EVERSOURCE

Project Approval Form

Project Title: Hartford Reverse Riser Rebuild	Project Number: CD01607
Date Prepared: 11/23/2023	**Company:** Eversource CT
Organization: Electric System Operations	**Project Category:** RELIABILITY IMPROVE SPEC PROJ
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: 12/31/23	
Total Capital Request: $713K	**Authorization Type:** Full Funding

1. Executive Summary

Project CD01607 – Hartford Reverse Riser Rebuild - was established to address outdated construction of reverse risers on switchgear circuits in the Hartford Area Work Center territory.

- There were 111 reverse riser locations identified to be rebuilt to the new construction standard.
- [redacted] in the Hartford AWC and will experience increased reliability due to the resiliency gained from the new construction technique.
- Reverse risers constructed to the outdated standard are at increased risk for animal outages due to suboptimal clearances between pole top equipment, bottom fed cutouts that are prone to arcing with energized riser cable during cutout operation, and a lack of animal protection by way of terminator animal guards.
- Project Location
    - Division: Central
    - District: Hartford AWC
    - City/Town: Hartford

The partial funding estimate for this project is $794K and was approved at the 10/15/2020 CTPAC. The full funding estimate is $713K. The difference in cost equates to $81K, a decrease of 10%.

2. Project Cost Summary

Note: Dollar values are in thousands.

Capital Costs	Year 2021	Year 2022	Year 2023	Total
Direct Capital Costs				
Internal Labor and Construction Equipment	23.0	24.2	10.7	57.9
Outside Services	0.3	29.6	0.0	30.0
Materials	1.3	4.8	215.6	221.6
Removals	7.2	15.2	55.9	78.3
Risk and Contingency	8.7	11.1	30.0	49.7
Other	0.0	0.0	0.0	0.1
Subtotal – Direct Costs	**40.5**	**85.0**	**312.1**	**437.7**
Indirect Capital Costs				
Indirect/Overheads (including benefits)	83.2	73.3	117.3	273.9
Capitalized interest or AFUDC, if any	0.3	1.1	0.0	1.4
Subtotal – Indirect Costs	**83.6**	**74.4**	**117.3**	**275.4**
Total Gross Capital Costs	**124.1**	**159.4**	**429.5**	**713.0**
Customer Contribution	**0.0**	**0.0**	**0.0**	**0.0**
Total Net Capital Project Costs	**124.1**	**159.4**	**429.5**	**713.0**

3. Technical Justification

Background, Project Need/Justification, and Project Scope

a. Background

The involved circuits experienced a total of 42 outages that affected upstream switchgear fuses. The rebuild priority of the pertinent reverse risers is ranked based on the number of outages and

how recently the outages occurred. The combined 2015 and 2016 outages are weighted with a '1', then each subsequent year, the weight of an outage is increased by 1 – up to '5' for 2020. Then, the number of outages in each year is multiplied by these weights and summed to reach a cumulative rank for each circuit. Reverse risers will be rebuilt by circuit in order of priority from highest to lowest rank.



Reverse Riser Rebuild Schedule and Outage History (2015-2020)

b. Project Need

The purpose of this project is to address outdated construction of reverse risers on switchgear circuits in the Hartford Area Work Center territory. A reverse riser is the first backbone transition from an underground source to overhead load on a circuit. Typically, this is the first isolating device downstream of the switchgear fuse.

Reverse risers constructed to the outdated standard are at increased risk for animal outages due to suboptimal clearances between pole top equipment, bottom fed cutouts that are prone to arcing with energized riser cable during cutout operation, and a lack of animal protection by way

of terminator animal guards. Furthermore, bottom fed cutouts pose an increased risk to operating crews as the cutout door remains energized while open.

Rebuilding these 111 reverse riser locations to the new standard increases the resiliency of the involved circuits to animal outages and improves reliability for 21,154 customers.

c. Project Scope

The scope of this project is as follows:

- Rebuild 111 reverse riser locations to new standard
- 34 3-phase risers were selected to be rebuild
- 77 1-phase risers were selected to be rebuild

Major Material:

- 34 3-phase risers
- 77 1-phase risers

4. Alternatives Considered

No other options were considered. Failure to complete this project would have resulted in continued outages for 21,154 customers.

