tables above. These projects are shown in Table 5.

Table 5: Known Mobile Transformer Fleet Needs not included in above tables

Project #	[redacted]	ISD	Mobile Transformer Needed	Date Mobile Required
CS00516		2023	Yes	1-3-23 to 5-31-23
CS00401		2023	Yes	9-1-22 to 2-10-23
CS00401		2023	Yes	2-1-23 to 9-1-23
CS00284		2023	Yes	TBD
CS00166		2023	TBD	TBD
CS00392		2024	Yes	2-1-24 to 5-31-24
CS00364		2024	TBD	TBD
CS00383		2024	Yes	2-1-24 to 5-31-24
CS00383		2024	Yes	9-3-24 to 12-30-24
CS00365		2024	TBD	TBD
CS00533		2024	Yes	1-2-24 to 5-31-24
CS00392		2025	Yes	9-3-24 to 12-30-24
CS00544		2025	Yes	1-2-25 to 5-30-25
CS00365		2025	TBD	TBD
CS00286		2025	Yes	9-3-24 to 5-30-25
CS00286		2025	Yes	9-3-24 to 5-30-25

Project Scope

The project scope is to order a new mobile transformer to replace the 71MX mobile transformer (T6725) and cable trailer. There are over 225 transformers with a 115kV primary and 23kV, 13.8kV or 13.2kV secondary voltage. This class of transformer is scheduled to have numerous replacements over the next few years and mobile transformer support will be required for many of them. Purchasing a unit for CT with both 115kV wye and delta configurations ensures the unit can be used for both of those scenarios. The mobile transformer will have a 115kV delta primary and 27.6kV, 23kV and 14.4kV wye secondary. The new 71MX will be identical to the new 78MX mobile transformer currently being built by Delta-Star. This will save time and engineering costs. The unit will be purchased with trailer included in accordance with Eversource SUB 124.3 – Mobile Transformer procurement standard. P&C input has been obtained for protective relaying and SCADA devices to be installed on the transformers. Wildlife protection will also be installed as required.

Substation Equipment

Station	Device Position / Nomenclature	Device Removals *include manufacturer*	Device Additions *include manufacturer*
N/A	71MX	Existing (damaged) 71MX Delta-Star Mobile Transformer	Delta-Star Mobile Transformer

Background

The 71MX mobile transformer (T6725), a 30MVA 115/28.8/23/14.4kV unit manufactured in 1995, was damaged in mid-2021 when the trailer jackknifed during transit.

The mobile transformer was brought into the Central Maintenance Service (CMS) facility where Field Test personnel performed a suite of electrical tests. The electrical tests revealed core ground issues. An internal inspection was performed by Substation Operations and abnormalities such as physical shifting of the core was observed. Additionally, the transformer trailer sustained broken welds to structural members requiring substantial repairs or complete replacement.

Delta-Star, who manufactured the unit in 1995, was contacted to discuss the possibility of repairing the unit. To determine the costs related to the repair, Delta-Star was contracted to perform a detailed inspection at the CMS facility. They evaluated the repairs required and determined extensive repairs were needed to restore the unit to service with the most significant repair being replacement of the core and coils. Replacing the core and coils is estimated to cost $1.3M. Also, the structural integrity of the trailer was found to be suspect. While the unit is out-

of-service for internal repairs, additional upgrades would be made to the 27-year-old unit. These include:

- Rebuilding oil pumps
- Replacing fan motors
- Replacing all bushings and arresters
- Upgrading relays
- Reconditioning of the trailer to address structural integrity
- Upgrading trailer tires, airlines, valves

The repairs required are similar in scope to building a new mobile transformer. However, the repair work would only have a one-year warranty.

[4] ALTERNATIVES CONSIDERED

The alternatives presented at SDC are as follows.

Alternative #1 Do Not Replace

Do not replace the 71MX mobile transformer and continue to rely on the existing fleet. This alternative is not preferred because it does not address the upcoming mobile support needed for transformer replacements, both planned and emergent.

Advantages: This alternative has the least cost.

Disadvantages: This alternative does not support the needs to the system. There are numerous planned projects and an unknown number of emergent projects requiring mobile transformer support.

Customer/Community Impacts: This alternative places customers at risk by not having enough mobile transformers for outage needs. Any location that has inadequate distribution ties to other substations and has a bulk transformer failure could strand customers for a greater period of time if a mobile transformer is not available.

Risks: This alternative risks not having enough mobile transformers to support the system needs.

Alternative #2 Replace with New Mobile Unit (Preferred alternative)

Purchase a new mobile transformer unit and trailer with the same configuration as one of the units being purchased under project CS00486. This mobile transformer will be able to support transformers with a 115kV delta primary and 27.6kV, 23kV and 13.8kV wye secondary winding. This configuration can support the most common transformers used in the Connecticut system.

