EVERSOURCE

Supplement Authorization Form

Project Title: [redacted] PILC Cable Replace	**Project Number:** CD02232
Date Prepared: 10/15/2024	**Company:** Eversource CT
Organization: Distribution Engineering	**Project Category:** UG CABLE & EQUIPMNT REPLACEMNT
Project Initiator: [redacted]	**Project Type:** Specific
Initiating Organization: Distribution	**Capital Investment part of original Op Plan:** Yes
Project Manager: [redacted]	**Emergency Related Request?** No
Project Sponsor: [redacted]	**Facility Type** (check all that apply): ☐ PTF ☐ non-PTF ☒ Distribution ☐ N/A (General Plant)
Current Authorized Amount: $1,631K	**Approved In-Service Date:** 12/31/2024
Supplement Request: $393K	**Estimated In-Service Date:** 12/31/2024
Total Capital Request: $2,023.5K	**Authorization Type:** Supplement Request
	Reason: Cost Overage

1. Project Background

Supplemental funding is being requested for this project. The total capital request is $2,024K which is $393K (24%) more than the current authorized amount of $1,631K.

CD02232 is part of an overall strategy to address the poor performance of the Paper Insulated Lead Covered (PILC) cable in Eversource's underground distribution system. PILC cable was installed on the Eversource distribution system prior to 1984.

[redacted] contains a total of approximately 11,500 feet of underground PILC cable that was replaced under this project. [redacted]

2. Supplement Justification Overview

CD02232's variance of $393K is due to extra labor, outside services and material needed to complete the project.

3. Supplement Justification Overview

CD02232 required more labor that expected due to minimizing the length of time that the feeder was out of service for the cutovers. To do this there were multiple days where work was extended increasing the cost of the cutovers.

This project required cleaning manholes that cost more due to unforeseen circumstances that were not accounted for in the full funding authorization. There was excessive vegetation that needed to be cleared out and trap rock needed to be laid to gain access to manhole 54. This manhole is in a wooded area on the north side of the substation.

Material came in high than the full funding authorization due to the cost of 1000 Cu cable increasing by $5 a foot and 500 Cu increasing $3 a foot since authorization occurred.

The above direct costs combined with the indirects and contingencies resulted in the $393K of variance.

4. Supplement Cost Summary (Project Total)

Financial Evaluation ($000's)

Capital Costs	To Date Spend (2024)	Prior Authorized	Supplemental Request	Total Request
Internal Labor and Construction Equipment	187.4	137.6	49.9	187.4
Outside Services	119.5	55.8	63.7	119.5
Materials	620.5	546.9	73.7	620.5
Removals	215.5	190.0	25.5	215.5
Risk and Contingency	0.0	113.8	-74.1	39.7
Other	1.3	0.0	1.3	1.3
Subtotal	**1,144.1**	**1,044.0**	**139.8**	**1,183.8**

Indirect Capital Costs	To Date Spend (2024)	Prior Authorized	Supplemental Request	Total Request
Indirects/Overheads (including benefits)	788.2	586.9	201.3	788.2
Capitalized interest or AFUDC, if any	51.4	0.0	51.4	51.4
Subtotal	**839.6**	**586.9**	**252.7**	**839.6**
Total Capital Costs (Gross)	**1,983.8**	**1,630.9**	**392.6**	**2,023.5**
Less Total Customer Contribution	**0.0**	**0.0**	**0.0**	**0.0**
Project Costs (Net of Reimbursement)	**1,983.8**	**1,630.9**	**392.6**	**2,023.5**

5. New Total Request by Year (if applicable)

Note: If multi-year project, include actuals for current and years past, and then show forecasted spend for upcoming years.

All work was completed in 2024.

6. Lessons Learned

Project Title: [redacted] **PILC Cable Replace**	**Project Number: CD02232**
Date Prepared: 02/16/2024	**Company:** Eversource CT
Organization: Distribution Engineering	**Project Category:** UG Cable & Equipment Replacement
Project Initiator: [redacted]	**Project Type:** Specific
Initiating Organization: Distribution	**Capital Investment part of original Op Plan:** Yes
Project Manager: [redacted]	**Emergency Related Request?** No
Project Sponsor: [redacted]	**Facility Type** (check all that apply)**:** ☐ PTF ☐ non-PTF ☒ Distribution ☐ N/A (General Plant)
Required in service date: 12/31/2024	
Total Capital Request: $1,631K	**Authorization Type:** Full Funding

7. Executive Summary

Project CD02232 is being established to replace the remaining paper-insulated lead covered (PILC) cable on the [redacted] This project is part of an overall strategy to address poor performing PILC cable in the underground distribution system.

