EVERSOURCE

Project Approval Form

Project Title: Vacufuse 2025	Project Number: CD02521
Date Prepared: 10/27/2025	**Company:** Eversource CT
Organization: Distribution Engineering	**Project Category:** SMART SWITCHES PROGRAM
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: 12-31-2025	**NWS Excludable:** ☒ Yes ☐ No
Total Capital Request: 409.6K	**Authorization Type:** Full Funding

1. Executive Summary

Full funding is being requested for this project at a cost of $409.6K, which is 205% of the partial funding estimate of $200K. Cost overages include the need to install 19 poles at locations where minimum clearance standards could not be maintained with existing 35' poles. Labor will be done with internal crews.

Project CD02521 proposes to install Vacufuses on Distribution transformer locations in Connecticut to reduce the number of outages caused by transient type events (Limbs, Animal, Lightning, Patrolled Nothing Found).

A Vacufuse is a self–powered, electronically controlled, single–phase, cutout–mounted, vacuum interrupter recloser. The Vacufuse is designed to eliminate the sustained interruption that occurs when a transformer fuse cutout operates in response to a transient fault. This device will save outages and reduce trips by troubleshooters. This device will save outages and reduce trips by troubleshooters by reclosing after a transient fault occurs.

In 2025 Vacufuses will be installed on 15kV class distribution transformers normally fused by 6K and 10K fuse links which once exposed to a transient fault, cause a permanent outage. Approximately 59 locations. The locations were prioritized by customer interruptions on transformers with 3 events or more.

2. Project Cost Summary

Note: Dollar values are in thousands.

Capital Costs	2025	2026	2027+	Total
Internal Labor and Construction Equipment	60.4	0.0	0.0	60.4
Outside Services	9.1	0.0	0.0	9.1
Materials	83.8	0.0	0.0	83.8
Removals	4.5	0.0	0.0	4.5
Risk and Contingency	37.2	0.0	0.0	37.2
Other	0.0	0.0	0.0	0.0
Subtotal	**194.9**	**0.0**	**0.0**	**194.9**

Indirect Capital Costs	2025	2026	2027+	Total
Indirects/Overheads (including benefits)	214.7	0.0	0.0	214.7
Capitalized interest or AFUDC, if any	0.0	0.0	0.0	0.0
Subtotal	**214.7**	**0.0**	**0.0**	**214.7**
Total Capital Costs (Gross)	**409.6**	**0.0**	**0.0**	**409.6**
Less Total Customer Contribution	**0.0**	**0.0**	**0.0**	**0.0**
Project Costs (Net of Reimbursement)	**409.6**	**0.0**	**0.0**	**409.6**

Explain unique payment provisions, if applicable:

3. Technical Justification

Background, Project Need/Justification, and Project Scope

a. Background

A Vacufuse is a self–powered, electronically controlled, single–phase, cutout–mounted, vacuum interrupter recloser. The Vacufuse is designed to eliminate the sustained interruption that occurs when a transformer fuse cutout operates in response to a transient fault. This device will save outages and reduce trips by troubleshooters. This device will save outages and reduce trips by troubleshooters by reclosing after a transient fault occurs.

The Vacufuses for 2025 will only be available in 15kV class voltages for transforms utilizing 6k and 10K fuses.
A GIS model change is required to transformers in GIS allowing notation of a Vacufuse as a protective device for the transformer, otherwise protective devices on transformers cannot be tracked. Currently transformers are assumed to have a conventional fuse but, they are not mapped.

Due to these pieces of equipment not being recorded in GIS as this time, it is required for each location to have an individual work order so that each location can be tracked.

b. Project Need

Similar to the program of the Tripsaver, The Vacufuse is an edge of the grid device that offers the ability to add a reclosing device for low cost at the end of the line for a customer. The success of the trip saver, which showed approximately a 70% reduction in CMI on laterals that were selected in the 2015-2019, has driven the development of the Vacufuse program. Unlike the Tripsaver, the Vacufuse does not require load current to stay operational and is small enough to be deployed at distribution transformers.

This project will target transient outages on transformers. These types of events include Tree, Animal, Lightning, Patrolled Nothing Found, and temporary secondary faults. Locations were prioritized by customer interruptions on transformers with 3 events or more.