Advantages: This alternative purchases a mobile transformer that can support the most common transformer configurations in the Eversource CT and WMA systems. This option helps ensure system reliability by having enough mobile transformers available to support system needs. The new unit will have a 6-year warranty.

Disadvantages: This alternative has a higher initial cost than the other alternatives.

Customer/Community Impacts: This alternative helps ensure system reliability by having a sufficient supply of mobile transformers to support current and future system needs.

Risks: This alternative is subject to supply chain delays, leading to risk of the unit being committed before delivery and then not being able to support system needs.

Cost: The cost for this alternative is $4.892M

Alternative #3 Repair Existing Mobile Unit

When the mobile transformer was damaged, it was brought into the Central Maintenance Service (CMS) facility where Field Test personnel performed a suite of electrical tests. The electrical tests revealed core ground issues. An internal inspection was performed by Substation Operations, and abnormalities such as physical shifting of the core was observed. The transformer trailer sustained broken welds to structural components.

Delta-Star, who manufactured the unit in 1995, was contacted to discuss the possibility of repairing the unit. To determine the costs related to the repair, Delta-Star was contracted to perform a detailed inspection at the CMS facility. They evaluated the repairs required and determined extensive repairs were needed to restore the unit to service with the most significant being replacement of the core and coils. Replacing the core and coils is estimated to cost $1.3M. Also, the structural integrity of the trailer was found to be suspect. While the unit is out-of-service for internal repairs, additional upgrades would be made to the 27-year-old unit. These include:

- Rebuilding oil pumps
- Replacing fan motors
- Replacing all bushings and arresters
- Upgrading relays
- Reconditioning of the trailer to address structural integrity
- Upgrading trailer tires, airlines, valves

Advantages: There is a cost advantage to repairing the unit, however it should be noted that repair costs may increase if additional damage is found when the unit is disassembled. After the repairs are performed, Eversource will have purchased a new transformer, but one (1) with only a 1-year warranty as opposed to a 6-year warranty for a new unit.

Disadvantages: This alternative has a shorter warranty period (warranty on repairs is one (1) year and cannot be extended, per manufacturer), and would have a shorter expected service life than purchasing a new unit.

Customer/Community Impacts: This alternative helps ensure system reliability by having an ample supply of mobile transformers to support system needs.

Risks: This alternative is subject to supply chain delays, leading to risk of the unit being committed before delivery and then not being able to support system needs. Current estimated lead time to repair the unit is 56-60 weeks, which is comparable to the lead time to order a new unit.

Delta-Star's costs for the repairs and replacements are shown in the table below. Total costs for repair would be $1.6M + 10 /- 10% (including trailer repairs and excluding transport to and from Delta-Star's facility). This compares to purchasing a new transformer at a cost of approximately $3.3M. This work would have a 1-year warranty with no option to extend the warranty. Therefore, repairing the mobile transformer is not recommended.

Item	Scope of Work	Cost	Cost Deviation
1	[redacted]	$45,000.00	+/- 10%
2		$1,300,000.00	+/- 10%
3		$35,000.00	+/- 10%
4		$9,000.00	+/- 10%
5		$65,000.00	+/- 10%
6		$25,000.00	+/- 10%
7		$60,000.00	+/- 10%
8		$61,000.00	+/- 10%
9		$16,000.00	+/- 10%
10		$6,000.00	+/- 10%
11		$3,000.00	+/- 10%
12		$3,000.00	+/- 10%
	Total Cost	$1,628,000.00	

Figure 1 - Repair cost quote from manufacturer

Due to the excessive damage to the unit, the high cost of repairs that would be needed to return the 71MX to service and the reduced warranty period for repairs, the preferred alternative is to replace the 71MX mobile transformer with a new unit to ensure the fleet of mobile transformers can provide upcoming mobile support needed for planned and emergent transformer replacements.

[5] PROJECT SCHEDULE

Milestone	Scheduled Completion Date
IFR Approval	May 2022
SDC Approval (for applicable projects)	August 2022
Conversion of Tx development costs, 183 to 107 (applicable to projects that require SSF approval and/or ISO preferred alternative selection)	NA
EPAC Partial Funding Approval (for applicable projects)	NA
Preliminary Design Completion (or latest pre-full funding design phase)	NA
EPAC Full Funding Approval	June 2023
Siting Approval (for applicable projects)	NA
Start of Construction	September 2023
Project In-Service Date (ISD)	March 2025
Project Need Date (for applicable projects)	NA
ISO Related Milestones: (for applicable projects)	
• ISO Preferred Alternative Selected	NA
• PAC Presentation	NA
• TCA Submittal	NA

The P6 schedule is provided in Attachment B.