This project consists of the following:

- Replace 9,280' of PILC cable with 500 kcmil 25kV CU EPR cable.
- Replace 2,230' of PILC cable with 1,000 kcmil 25kV CU EPR cable.

- Project Location
  - Division: Central
  - District: Hartford AWC
  - City: Hartford

The Partial Funding Estimate (PFE) of $3,300K was approved on 6/22/2023.
The Full Funding Estimate (FFE) is $1,631K or 49% of the Initial Funding estimate.
The reasons for the lower Full Funding estimate are as follows:

- The FFE calls for replacing 9,280 feet of 500 kcmil CU where the PFE called for replacing 10,268 feet. This is a difference of 988 feet, which is a reduction of $68,765.
- The FFE calls for replacing 2,230 feet of 1000 kcmil CU where the PFE called for replacing 1,966 feet. This is a difference of 264 feet, which is an increase of $25,344.
- The overall reduction in cost for this work is $43,421

- The PFE includes $489,360 for cable removal. The FFE calls for $190,000 for removals, which is a $299,360 reduction.

Traffic Control:

- Traffic control is now a loader and does not show up in the direct costs. The PFE calls for $211,162, which is not reflected in the FFE.

Labor:

- The PFE includes $63,600 for field notes to write up the project. The FFE does not have any actual labor charges, so this work was not needed.
- The PFE includes a 30% adder for contract labor. Internal line resources will be performing, so the $549,022 is not needed.

Outside Services:

- The PFE included $79,500 for manhole cleaning. The FFE calls for $20,500 for manhole cleaning, which is a reduction of $59,000

8. Project Cost Summary

Financial Evaluation ($000's)

Capital Costs	2024	Total
Internal Labor and Construction Equipment	137.6	137.6
Outside Services	55.8	55.8
Materials	546.9	546.9
Removals	190.0	190.0
Risk and Contingency	113.8	113.8
Other	0.0	0.0
Subtotal	**1,044.0**	**1,044.0**

Indirect Capital Costs	2024	Total
Indirects/Overheads (including benefits)	586.9	586.9
Capitalized interest or AFUDC, if any	0.0	0.0
Subtotal	**586.9**	**586.9**
Total Capital Costs (Gross)	**1,630.9**	**1,630.9**
Less Total Customer Contribution	**0.0**	**0.0**
Project Costs (Net of Reimbursement)	**1,630.9**	**1,630.9**

9. Technical Justification

Background, Project Need/Justification, and Project Scope

a. Background

PILC cable was used extensively in the urban underground electrical systems that were built in the early/mid 1900s. This cable is now reaching the end of its useful life, and cable failures cause feeder lockouts which can impact customer reliability and satisfaction.

Eversource CT established a program in 2018 to proactively replace PILC cable. Targeted cable replacement is prioritized based on load, outage history and reliability.

b. Project Need

[redacted]

Town	Feeder	Report Number	Date	Customers Interrupted	Duration (min)	Customer Minutes	Failure Type
[redacted]							

c. Project Scope

This project consists of the following underground aging infrastructure replacement:

- Replace 9,280' of PILC cable with 500 kcmil 25kV CU EPR cable.
- Replace 2,230' of PILC cable with 1,000 kcmil 25kV CU EPR cable.

500 kcmil CU EPR cable was chosen for areas where the duct size is 4" or unknown which prohibits installation of cable greater than 500 CU EPR at 25kV.

Major Material:

- 9,280' of PILC cable with 500 kcmil 25kV CU EPR cable.
- 2,230' of PILC cable with 1,000 kcmil 25kV CU EPR cable.

10. Alternatives Considered

Replacement of PILC cable is the only feasible option to mitigate the underground aging infrastructure and reliability events on the Eversource Distribution Circuits which contain PILC. PILC cable is Eversource's most mature asset and has reached the end of its useful life. It is not only prone to failure but requires longer repair time.

The alternative proposed (Option 1) is to replace only existing PILC with EPR cable. This alternative was not selected due to the increased outage time needed for the cut-over which would increase outage risk and labor cost.