Total	Events	Total Customer	Customer Mins	Total Customers	
[redacted]					

c. Project Scope

a. Project Scope

This project will install Vacufuses on 15kV voltage class transformers:

Division	Locations
CT CENTRAL	19
CT EASTERN	12
CT WESTERN	28
total	59

It is required for each location to have an individual work order so that each location can be tracked. these pieces of equipment not being recorded in GIS as this time.

Major Material:

27 - 6K Vacufuses stock code 621139

32 – 10K Vacufuses stock code 621138

4. Alternatives Considered

This project includes the installation of low cost Vacufuses at multiple locations to enable the distribution system to automatically clear temporary fault conditions, therefore, a NWS solution was not considered.

Authorization Type	Partial
Capital Cost	$409.6K
Expense Cost	$17.2K
Total Cost	$427.8K
Total Cost / CM Saved	$6.98
Total Cost / CI Saved	$1739.02

5. Project Schedule

Add any additional milestones that are pertinent to the project

Milestone/Phase Name	Estimated Date
Partial Approval	10/10/2024
100% Detailed Engineering Completion	10/24/2025
Fully Funded	10/31/2025
Construction Start	11/3/2025
In Service Date	12/31/2025

6. Regulatory Decisions

7. Codes and Standards

DTR 18.724 - VACUFUSE II – SINGLE-PHASE TRANSFOMERS WITH ARMLESS INSTALLATION

DTR 18.726 - VACUFUSE II – SINGLE-PHASE TRANSFORMER WITH CROSSARM INSTALLATION

8. Risk and Contingencies

Contingencies:

Risk Mitigation:

Risk Event	Risk Horizon	Likelihood of Occurrence	Risk Mitigation
Actual cost higher than estimated due to scope changes.	2025	Low	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.	2025	Low	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.	2025	Low	Plan internal resources to perform the work. Use competitive bidding to ensure lowest outside labor cost.
Storm delays	2025	Low	If storm activity delays work, we may be forced to use external resources.
System abnormal configuration	2025	Low	Schedule work to minimize system abnormal time. Most of this work will require system to be abnormal for any extended period of time.

9. References

References
1. **PIB-24-004** - VacuFuse II Quick Reference Guide & FAQs

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

Attachment	Included in Submittal?
A. Partrial Funding PAF	*YES /*

A: Partial Funding PAF:

Project Title: Vacufuses Program 2025	**Project Number:CD02521**
Date Prepared: 10/04/2024	**Company:** Eversource CT
Organization: Distribution Engineering	**Project Category:** SMART SWITCHES PROGRAM
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: 12-31-2025	
Total Capital Request: $200,000	**Authorization Type:** Partial Funding

11. Executive Summary

Project CD02521 proposes to install Vacufuses on Distribution transformer locations in Connecticut to reduce the number of outages caused by transient type events (Limbs, Animal, Lightning, Patrolled Nothing Found).

A Vacufuse is a self–powered, electronically controlled, single–phase, cutout–mounted, vacuum interrupter recloser. The Vacufuse is designed to eliminate the sustained interruption that occurs when a transformer fuse cutout operates in response to a transient fault. This device will save outages and reduce trips by troubleshooters. This device will save outages and reduce trips by troubleshooters by reclosing after a transient fault occurs.

In 2025 Vacufuses will be installed on 15kV class distribution transformers normally fused by 6K and 10K fuse links which once exposed to a transient fault, cause a permanent outage. Approximately 59 locations. The locations were prioritized by customer interruptions on transformers with 3 events or more.

12. Project Cost Summary

Note: Dollar values are in thousands.