[6] REGULATORY APPROVALS

N/A

[7] Risk and Risk Mitigation Plans

Contingency: Contingency of $133K has been included to account for project unknowns.

Risk Mitigation:

Risk	Mitigation
1. Severe weather, delays, OT	Consult with vendor before placing purchase order. Risk allocation is also included in the estimate.
2. Design Development	Consult with vendor before placing purchase order and during design. Risk allocation is also included in the estimate.
3. Materials arrive late or defective	Consult with vendor before placing purchase order and during manufacture. Risk allocation is also included in the estimate
4.	
5.	

[8] References

References
1. DSPG - Distribution system planning guide
2. Eversource SUB 124.3 – Mobile Transformer procurement standard
3. CS00486 – Purchase 5 Mobile Transformers & Cable Trailers, Approved 3/2/2022.
4.
5.

[9] Attachments (One-Line Diagrams, Images, etc.)

Attachment	Included in Submittal?
A. Cost Estimate	*YES*
B. P6 Schedule	*YES*

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: Replace Mobile Transformer 71MX	**Project Number: CS00593**		
Facility Type: ☐BPS ☐BES ☐PTF ☐PTF non-regional ☐non-PTF ☐CIP ☒Distribution ☐General Plant			
PLANNING			
Is a NX-9 required?	No		
Is an ISO-NE PAC presentation required?	No		
ISO-NE Presentation Date (if completed):	Enter Date		
Cost in ISO-NE Presentation ($M) (if completed):	Enter Cost ($M)		
Is a PPA required?	No		
ISO-NE Approval Date (if completed):	Enter Date		
Is a TCA Application Required?	No		
TCA Submittal Date (if submitted):	Enter Date		
Cost in TCA Submittal ($M) (if submitted):	Enter Cost ($M)		
Enter ISO-NE RSP / Asset Condition ID, if assigned:	Enter ISO-NE ID		
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?	No		
Are Operations & Maintenance procedures/training required?	No		
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?	No		

Project Checklist - Transmission & Substation Capital Project	
Project Name: Replace Mobile Transformer 71MX	**Project Number: CS00593**

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	
Has Siting reviewed this project?	No
Name of Siting contact:	N/A
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
PROJECT SERVICES (OUTREACH) and ROW WORK COORDINATION	
What is the level of outreach expected?	None
Is any part of this project in an Environmental Justice Community?	No
Has ROW Coordination reviewed this project?	No
Is this project coordinating with other existing scheduled work?	No
INITIATOR	
Has a field constructability review been completed?	NR
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 the Eversource Estimating Team
Name of the person who prepared the estimate:	[redacted]
Was the estimate reviewed by Eversource Estimating?	Yes - Full Review

ESTIMATE SUMMARY

Project Title: Replace Mobile Transformer 71MX
Project Mgr/Lead [redacted]

Proiect Number: CS00593
WO & Task #: 80275493
Estimate revision #: 00
Estimate Type - Station work

Estimate #: C-23-166
Date of Estimate:04/13/2023

Estimate done by [redacted]
In Service date (ISD):03/31/2025

Alt Estimate Summary for PP4 Calc (escalation separate)

Estimate #: C-23-166
Date of Estimate:04/13/2023

Project Number: CS00593
WO & Task #: 80275493

ESTIMATE SUMMARY

Estimate Type: Planning

WBS	Description	TOTAL	% of Directs	% of Total	Priors	2023	2024	2025	2026	2027
1	ROW / Easements / Land purchases									
2	Environmental Approvals / Permits									
3	Outreach									
4	Siting Approvals / Permits									
5	Engineering / Design	$25,300	0.6%	0.5%		$2,300	$15,000	$8,000		
6	Materials (Eversource purchased)	$3,776,300	90.2%	77.2%			$743,400	$3,032,900		
7	Construction (incl materials by contractors)	$11,300	0.3%	0.2%	$800			$10,500		
8	Testing / Commissioning	$36,900	0.9%	0.8%				$36,900		
9	PMT Project Mgmt Team	$28,200	0.7%	0.6%	$600	$13,800	$6,000	$7,800		
10	Removals									
11	Other									
12	Risks	$310,000	7.4%	6.3%			$250,000	$60,000		
125										
	Project Directs Total w/Risks	**$4,188,000**	100.0%	85.6%	**$1,400**	**$16,100**	**$1,014,400**	**$3,156,100**		
13	Indirects/Overhead	$500,400		10.2%	$500	$20,200	$102,100	$377,600		
14	AFUDC	$70,700		1.4%		$1,300	$38,300	$31,100		
125										
	Project Total - Baseline Budget	**$4,759,100**		97.3%	**$1,900**	**$37,600**	**$1,154,800**	**$3,564,800**		
15	Contingency	$133,000		2.7%		$500	$26,600	$105,900		
	Project Total - Funding Approval Level	**$4,892,100**		100.0%	**$1,900**	**$38,100**	**$1,181,400**	**$3,670,700**		
16	Reimbursables/Customer Contribution									
125										
	Project Total (less reimbursables)	**$4,892,100**			**$1,900**	**$38,100**	**$1,181,400**	**$3,670,700**		
	Cost per key qty (if appl)	4,892,100	$'s / EA 30MVA Mobile Transformer and Cable Reel Trailer							
	Amount of Escalation included above	$210,700					$27,500	$183,200		
6	Total materials - Eversource	$3,776,300					$743,400	$3,032,900		
	Total materials - Contractor									
	Total materials	$3,776,300					$743,400	$3,032,900		
	NOTE: Risk / Contingency is 10% of Project Total Costs (incl escal/indirects/AFUDC but excl reimb.)									
	Estimate Range	**-25%**	-		**25%**					
		$3,669,000	-		**$6,115,000**					