The new EPR cable will be installed in spare ducts prior to removal of the existing PILC cable. Once all the EPR cable is installed, an outage will be taken on the circuit to splice the new cable onto electrical equipment and other sections of cable. The more splices that are needed, the longer the outage duration. Option 2 replaces existing EPR, but does so to limit splices needed, thus limiting outage duration and risk.

Additionally, the preferred option increases the circuit rating by MW

Project Option Comparison

	Option
[redacted]	

Estimate Type	Partial	Full
Total Cost	$2,697k	$
Capital Cost	$2,615k	$1,631K
Expense Cost	$82K	$
Cost / MVA added	$1,006K	$274K
Preferred option		X

11. Project Schedule

Milestone/Phase Name	Estimated Date
Preliminary Approval	June 2023
Detail Design Engineering	January 2024
Construction Start	February 2024
Construction Complete	December 2024

12. Regulatory Decisions

N/A

13. Codes and Standards

N/A

14. Risk and Contingencies

Risk Event	Risk Horizon	Likelihood of Occurrence	Risk Mitigation
Actual cost higher than estimated due to scope changes.	2024	Medium	Included contingency costs in the funding request.
Internal construction resources not available to perform the work.	2024	Medium	Use competitive bidding to ensure lowest outside labor cost. 30% adder added to estimate for contractor labor.
Materials Shortage or long lead times	2024	Medium	Pre-order long lead time material; minimize the use of non-standard and non-stocked material.
System abnormal configuration	2024	Medium	Schedule work to minimize system abnormal time. Install temporary bypasses/equipment if system will be abnormal for extended periods. Selected option 2 to avoid additional cable cutovers.

15. References

References
1. N/A

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

Attachment	Included in Submittal?
A. Cost Summary	*YES*

B. Load Sheets	*YES*
C. Geographic Map	*YES*
D. Partial Funding PAF	*YES*

Attachment A: Cost Summary. Option 1:

Design Alternative CD02232-01

Estimate

Preliminary Estimate Summary

Revision Number:	0
Contingency:	24.00%
SubTotal:	$2,359,547
Contingency Amount:	$566,291
Estimate:	$2,925,839
Reimbursement:	$0
Net Amount:	**$2,925,839**

Description: Option 1 Estimate

Item Description	CU	Amount
SWITCHING OH/DB/UG - SWITCHING NonNetwork - Complex	16-ALL16	$14,048.00
UG CABLE DB/UG - 350/500 - 3-1/C (3ph) Cu	16-UG114	$582,343.20
UG CABLE DB/UG - 750/1000 - 3-1/C (3ph) Cu	16-UG114B	$188,736.00
UG CABLE UG - Cable Removal - all cables	16-UG117	$206,660.00
TRAFFIC OH/DB/UG - Traffic Control - Police Officer 15% of Subtotal Amount	16-ALL18	$180,000.00
OTHER OTHER 30% Contractor Adder - Cable Replacement	16-ALL14	$468,000.00
OTHER OTHER 30% estimate adjustment	16-ALL14	$360,000.00
OTHER OTHER Additional cost for removal of PILC Cable	16-ALL14	$206,660.00
OTHER OTHER Inspect MHs for engineering - 53 loc@ $1.2k per location	16-ALL14	$63,600.00

[redacted]

OTHER	16-ALL14	[redacted]	$10,000.00
OTHER Mechnical H Splice: 2 @ $5k each			
OTHER	16-ALL14		$79,500.00
OTHER MH cleaning and rod duct 53 loc @$1.5k per location			

Option 2:

Design Alternative CD02232-02

Estimate

Preliminary Estimate Summary

Revision Number:	0
Contingency:	24.00%
SubTotal:	$2,747,406
Contingency Amount:	$659,377
Estimate:	$3,406,783
Reimbursement:	$0
Net Amount:	$3,406,783

Description: Option 2 estimate

Item Description	CU	Amount
SWITCHING OH/DB/UG - SWITCHING NonNetwork - Complex	16-ALL16	$14,048.00
UG CABLE DB/UG - 350/500 - 3-1/C (3ph) Cu	16-UG114	$714,652.80
UG CABLE DB/UG - 750/1000 - 3-1/C (3ph) Cu	16-UG114B	$188,736.00
UG CABLE UG - Cable Removal - all cables	16-UG117	$244,680.00
TRAFFIC OH/DB/UG - Traffic Control - Police Officer 15% of labor subtotal	16-ALL18	$211,162.00
OTHER OTHER 30% Contractor Adder	16-ALL14	$549,022.00
OTHER OTHER 30% Estimate Adjustment	16-ALL14	$422,325.00
OTHER OTHER Additional cost for removal of PILC Cable	16-ALL14	$244,680.00
OTHER OTHER Inspect MHs for engineering - 53 loc@ $1.2k per location	16-ALL14	$63,600.00