Project Option Comparison

Design Criteria	Option	
	1 – Rebuild Reverse Risers	2 – Do Nothing
Improve Reliability	X	
Improve Resiliency to animal outages	X	
Estimate Type:	Full	Partial
Capital Cost	$713K	N/A
Expense Cost	$K	N/A
Total Cost	$K	N/A

Preferred option	X	

5. Project Schedule

Milestone/Phase Name	Estimated Date
Partial Approval	October 2020
100% Detailed Engineering Completion	November 2020
Fully Funded	November 2023
Construction Start	March 2021
In Service Date	December 2023

6. Regulatory Decisions

N/A

7. Codes & Standards

N/A

8. Risks and Contingencies

Risk Event	Risk Horizon	Likelihood of Occurrence	Risk Mitigation
Actual cost higher than estimated due to scope changes.	2023	Low	Included contingency costs in the funding request.
Internal construction resources not available to perform the work.	2023	Low	Plan internal resources to perform the work. Use competitive bidding to ensure lowest outside labor cost.
Materials Shortage or long lead times	2023	High	Pre-order long lead time material; minimize the use of non-standard and non-stocked material.
Storm delays	2023	Low	If storm activity delays work, we may be forced to use external resources.
System abnormal configuration	2023	Low	Schedule work to minimize system abnormal time. Install temporary bypasses/equipment if system will be abnormal for extended periods.

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

Attachment	Included in Submittal?
A. Cost Estimate	*YES*
B. P6 Schedule	*NO*
C. Geographic Map	*NO*
D. System and Station One-Lines	*N/A*
E. Reverse Riser List	*YES*
F. Partial Funding PAF	*YES*

Attachment A - Partial Cost Estimate:

Estimate

	Preliminary Estimate Summary
Revision Number:	0
Contingency:	24.00%
SubTotal:	$640,000
Contingency Amount:	$153,600
Estimate:	$793,600
Reimbursement:	$0
Net Amount:	**$793,600**

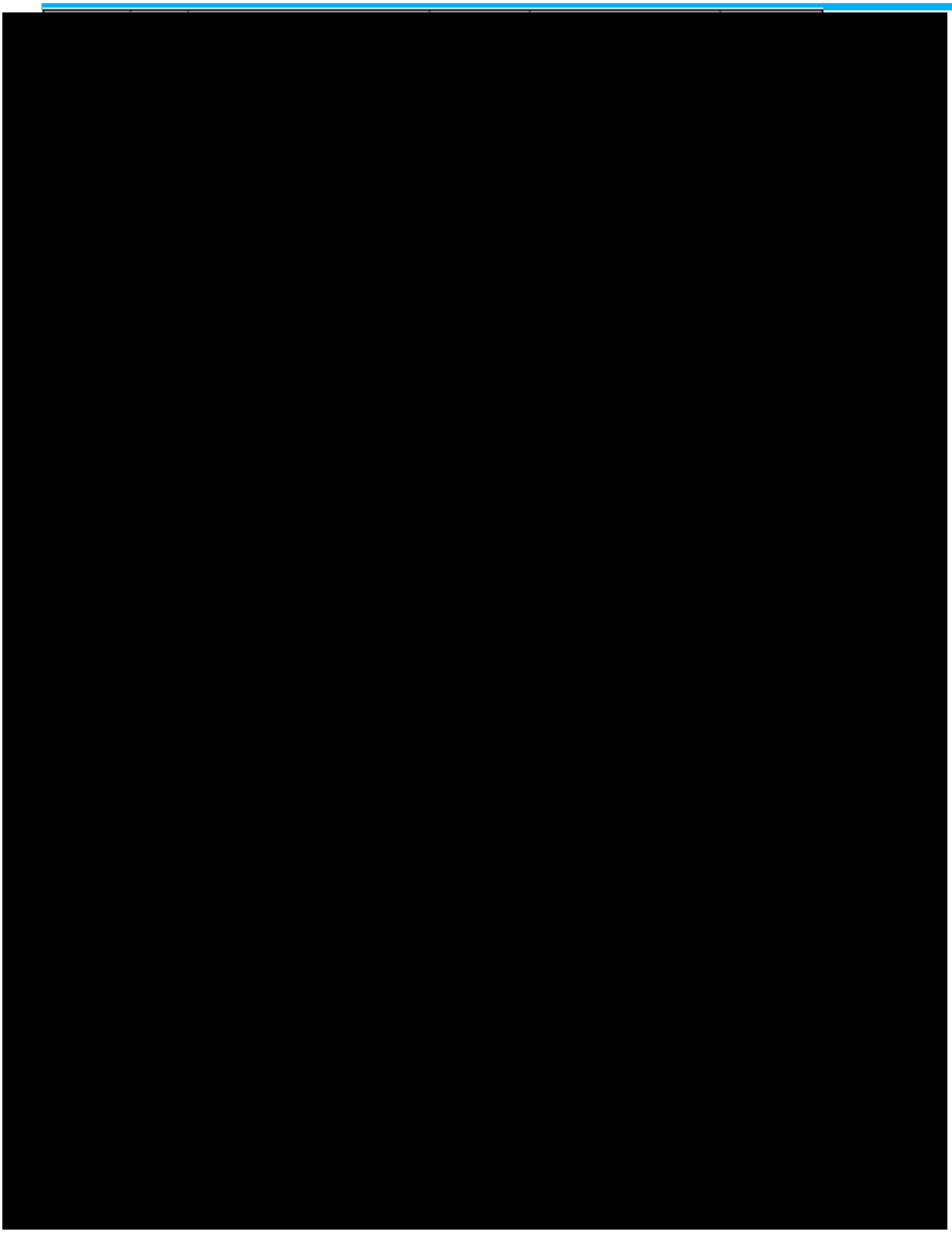
Description: Reverse Riser Rebuilds

Item Description	CU	$ / Per	Qty	Amount
OTHER OTHER 34 three phase x $7500 per riser = $255,000	16-ALL14	[redacted]		$255,000.00
OTHER OTHER 77 single phase x $5000 per riser = $385,000	16-ALL14			$385,000.00