	TOTAL w/ escal broken out
ROW / Easements / Land purchas	$ -
Environmental Approvals / Permit	$ -
Outreach	$ -
Siting Approvals / Permits	$ -
Engineering / Design	$ 23,800
Materials (Eversource purchased	$ 3,608,500
Construction (incl materials by cc	$ 10,300
Testing / Commissioning	$ 33,800
PMT Project Mgmt Team	$ 27,200
Removals	$ -
Other	$ -
Risks	$ 310,000
	$4,013,600
Indirects/Overhead	$ 463,700
AFUDC	$ 70,700
	$ -
	$4,548,000
	$ -
Contingency	$ 133,100
	$4,681,100
	$ -
	$ -
	$4,681,100
	$ 210,700
Escal total	**$4,891,800**
Check total	-$300

COMMENTS:

Proiect Scope: Purchase new 71MX Mobile Transformer and Cable Reel Trailer

Key qty's and UOM (tie to inputs on est sheets): 1 EA 30MVA Mobile Transformer a

1.30 Factor (total $/Eversource Mat'l $'s)

1.11 Factor (Total directs $/Total Eversource mat'l $'s)

[redacted]

Assumptions/Clarifications:

Indirect rates based on: 11 - CT . Station work

This estimate is based on Delta Star quotation #Q010968 revision 1, dated 1/23/2023 Mobile Substations - RFP Mobile Transformers (CT and Eastern Ma.)
See previous estimate C-22-400, dated 7/15/2022, Mobile Transformer for reference
Purchase of a mobile transformer is to replenish inventory only
No mobile transformer connection boxes are required.
See replace mobile transformer 71MX (CS00593) task filter document dated 3/24/2023 for schedule
Prior cost provided by asset management dated 4/6/2023

Labor
- Engineer - internal
- Project management services - internal
- Construction (Electric and Civil) - internal
- Testing and LCE - internal

RISKS

Severe Weather, Delays, OT	$ 60,000
Design Development	$ 85,000
Materials Arrive Late or Defective	$ 165,000