OTHER	16-ALL14	[redacted]	$15,000.00
OTHER Mechnical H Splice: 3 @ $5k each			
OTHER	16-ALL14		$79,500.00
OTHER MH cleaning and rod duct 53 loc @$1.5k per location			

Attachment B Load Sheets:

Current Load Sheet:

Circuit/ Zone	S/S Bus	Zone Amps	Load Amps	Normal			Emergency		
				Rating	% of Rating	Limiting Factor	Rating	% of Rating	Limiting Factor
[redacted]									

Proposed Load Sheet Options 1 & 2:

Circuit/ Zone	S/S Bus	Zone Amps	Load Amps	Normal			Emergency		
				Rating	% of Rating	Limiting Factor	Rating	% of Rating	Limiting Factor
[redacted]									

Circuit/ Zone	S/S Bus	Zone Amps	Load Amps	Normal			Emergency		
				Rating	% of Rating	Limiting Factor	Rating	% of Rating	Limiting Factor
[redacted]									

Attachment C Project Maps:

Existing:



Option 1:



Option 2:

[redacted]

Attachment D Partial Funding PAF:

Operations Project Authorization Form

Project Title: [redacted] **PILC Cable Replacement**	**Project Number: CD02232**
Date Prepared: 04/28/2023	**Company:** Eversource CT
Organization: Electric Field Operations	**Class(es) of Plant:** D Line
Project Initiator: [redacted]	**Project Category:** UG CABLE & EQUIPMNT REPLACEMNT
Project Manager: [redacted]	**Project Type:** Specific
Project Sponsor: [redacted]	**Capital Investment part of original Operating Plan:** No
Estimated in service date: 12/31/2024	**Emergency Related Request?** No
Eng./Constr. Resources Budgeted? No	**Facility Type** (check all that apply)**:** ☐ PTF ☐ non-PTF ☒ Distribution
Total Gross Capital Request: $3.3M	**Authorization Type:** Initial Funding

Executive Summary

Project CD02232 is being established to replace the remaining paper-insulated lead covered (PILC) cable on the [redacted] This project is part of an overall strategy to address poor performing PILC cable in the underground distribution system.

This project consists of the following:

1. Replace 1,966' of PILC cable with 1,000kcmil CU EPR 25kV cable
2. Replace 10,268' of PILC & EPR cable with 500kcmil CU EPR 25kV cable

1,000kcmil CU EPR cable was chosen for areas where the duct size is specified as 6" to increase the load capacity in these sections. 500kcmil CU EPR cable was chosen for areas where the duct size is 4" or unknown, which prohibits installation of cable greater than 500 CU EPR at 25kV.

Project Costs Summary

Note: Dollar values are in thousands

Capital Costs	2024	2025	2026+	Total
Direct Capital Costs				
Internal Labor and Construction Equipment	170.8	0.0	0.0	170.8
Outside Services	809.7	0.0	0.0	809.7
Materials	768.8	0.0	0.0	768.8
Removals	555.8	0.0	0.0	555.8
Other	14.5	0.0	0.0	14.5
Risk and Contingency	0.0	0.0	0.0	0.0
Subtotal	**2,319.7**	**0.0**	**0.0**	**2,319.7**
Indirect Capital Costs				
Indirects/Overheads (including benefits)	881.3	0.0	0.0	881.3
Capitalized interest or AFUDC, if any	102.2	0.0	0.0	102.2
Subtotal	**983.5**	**0.0**	**0.0**	**983.5**
Total Capital Costs (Gross)	**3,303.2**	**0.0**	**0.0**	**3,303.2**
Customer Contribution	**$0**	**$0**	**$0**	**$0**
Total Net Capital Project Costs	**3,303.2**	**0.0**	**0.0**	**3,303.2**

Technical Justification:

Project Need, Objective and Justification:

Project CD02232 has been established to replace the remaining paper insulated lead covered (PILC) underground primary cable on the Southwest Hartford, 47N1 circuit with ethylene propylene rubber (EPR) insulated cable.

This project is part of the initiative to eliminate PILC underground cable due to demonstrated poor performance of this type of cable on our distribution system.