Attachment E: Reverse Riser List:

[redacted]

[redacted]



Attachment F: Partial PAF:

Operations Project Authorization Form

Date Prepared: 12/1/2020	**Project Title: Hartford Reverse Riser Rebuilds**
Company/ies: Eversource CT	**Project ID Number: CD01607**
Organization: Distribution Electric	**Class(es) of Plant: Distribution**
Project Initiator: [redacted]	**Project Category: Line**
Project Manager: [redacted]	**Project Type: Reliability**
Project Sponsor: [redacted]	**Project Purpose: Rebuild Reverse Risers**
Estimated in service date: 12/31/2023	**If Transmission Project: PTF? N/A**
Eng. /Constr. Resources Budgeted? Yes	**Capital Investment Part of Original Operating Plan? Yes**
Authorization Type: Preliminary Funding	**O&M Expenses Part of the Original Operating Plan? Yes**
Total Request: $793,600	

Financial Requirements:

Project Authorization

ERM: _____

FP&A: _____

Executive Summary

The purpose of this project is to address outdated construction of reverse risers on switchgear circuits in the Hartford Area Work Center territory. A reverse riser is the first backbone transition from an underground source to overhead load on a circuit. Typically, this is the first isolating device downstream of the switchgear fuse. Reverse risers constructed to the outdated standard are at increased risk for animal outages due to suboptimal clearances between pole top equipment, bottom fed cutouts that are prone to arcing with energized riser cable during cutout operation, and a lack of animal protection by way of terminator animal guards. Furthermore, bottom fed cutouts pose an increased risk to operating crews as the cutout door remains energized while open. Rebuilding these 111 reverse riser locations to the new standard increases the resiliency of the involved circuits to animal outages and improves reliability for [redacted] customers.

Project Costs Summary

Based on prior projects, an average cost of $5,000 per single phase location and an average cost of $7,500 per three phase location is assumed. 111 total locations: 34 three-phase and 77 single-phase. Per year costs are estimated to be distributed at 35%/34%/31% of the total request for 2021/2022/2023 respectively due to variance in per-year riser totals and ratio of three-phase to single-phase risers. (further detailed in Project Scope)

	Prior Authorized	2021	2022	2023+	Totals
Capital Additions - Direct	$0	$118,349	$114,968	$104,823	$338,140
Less Customer Contribution	$0	$0	$0	$0	$0
Removals net of Salvage ____%	$0	$35,889	$34,864	$31,787	$102,540
Total - Direct Spending	$0	$154,238	$149,831	$136,611	$440,680
Capital Additions - Indirect	$0	$107,717	$104,639	$95,406	$307,762
Subtotal Request	$0	$260,095	$251,216	$232,017	$748,442
AFUDC	$0	$2,482	$2,411	$2,198	$7,090
Total Capital Request	$0	$262,576	$253,657	$239,299	$755,532
O&M	$0	$13,324	$12,943	$11,801	$38,068
Total Request	$0	$275,900	$266,600	$251,100	$793,600

Financial Evaluation

Direct Capital Costs	2021	2022	2023+	Total
Straight Time Labor	$19,260	$18,710	$17,059	$55,028
Overtime Labor	$4,350	$4,226	$3,853	$12,428
Outside Services	$93,525	$90,852	$82,836	$267,213
Materials	$36,087	$35,056	$31,963	$103,106
Other, including contingency amounts (describe)	$1,016	$987	$900	$2,904
Total Direct Costs	**$154,238**	**$149,831**	**$136,611**	**$440,680**

Indirect Capital Costs	2021	2022	2023+	Total
Indirects/Overheads (including benefits)	$107,717	$104,639	$95,406	$307,762
Capitalized interest or AFUDC, if any	$2,361	$2,294	$2,092	$6,747
Total Indirect Costs	**$110,078**	**$106,933**	**$97,498**	**$314,509**
Total Capital Costs	**$262,456**	**$253,540**	**$239,192**	**$755,189**
Less Total Customer Contribution	**$0**	**$0**	**$0**	**$0**
Total Capital Project Costs	**$262,456**	**$253,540**	**$239,192**	**$755,189**
Total O&M Project Costs	**$13,444**	**$13,060**	**$11,908**	**$38,411**
Total Project Cost	**$ 275,900**	**$ 266,600**	**$ 251,100**	**$ 793,600**