UNESCALATED LINE ITEM DOLLARS

Project Number CS00593
Date of Estimate 04/13/2023
Estimate revision # 00

Escalation Rate		E Rate $	57										
			Prior		2023		2024	1	2025	2		TOTAL	
CSTXX-CONSTRUCTION	R		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												
Support Switch/Tag	LT												
Other (Electricians to Assist Testing)	LT									$8,120			$8,120
Other (specify)	LT	$ -											
Other (specify)	LT	$ -											
LT Total										$8,120			$8,120
Employee Expenses	AE	6%								$456			$456
Construction Purchased Material	AM	1%											
Outside Construction Vendor	AQ												
Sales tax on Constr Vendor													
Vehicles (now in Indirects section)	AV												
Inspection services [Outside Vendor)	AQ												
Construction Rep (Outside vendor)	AQ			$705									$705
Rents and Leases	SR												
CSTXX Subtotal				$705						$8,576			$10,341
Escalation													
CSTXX Total				$705						$8,576			$10,341
ENRXX-TG ENGINEERING/DESIGN													
Project Services/Drafting	LT									$1,996			$1,996
T- Line Engineering/Design	LT												
D- Street Engineering/Design	LT												
Civil Engineering/Design	LT												
Substation (T) Engineering/Design	LT												
Substation (D) Engineering/Design	LT					$2,164		$10,820		$2,164			$15,148
Protection & Controls Engineering	LT							$1,402		$1,402			$2,804
Survey Engineering	LT												
SCADA / Automation Engineering	LT							$1,375		$1,375			$2,750
Telecom Engineering	LT												
Other - specify	LT												
Other - specify	LT												
LT Total						$2,164		$13,597		$6,937			$22,698
Employee Expenses	AE					$108		$680		$347			$1,135
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 / Automation	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						$2,272		$14,277		$7,284			$23,833
Escalation													
ENRXX Total						$2,272		$14,277		$7,284			$23,833
LNDXX-TG LAND													
Real Estate	LT												
Employee Expenses	AE	5%											
Purchase Land	AM												
Easements	AM												
Vehicles (now in Indirects section)	AV												
Fees and Payments	SF												
LNDXX Subtotal													
Escalation													
LNDXX Total													
MATXX-TG MATERIAL													
Eversource	AM							$694,608		$2,778,431			$3,473,039
Outside Services	AM												
	AM												
Freight													
Sales Tax Eversource/outside services	3.9%	3.9%						$27,100		$108,400			$135,500
Other													
MATXX Subtotal								$721,708		$2,886,831			$3,608,539
Escalation													
MATXX Total								$721,708		$2,886,831			$3,608,539
PSMXX-PROJECT MANAGER & SUPPORT													
Project Management (PM)	LT			$574		$2,246		$2,246		$4,496			$9,566
Project Planning/Cost (P)	LT					$1,222							$1,222
Contracts/Purchasing (CP)	LT					$883		$883					$1,766
System Planning	LT												
Environmental	LT												
SCS - None	LT												
Legal	LT												
Estimating	LT												
Siting - None	LT												
Asset Management	LT							$2,336		$2,336			$4,672
Other - Scheduler	LT					$1,428							$1,428
Other - Cost Analyst	LT					$1,222							$1,222
Other -	LT	$ -											
Other -	LT	$ -											
LT Total				$574		$7,001		$5,467		$6,832			$19,074
Employee Expenses	AE					$350		$273		$342			$965
Project Support Vendor - PM	AQ												
Project Support Vendor - IP	AQ												
Project Support Vendor - CiP	AQ												
Project Support Vendor - System Planning	AQ												
Project Support Vendor - Environmental	AQ												
Project Support Vendor - SCS - None	AQ												
Project Support Vendor - Legal	AQ												
Project Support Vendor - Estimating	AQ					$6,400							$6,400
Project Support Vendor - Siting - None	AQ												
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 CWIP tax large proj. allowance	SR												
Builder All risk insurance excluding deductibles(if project is over $50m)	SR												
Fees and Payments - Environmental	SF												
Fees and Payments - Siting	SF												
Fees and Payments - Other	SF												
PSMXX Subtotal				$574		$13,751		$5,740		$7,174			$27,239
Escalation													
PSMXX Total				$574		$13,751		$5,740		$7,174			$27,239
REMXX-TG REMOVAL													
Engineering/Design	LT												
Internal Construction	LT												
LT Total													
Employee Expenses	AE												
Outside Services	AO												
Contractor Labor	AQ												
Vehicles (now in Indirects section)	AV												
Rents and Leases	SR												
REMXX Subtotal													
Escalation													
REMXX Total													
TSTXX-TG TEST													
Test / Field Engr. Labor (In House)	LT									$20,480			$20,480
Lead Commissioning Engr. (LCE) (Internal)	LT									$10,240			$10,240
Employee Expense	AE									$3,072			$3,072
Test / Field Engr. Labor (contractor)	AQ												
Lead Commissioning Engr. (LCE) (contractor)	AQ												
Vehicles (now in Indirects section)	AV												
TSTXX Subtotal										$33,792			$33,792
Escalation													
TSTXX Total										$33,792			$33,792
SUBTOTAL PROJECT DIRECT COST			-	$1,339		$16,023		$741,726		$2,944,667			$3,703,744
Risk													
Risk								$250,000		$60,000			$310,000
						$ -		$ -		$ -			
						$ -		$ -		$ -			
Risk Total								$250,000		$60,000			$310,000
TOTAL PROJECT DIRECT COST (w/risk)			-	$1,339		$16,023		$991,726		$3,004,667			$4,013,744
INDIRECTS													
Non-Productive Time Allocation (ZNP)	17.0%			$26		$1,559		$3,241		$9,114			$13,939
Payroll Benefits Allocation (ZPB) Incl NPT	44.0%					$1,114		$7,000		$24,081			$32,195
Gen SVC CO Overhead (ZGN) Incl NPT	80.0%			$121		$6,553		$5,117		$6,395			$18,186
E&S Allocations (ZES,ZEL,ZER)	26.0%			$230		$6,941		$9,836		$26,098			$43,214
AG&E Allocations (ZAG)	1.3%			$13		$402		$9,564		$37,629			$47,608
Stores Expense Allocation (ZST)	8.0%							$55,589		$222,274			$277,843
Lobby Stock													
MOEC (ZME)	6.0%			$54		$1,094		$1,758		$5,208			$8,114
Vehicles (ZVE)	26.0%					$2,586		$5,338		$15,011			$22,915
Indirects Subtotal				$453		$20,226		$97,245		$345,809			$483,734
TOTAL PROJECT COST - Direct & Indirect (excl AFUDC)				$1,792		$36,251		$1,088,970		$3,350,466			$4,477,478
AFUDC													
AFUDC (ZX)				$26	0.50%	$1,296	0.50%	$30,259	0.50%	$31,081	1		$70,662
In Service Dollars / Land costs						-		-		-			
Cumulative ISS & Land Costs													
AFUDC Subtotal				$26		$1,296		$30,259		$31,081			$70,662
TOTAL PROJECT COST - Baseline Budget				$1,818		$37,547		$1,137,229		$3,381,548			$4,548,140
Contingency													
Contingency						$549		$26,011		$105,913			$133,074
Other				$ -		$ -		$ -		$ -			
Contingency Subtotal						$549		$26,011		$105,913			$133,074
TOTAL PROJECT COST - Approved Funding				$1,818		$38,096		$1,163,239		$3,487,460			$4,681,214
Reimbursables / Customer Contribution													
Reimbursables / Customer Contribution (enter as negative)				$ -		$ -		$ -		$ -			
TOTAL PROJECT COST				$1,818		$38,096		$1,163,239		$3,487,460			$4,681,214