PILC cable was used extensively in the urban underground electrical systems that were built in the early/mid 1900s. This cable is now reaching the end of its useful life, and cable failures cause feeder lockouts which can impact customer reliability and satisfaction.

Eversource CT established a program in 2018 to proactively replace PILC cable. Targeted cable replacement is prioritized based on outage history & reliability.

Project Scope:

This project proposes the following cable replacement:

1. Replace 1,966' of PILC cable with 1,000kcmil CU EPR 25kV cable
2. Replace 10,268' of PILC & EPR cable with 500kcmil CU EPR 25kV cable

Major Material:

- Replace 1,966' of PILC cable with 1,000kcmil CU EPR 25kV cable
- Replace 10,268' of PILC & EPR cable with 500kcmil CU EPR 25kV cable

Note: the cable required amounts shown above are greater than the amount being replaced to account for extra cable needed in the manholes for racking.

Background:

[redacted]

Town	Feeder	Report Number	Date	Customers Interrupted	Duration(min)	Customer Minutes	Failure Type
[redacted]							

Current Load Sheet:

Circuit/ Zone	S/S Bus	Zone Amps	Load Amps	Normal			Emergency			Comments
				Rating	% of Rating	Limiting Factor	Rating	% of Rating	Limiting Factor	
[redacted]										

Proposed Load Sheet Option 1:

Circuit/Zone	S/S Bus	Zone Amps	Load Amps	Normal			Emergency			Comments
				Rating	% of Rating	Limiting Factor	Rating	% of Rating	Limiting Factor	
[redacted]										

Proposed Load Sheet Option 2:

Circuit/ Zone	S/S Bus	Zone Amps	Load Amps	Normal			Emergency			Comments
				Rating	% of	Limiting	Rating	% of	Limiting	
[redacted]										

Alternatives Considered:

Replacement of PILC cable is the only feasible option to mitigate reliability events on the Eversource Distribution Circuits which contain PILC. PILC cable is Eversource's most mature asset and has reached the end of its useful life. It is not only prone to failure but requires longer repair time.
These two reliability issues together, coupled with the heath & environmental issues of carcinogenic PCBs found in PILC oil, necessitate the proactive replacement of PILC on the Eversource system.
The alternative proposed (Option 1) is to replace only existing PILC with EPR cable. This alternative was not selected due to the increased outage time needed for the cut-over which would increase outage risk and labor cost.

The new EPR cable will be installed in spare ducts prior to removal of the existing PILC cable. Once all the EPR cable is installed, an outage will be taken on the circuit to splice the new cable onto electrical equipment and other sections of cable. The more splices that are needed, the longer the outage duration. Option 2 replaces existing EPR, but does so to limit splices needed, thus limiting outage duration and risk.

Additionally, the preferred option increases the circuit rating by 3.36 MW.

Project Option Comparison

Design Criteria	Option

[redacted]

Cost	$2.93M	$3.41M
Cost / MVA added	$1.13M/MVA	$572K/MVA
Preferred option		X

Regulatory Approvals:

Are Regulatory body approvals needed for the project?

No

Project Schedule

Milestone/Phase Name	Estimated Date
Preliminary Approval	June 2023
Detail Design Engineering	Sep 2024
Construction Start	March 2024
Construction Complete	December 2024

Risks and Risk Mitigation Plans

Risk Event	Risk Horizon	Likelihood of Occurrence	Risk Mitigation
Actual cost higher than estimated due to scope changes.	2024	Medium	Included contingency costs in the funding request. Perform detailed Field Analysis and walk down in project development to avoid potential issues.
Customer Permission / Siting Council / Municipal approvals	2024	Low	Design to minimize customer impact. Project Preplanning and customer/community outreach
Internal construction resources not available to perform the work.	2024	Medium	Plan internal resources to perform the work. Use competitive bidding to ensure lowest outside labor cost.
Internal engineering resources not available to perform the work.	2024	Medium	Plan internal resources to perform the work. Use competitive bidding to ensure lowest outside labor cost.
Materials Shortage or long lead times	2024	Low	Pre-order long lead time material; minimize the use of non-standard and non-stocked material.
Storm delays	2024	Low	If storm activity delays work, we may be forced to use external resources.
System abnormal configuration	2024	Medium	Schedule work to minimize system abnormal time. Install temporary bypasses/equipment if system will be abnormal for extended periods

References

None

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

[redacted]

Option 1:

[redacted]

Option 2:

