EVERSOURCE

Project Approval Form

Project Title: [redacted] PILC Cable Replacement	**Project Number: CD02226**
Date Prepared: 12/28/2023	**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)
Required in service date: 12/31/2024	
Total Capital Request: $5,621K	**Authorization Type:** Full Funding

1. Executive Summary

Project CD02226 was established to replace the remaining paper-insulated lead covered (PILC) cable on the [redacted] circuit. 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:

[redacted]

- Division: Central
- District: Hartford
- City/Town: Hartford

The Partial Funding Estimate (PFE) is $8.18M and was approved in April 2023.
The Full Funding Estimate (FFE) is $ 5,621K, or a 33% reduction from the Partial Funding estimate.
There is no scope change. Some explanations for the lower Full Funding estimate are:

- Traffic control – PFE is 15% of subtotal, or $506K. The FFE does not consider traffic control as it is a loaded activity – it is already included in Maximo estimating units.
- Cable removal – PFE estimates $1.2M for removal. FFE estimates about half of that.

2. Project Cost Summary

Financial Evaluation ($000's)

Capital Costs	2024	Total
Internal Labor and Construction Equipment	365.4	365.4
Outside Services	805.7	805.7
Materials	1,061.2	1,061.2
Removals	659.8	659.8
Risk and Contingency	733.2	733.2
Other	0.0	0.0
Subtotal	**3,625.3**	**3,625.3**

Indirect Capital Costs	2024	Total
Indirects/Overheads (including benefits)	1,996.0	1,996.0
Capitalized interest or AFUDC, if any	0.0	0.0
Subtotal	**1,996.0**	**1,996.0**
Total Capital Costs (Gross)	**5,621.3**	**5,621.3**
Less Total Customer Contribution	**0.0**	**0.0**
Project Costs (Net of Reimbursement)	**5,621.3**	**5,621.3**

3. Technical Justification

Background, Project Need/Justification, and Project Scope

a. Background

[redacted]

b. Project Need

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.
Replacement of the PILC cable eliminates the exposure to failure of the PILC cable on the 2N07 circuit. These failures cause the remaining feeders in the Hartford underground secondary network systems to be in an abnormal status, with the risk of overloading portions of the system for loss of a second source to the network since the network is presently not designed for N-1-1 for the summer peak load period.

c. Project Scope

This project proposes the following cable replacement:

[redacted]

Major Material:

- 30,181’ of 500 CU EPR 25kV 3-1/C cable
- 856’ of 350 CU EPR 25kV 3-1/C cable

4. Alternatives Considered

Design Criteria	Option	
	1 – PILC Only	2 – PILC & select EPR
Eliminates PILC	X	X
Reduces Cut-Over duration		X
Estimate Type:	Partial	Full
Capital Cost	$7,883	$5,621K
Expense Cost	$247	
Total Cost	$8,130K	
Preferred Option		X

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 health & 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.

5. Project Schedule

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

6. Regulatory Decisions

N/A

7. Codes and Standards

N/A

8. Risk and Contingencies

Risk Event	Risk Horizon	Likelihood of Occurrence	Risk Mitigation

Actual cost higher than estimated due to scope changes.	2024	Medium	Included contingency costs in the funding request. Perform detailed Field Analysis and walk down in project development to avoid potential issues.
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.
Materials Shortage or long lead times	2024	Medium	Pre-order long lead time material; minimize the use of non-standard and non-stocked material.
Storm delays	2024	Medium	If storm activity delays work, we may be forced to use external resources.
System abnormal configuration	2024	Low	Schedule work to minimize system abnormal time. Install temporary bypasses/equipment if system will be abnormal for extended periods

9. References

References
1.

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

Attachment	Included in Submittal?
A. Cost Estimate	*YES*
B. Geographic Maps	*YES*
C. Partial Funding PAF	*YES*

Attachment A: Cost Estimate

Design Alternative CD02226-01

Estimate

Preliminary
Estimate Summary

Revision Number:	0
Contingency:	24.00%
SubTotal:	$6,556,083
Contingency Amount:	$1,573,460
Estimate:	$8,129,543
Reimbursement:	$0
Net Amount:	**$8,129,543**

Description: Proposed Estimate

Item Description	CU	Amount
SWITCHING OH/DB/UG - SWITCHING Network	16-ALL15	$42,146.40
UG CABLE DB/UG - 350/500 - 3-1/C (3ph) Cu	16-UG114	$2,075,193.60
UG CABLE UG - Cable Removal - all cables	16-UG117	$622,060.00
TRAFFIC OH/DB/UG - Traffic Control - Police Officer 15% of subtotal	16-ALL18	$506,147.00
OTHER OTHER 30% Contractor Adder	16-ALL14	$1,315,982.00
OTHER OTHER 30% Estimate Adjustment	23-ALL14	$1,012,294.00
OTHER OTHER Additional cost for removal of PILC cable	16-ALL14	$622,060.00
OTHER OTHER Inspect MHs for engineering: 113 loc@ $1.2k per location	16-ALL14	$135,700.00
OTHER OTHER Mechanical H splice: 11 @5k each	16-ALL14	$55,000.00
OTHER OTHER MH cleaning & rod ducts: 112loc @$1.5k per location	16-ALL14	$169,500.00