Activity ID	Activity Name	Activity Status	Original Duration	Actual Duration	Remaining Duration	Start	Finish	Total Float	Primary Resource	Resources	Comme
80275493	**Replace Mobile Transformer 71MX (CS00593)**		482	0	482	12-Jun-23	09-May-25	0			
80275493.01	**PROJECT PLANNING & FUNDING**		438	0	438	12-Jun-23	11-Mar-25	44			
80275493.01.01	**T-Minus Milestones**		359	0	359	02-Oct-23	11-Mar-25	0			
80275493.01.01.02	**Electrical T-Milestones**		359	0	359	02-Oct-23	11-Mar-25	0			
AT00	T-00 - TEST & COMMISSIONING START 71MX	Not Started	0	0	0	11-Mar-25*		0			
AT0401	Final Material Receipt Review Completed (Mobile Transformers DELIVER TO YARD) 71MX	Not Started	0	0	0		10-Mar-25	0			
AT0805M10	Final Material Drawings Issued by Vendor for Material 71MX	Not Started	0	0	0		02-Oct-23	359			
80275493.01.02	**Project Funding**		92	0	92	12-Jun-23	20-Oct-23	390			
80275493.01.02.05	**Full Funding**		92	0	92	12-Jun-23	20-Oct-23	390			
FF1020	EPAC Full Funding Approval	Not Started	0	0	0		22-Jun-23*	0			
FF1030	Full Funding PowerPlan Approval	Not Started	15	0	15	23-Jun-23	14-Jul-23	0	CT.B&Q.TRC [redacted]	[redacted]	
PAFF2230	Incorporate EPAC Full Funding PAF Review Comments	Not Started	5	0	5	12-Jun-23	16-Jun-23	4	CT.B&Q.TRC [redacted]		
80275493.01.02.05.05	**Full Funding Schedule Baseline Acknowledgement - FF**		5	0	5	16-Oct-23	20-Oct-23	390			
FFB_03	Scheduler Issues FF Baseline for Review/Acknowledgement	Not Started	1	0	1	16-Oct-23	16-Oct-23	390	CT.SCH [redacted]		
FFB_04A	Review & Acknowledgement of FF Baseline - PM	Not Started	3	0	3	17-Oct-23	19-Oct-23	390	CT.PM.CO [redacted]		
FFB_04B	Review & Acknowledgement of FF Baseline - SS Eng	Not Started	3	0	3	17-Oct-23	19-Oct-23	390	CT.PM.CO [redacted]		
FFB_04D	Review & Acknowledgement of FF Baseline - P&C Eng	Not Started	3	0	3	17-Oct-23	19-Oct-23	390	CT.PCE.AE [redacted]		
FFB_04H	Review & Acknowledgement of FF Baseline - Permitting	Not Started	3	0	3	17-Oct-23	19-Oct-23	390	CT.SPS [redacted]		
FFB_04J	Review & Acknowledgement of FF Baseline - LCE	Not Started	3	0	3	17-Oct-23	19-Oct-23	390	CT.SSE [redacted] J [redacted]		
FFB_04K	Review & Acknowledgement of FF Baseline - Construction Rep	Not Started	3	0	3	17-Oct-23	19-Oct-23	390	CT.PM [redacted] T [redacted]		
FFB_04L	Review & Acknowledgement of FF Baseline - Materials Coordinator	Not Started	3	0	3	17-Oct-23	19-Oct-23	390	CT.PM [redacted]		
FFB_10	FF Baseline Acknowledgements Rec'd - FF Baseline Settings Complete in P6	Not Started	1	0	1	20-Oct-23	20-Oct-23	390	CT.SCH [redacted]		
PFB_04C	Review & Acknowledgement of Initiation Baseline - Civil Eng	Not Started	3	0	3	17-Oct-23	19-Oct-23	390	CT.PM.CO [redacted]		