Technical Justification:

Project Need Statement

The purpose of this project is to address outdated construction of reverse risers on switchgear circuits in the Hartford Area Work Center territory. A reverse riser is the first backbone transition from an underground source to overhead load on a circuit. Typically, this is the first isolating device downstream of the switchgear fuse. Reverse risers constructed to the outdated standard are at increased risk for animal outages due to suboptimal clearances between pole top equipment, bottom fed cutouts that are prone to arcing with energized riser cable during cutout operation, and a lack of animal protection by way of terminator animal guards. Furthermore, bottom fed cutouts pose an increased risk to operating crews as the cutout door remains energized while open. Rebuilding these 111 reverse riser locations to the new standard increases the resiliency of the involved circuits to animal outages and improves reliability for [redacted] customers.

Project Objectives

- Update the construction of each reverse riser location to meet new company standards
- Harden switchgear circuits against animal related outages

Project Scope

The reverse riser rebuild forecast is divided into a 3-year plan:

3-Year Rebuild Plan Forecast				
Year	Circuits	Reverse Risers	3 Phase	1 Phase
2021	8	41	7	34
2022	14	36	14	22
2023	15	34	13	21
Totals	37	111	34	77

At each single-phase reverse riser location, the reverse riser is to be rebuilt in accordance with DTR 12.205 (below). This includes installation of terminator animal guards, reconfiguring of pole top equipment for proper spacing, and rewiring of cutouts to ensure the downstream overhead circuit is fed from the bottom of the cutout.



At each three-phase reverse riser location, the reverse riser is to be rebuilt in accordance with a new standard (below). DTR 12.241 is the most current available standard for three-phase reverse riser construction, but this project proposes building to a standard like the single-phase construction shown in DTR 12.205 (above). This includes installation of terminator animal guards, reconfiguring of pole top equipment for proper spacing, and rewiring of cutouts to ensure the downstream overhead circuit is fed from the bottom of the cutout.

As of 11/23/2020, a new standard has been made available that addresses the above requirements. This revised DTR 12.241 is shown below.



New Standard (Revised DTR 12.241)

Major Material:

There are no anticipated long lead time materials for this project. Large quantities of cutouts, terminator animal guards, covered wire, and other materials may be required.

Background / Justification

The involved circuits experienced a total of 42 outages that affected upstream switchgear fuses. The rebuild priority of the pertinent reverse risers is ranked based on the number of outages and how recently the outages occurred. The combined 2015 and 2016 outages are weighted with a '1', then each subsequent year, the weight of an outage is increased by 1 – up to '5' for 2020. Then, the number of outages in each year is multiplied by these weights and summed to reach a cumulative rank for each circuit. Reverse risers will be rebuilt by circuit in order of priority from highest to lowest rank.



Reverse Riser Rebuild Schedule and Outage History (2015-2020)

Business Process and / or Technical Improvements:

Assuming a 100% improvement, the cost per customer minute saved is $21.01 and the cost per customer interruption saved is $1388.87.

Alternatives Considered with Cost Estimates

Failure to complete this project will result in continued outages for [redacted] customers. There are no further alternatives to consider.

Project Schedule

Milestone/Phase Name	Estimated Completion Date
Preliminary Approval	10/15/20
Detailed Design	11/30/20
Full Funding Approval	2/28/21
Construction Start Date	3/15/21
Construction End Date	12/31/23

Risks and Risk Mitigation Plans

Risk Event	Risk Horizon	Likelihood of Occurrence	Risk Mitigation
Actual cost higher than estimated due to scope changes.	2021	Low	Included contingency costs in the funding request. Perform detailed Field Analysis and walk down in project development to avoid potential issues.
Customer Permission / Siting Council / Municipal approvals	2021	Low	Design to minimize customer impact. Project Preplanning and customer/community outreach.
Internal construction resources not available to perform the work.	2021	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.	2021	Low	Plan internal resources to perform the work. Use competitive bidding to ensure lowest outside labor cost.
Materials Shortage or long lead times	2021	Low	Pre-order long lead time material; minimize the use of non-standard and non-stocked material.
Storm delays	2021	Low	If storm activity delays work, we may be forced to use external resources.
System abnormal configuration	2021	Low	Schedule work to minimize system abnormal time. Install temporary bypasses/equipment if system will be abnormal for extended periods.
Technological risks involving integration of new technology	2021	Low	Before use of new technology ensure support of standards and manufacturer. Schedule project to accommodate for extra time or ensure new technology is not on the critical path.
Wetlands / Environmentally sensitive area	2021	Low	Use of mats and specialty equipment, only work during certain times of the year.