Design Alternative CD02226-02

Estimate

	Preliminary Estimate Summary
Revision Number:	0
Contingency:	24.00%
SubTotal:	$6,802,216
Contingency Amount:	$1,632,532
Estimate:	$8,434,747
Reimbursement:	$0
Net Amount:	**$8,434,747**

Description:

Item Description	CU	[redacted]	Amount
SWITCHING OH/DB/UG - SWITCHING Network	16-ALL15		$42,146.40
UG CABLE DB/UG - 350/500 - 3-1/C (3ph) Cu	16-UG114		$2,160,175.20
UG CABLE UG - Cable Removal - all cables	16-UG117		$646,480.00
TRAFFIC OH/DB/UG - Traffic Control - Police Officer 15% of subtotal	16-ALL18		$526,220.00
OTHER OTHER 30% Contractor Adder	16-ALL14		$1,368,173.00
OTHER OTHER 30% Estimate Adjustment	23-ALL14		$1,052,441.00
OTHER OTHER Additional cost for removal of PILC cable	16-ALL14		$646,480.00
OTHER OTHER Inspect MHs for engineering: 113 loc @1.2k per location	16-ALL14		$135,600.00
OTHER OTHER Mechanical H splice: 11 @5k each	16-ALL14		$55,000.00
OTHER OTHER MH cleaning & rod ducts: 113 loc @1.5k per location	16-ALL14		$169,500.00

Attachment B: Geographic Map





Attachment C: Partial Funding PAF

Operations Project Authorization Form

Project Title: [redacted] PILC Cable Replacement	**Project Number: CD02226**
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: $8.18M	**Authorization Type:** Initial Funding

Executive Summary

Project CD02226 is being established to replace the remaining paper-insulated lead covered (PILC) cable on the [redacted] circuit. 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:

- [redacted]
- [redacted]
- [redacted]
- [redacted]

500 kcmil CU EPR cable was chosen for circuit segments where the duct size is 4" or greater to comply with current design standards. 350kcmil CU EPR cable was chosen for areas where the duct size is smaller than 4" which prohibits installation of cable greater than 350 CU EPR at 25kV.

Project Costs Summary

Capital Costs	2024	2025	2026+	Total
Direct Capital Costs				
Internal Labor and Construction Equipment	422.8	0.0	0.0	422.8
Outside Services	2,004.8	0.0	0.0	2,004.8
Materials	1,903.5	0.0	0.0	1,903.5
Removals	1,376.2	0.0	0.0	1,376.2
Other	36.0	0.0	0.0	36.0
Risk and Contingency	0.0	0.0	0.0	0.0
Subtotal	**5,743.2**	**0.0**	**0.0**	**5,743.2**
Indirect Capital Costs				
Indirects/Overheads (including benefits)	2,182.0	0.0	0.0	2,182.0
Capitalized interest or AFUDC, if any	253.1	0.0	0.0	253.1
Subtotal	**2,435.1**	**0.0**	**0.0**	**2,435.1**
Total Capital Costs (Gross)	**8,178.3**	**0.0**	**0.0**	**8,178.3**
Customer Contribution	**$0**	**$0**	**$0**	**$0**
Total Net Capital Project Costs	**8,178.3**	**0.0**	**0.0**	**8,178.3**

Technical Justification:

Project Need, Objective and Justification:

Project CD02226 has been established to replace the remaining paper insulated lead covered (PILC) underground primary cable on the Northwest Hartford 2N07 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 copper 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.

Replacement of the PILC cable eliminates the exposure to failure of the PILC cable on the [redacted] circuit. These failures cause the remaining feeders in the Hartford underground secondary network systems to be in an abnormal status, with the risk of overloading portions of the system for loss of a second source to the network since the network is presently not designed for N-1-1 for the summer peak load period.

Project Scope:

This project proposes the following cable replacement:

[redacted]

Major Material:

- 30,181' of 500 CU EPR 25kV 3-1/C cable
- 856' of 350 CU EPR 25kV 3-1/C cable

Background:

[redacted]

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

[redacted]

Current Load Sheet:

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

[redacted]

Proposed Load Sheet:

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

[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.

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Project Option Comparison

	Option	[redacted]
Cost	$8,130K	$8,435K
Cost / MVA added	N/A	N/A
Preferred option		X

Regulatory Approvals:

Are Regulatory body approvals needed for the project?

No

Project Schedule

Milestone/Phase Name	Estimated Date
Preliminary Approval	April 2023
Detail Design Engineering	Aug 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.)