TASK filters: Remove Completes, Remove LOE and WBS Summary, Remove MAX Activities, Remove N/R.

ent	Comments	RESP - Responsibil
		TBD [redacted]
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TASK filters: Remove Completes, Remove LOE and WBS Summary, Remove MAX Activities, Remove N/R.

Activity ID	Activity Name	Activity Status	Original Duration	Actual Duration	Remaining Duration	Start	Finish	Total Float	Primary Resource	Resources	Comme
PFB_04E	Review & Acknowledgement of Initiation Baseline - OH Line Eng	Not Started	3	0	3	17-Oct-23	19-Oct-23	390	CT.TLE[redacted]	[redacted]	
PFB_04F	Review & Acknowledgement of Initiation Baseline - Telecom	Not Started	3	0	3	17-Oct-23	19-Oct-23	390	CT.TCOME.BMC[redacted]		
80275493.061	**PROCUREMENT MATERIAL - BALANCE OF MATERIAL**		414	0	414	14-Jul-23	10-Mar-25	0			
80275493.061.02	**Electrical Balance of Material**		414	0	414	14-Jul-23	10-Mar-25	0			
TRANS-6897	Material - Major Items - Mobile Transformer & Trailer - Issue DR Unit #71MX	Not Started	4	0	4	17-Jul-23	20-Jul-23	16	CT.PM.CO[redacted]	[redacted]	
TRANS-6907	Mobile Transformer & Trailer Material Ordered Issue DR	Not Started	0	0	0		20-Jul-23	16			
TRANS-6937	ES SS Eng. Reviews Initial Vendor Drawings and Schematics	Not Started	5	0	5	14-Aug-23	18-Aug-23	0	CT.SSE[redacted]	[redacted]	
TRANS-6947	ES P&C Eng. Reviews Initial Vendor Drawings and Schematics	Not Started	5	0	5	21-Jul-23	27-Jul-23	16	CT.PC-CSS[redacted]		
TRANS-6957	Vendor Submits Final Drawings and Schematics for ES Review	Not Started	15	0	15	21-Aug-23	11-Sep-23	0	Delta Star.Delta Star	Delta Star	
TRANS-6967	ES SS Eng. Reviews Final Vendor Drawings and Schematics for MFG Release	Not Started	5	0	5	12-Sep-23	18-Sep-23	10	CT.SSE[redacted]	[redacted]	
TRANS-6977	ES-P&C Reviews Final Vendor Drawings and Schematics for MFG Release	Not Started	5	0	5	12-Sep-23	18-Sep-23	0	CT.PC-CSS[redacted]		
TRANS-6997	Material - Major Items - Mobile Transformer - Vendor Leadtime 71MX	Not Started	358	0	358	03-Oct-23	07-Mar-25	0	Delta Star.Delta Star	Delta Star	
TRANS-7007	Material - Major Items - Mobile Transformer & Trailer - Deliver to Site 71MX	Not Started	3	0	3	08-Mar-25	10-Mar-25	0	Delta Star.Delta Star	Delta Star	
TRANS-7027	Mobile Transformer & Trailer Material Ordered Issue DR	Not Started	0	0	0		14-Jul-23	0			
TRANS-7037	Material - Major Items - Mobile Transformer & Trailer - Issue PO	Not Started	5	0	5	17-Jul-23	21-Jul-23	0	CT.PM.CO[redacted]	[redacted]	
TRANS-7047	Vendor Submits Initial Drawings and Schematics for ES Review (3 weeks from PO per PE)	Not Started	15	0	15	24-Jul-23	11-Aug-23	0	Delta Star.Delta Star	Delta Star	
TRANS-7057	ES SS Eng. Reviews Initial Vendor Drawings and Schematics	Not Started	5	0	5	14-Aug-23	18-Aug-23	0	CT.SSE.LE[redacted]	[redacted]	
TRANS-7067	ES P&C Eng. Reviews Initial Vendor Drawings and Schematics	Not Started	5	0	5	21-Aug-23	25-Aug-23	10	CT.PC-CSS[redacted]		
TRANS-7137	Vendor Submits New Final Drawings and Schematics for ES Review	Not Started	10	0	10	19-Sep-23	02-Oct-23	0	Delta Star.Delta Star	Delta Star	
80275493.09	**TEST & COMMISSIONING**		15	0	15	11-Mar-25	31-Mar-25	7			
80275493.09.01	**Isolation Plan**		1	0	1	31-Mar-25	31-Mar-25	7			
FIN-#12	Project In-Service ISD (Mobile Tested;Commissioned and Deployment Ready) Unit #1 - 71MX	Not Started	1	0	1	31-Mar-25	31-Mar-25	7	CT.PM.CO[redacted]	[redacted]	
80275493.09.02	**Testing Activities**		14	0	14	11-Mar-25	30-Mar-25	7			

TASK filters: Remove Completes, Remove LOE and WBS Summary, Remove MAX Activities, Remove N/R.

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TASK filters: Remove Completes, Remove LOE and WBS Summary, Remove MAX Activities, Remove N/R.

Activity ID	Activity Name	Activity Status	Original Duration	Actual Duration	Remaining Duration	Start	Finish	Total Float	Primary Resource	Resources	Comme
100329	T&C/LCE Test Commissions Temp Mobile Transformer - 71MX	Not Started	1	0	1	11-Mar-25	11-Mar-25	28	CT.SSE[redacted]	[redacted]	
100339	T&C/LCE PM Requests Lead Commissioning Engineer Go/No-Go - 71MX	Not Started	1	0	1	11-Mar-25	11-Mar-25	0	CT.PM.CO[redacted]		
100349	T&C/LCE Assign Lead Commissioning Engineer - 71MX	Not Started	1	0	1	12-Mar-25	12-Mar-25	0	CT.PM.CO[redacted]		
100359	T&C/LCE LCE Reviews Drawings & Schematics - 71MX	Not Started	5	0	5	13-Mar-25	18-Mar-25	0	CT.SSE[redacted]		
100369	T&C/LCE Review and Approve EVS FET Test and Commissioning Plan - 71MX	Not Started	10	0	10	19-Mar-25	29-Mar-25	0	CT.PM.CO[redacted]		
100379	T&C/LCE Commissioning Engineer Commissions Temp Mobile Transformer - 71MX	Not Started	1	0	1	30-Mar-25	30-Mar-25	0	CT.SSE[redacted]		
80275493.10	**PROJECT CLOSE OUT**		30	0	30	31-Mar-25	09-May-25	0			
80275493.10.02	**Electrical Close Out**		22	0	22	01-Apr-25	30-Apr-25	7			
100449	Eversource Engineering Verifies Electrical Mark Up As-Built Drawing Package	Not Started	10	0	10	01-Apr-25	14-Apr-25	7		[redacted]	
100459	Eversource Engineering Updates Electrical As-Built Drawing Package	Not Started	3	0	3	15-Apr-25	17-Apr-25	7			
100469	ES Create Transmittal, Approve Final As-Built Package, and EDC Files and Issue Drawings to Field	Not Started	8	0	8	18-Apr-25	29-Apr-25	7			
100479	PM/PE to Document Electrical As-Built Drawings Complete Units	Not Started	1	0	1	30-Apr-25	30-Apr-25	7	CT.PM.CO[redacted]		
80275493.10.11	**Project Management Close Out**		30	0	30	31-Mar-25	09-May-25	0			
100489	Test Vendor - Review Test Data and Issue Commissioning Report - 71MX	Not Started	5	0	5	01-Apr-25	07-Apr-25	10		Delta Star	
100499	FORM TD-707 - ConRep/PE/PM Provide form to PE - 71MX	Not Started	5	0	5	01-Apr-25	07-Apr-25	14	CT.PM.CO[redacted]	[redacted]	
100509	LCE Reviews Test Data and Issue Commissioning Report - 71MX	Not Started	5	0	5	08-Apr-25	12-Apr-25	12	CT.SSE[redacted]		
100519	Construction Rep PE/PM Finalize CASCADE Forms (within 14 days)	Not Started	10	0	10	01-Apr-25	14-Apr-25	9	CT.PM.CO[redacted]		
100569	Prepare Final Units of Property (UoP)	Not Started	10	0	10	15-Apr-25	28-Apr-25	9	CT.PM.CO[redacted]		
100579	Project Complete [CLOSE OUT FINISH MILESTONE]	Not Started	0	0	0		09-May-25	0			
100589	Asset Management Complete Asset Update(s) in CASCADE	Not Started	30	0	30	31-Mar-25	09-May-25	0	CT.B&Q.TRC[redacted]		

TASK filters: Remove Completes, Remove LOE and WBS Summary, Remove MAX Activities, Remove N/R.

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TASK filters: Remove Completes, Remove LOE and WBS Summary, Remove MAX Activities, Remove N/R.