Capital Costs	Year 2025	Year 2026	Year 2027	Total
Direct Capital Costs				
Internal Labor and Construction Equipment	10.9	0.0	0.0	10.9
Outside Services	22.4	0.0	0.0	22.4
Materials	103.9	0.0	0.0	103.9
Removals	11.9	0.0	0.0	11.9
Risk and Contingency	0.5	0.0	0.0	0.5
Other	0.0	0.0	0.0	0.0
Subtotal – Direct Costs	**149.6**	**0.0**	**0.0**	**149.6**
Indirect Capital Costs	**Year 2025**	**Year 2026**	**Year 2027**	**Total**
Indirect/Overheads (including benefits)	48.1	0.0	0.0	48.1
Capitalized interest or AFUDC, if any	2.4	0.0	0.0	2.4
Subtotal – Indirect Costs	**50.4**	**0.0**	**0.0**	**50.4**
Total Capital Costs (Gross)	**200.0**	**0.0**	**0.0**	**200.0**
Customer Contribution	**0.0**	**0.0**	**0.0**	**0.0**
Total Net Capital Project Costs	**200.0**	**0.0**	**0.0**	**200.0**

Explain unique payment provisions, if applicable:

13. Technical Justification

Background, Project Need/Justification, and Project Scope

a. Background

A Vacufuse is a self−powered, electronically controlled, single−phase, cutout−mounted, vacuum interrupter recloser. The Vacufuse is designed to eliminate the sustained interruption that occurs when a transformer fuse cutout operates in response to a transient fault. This device will save outages and reduce trips by troubleshooters. This device will save outages and reduce trips by troubleshooters by reclosing after a transient fault occurs.

The Vacufuses for 2025 will only be available in 15kV class voltages for transforms utilizing 6k and 10K fuses.
A GIS model change is required to transformers in GIS allowing notation of a Vacufuse as a protective device for the transformer, otherwise protective devices on transformers cannot be tracked. Currently transformers are assumed to have a conventional fuse but, they are not mapped.

Due to these pieces of equipment not being recorded in GIS as this time, it is required for each location to have an individual work order so that each location can be tracked.

b. Project Need

Similar to the program of the Tripsaver, The Vacufuse is an edge of the grid device that offers the ability to add a reclosing device for low cost at the end of the line for a customer. The success of the trip saver, which showed approximately a 70% reduction in CMI on laterals that were selected in the 2015-2019, has driven the development of the Vacufuse program. Unlike the Tripsaver, the Vacufuse does not require load current to stay operational and is small enough to be deployed at distribution transformers.

This project will target transient outages on transformers. These types of events include Tree, Animal, Lightning, Patrolled Nothing Found, and temporary secondary faults. Locations were prioritized by customer interruptions on transformers with 3 events or more.

Total	Events	Total Customer	Customer Mins	Total Customers	
[redacted]					

c. Project Scope

This project will install Vacufuses on 15kV voltage class transformers:

Division	Locations
CT CENTRAL	19
CT EASTERN	12
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total	59

It is required for each location to have an individual work order so that each location can be tracked. these pieces of equipment not being recorded in GIS as this time.

Major Material:

27 - 6K Vacufuses stock code 621139

32 – 10K Vacufuses stock code 621138

14. Alternatives Considered

Do Nothing: # fused transformer locations in Connecticut will continue to experience outages caused by transient type events.

Authorization Type	Partial
Capital Cost	$200K
Expense Cost	$8.8K
Total Cost	$208.8K
Total Cost / CM Saved	$3.41
Total Cost / CI Saved	$849

15. Project Schedule

Add any additional milestones that are pertinent to the project

Milestone/Phase Name	Estimated Date
Partial Approval	10-10-24
100% Detailed Engineering Completion	12-30-24
Fully Funded	1-30-25
Construction Start	2-30-24
In Service Date	12-30-25

16. Regulatory Decisions

17. Codes and Standards

DTR 18.724 - VACUFUSE II – SINGLE-PHASE TRANSFOMERS WITH ARMLESS INSTALLATION

DTR 18.726 - VACUFUSE II – SINGLE-PHASE TRANSFORMER WITH CROSSARM INSTALLATION

18. Risk and Contingencies

Contingencies:

Risk Mitigation:

Risk Event	Risk Horizon	Likelihood of Occurrence	Risk Mitigation
Actual cost higher than estimated due to scope changes.	2025	Low	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.	2025	Low	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.	2025	Low	Plan internal resources to perform the work. Use competitive bidding to ensure lowest outside labor cost.
Storm delays	2025	Low	If storm activity delays work, we may be forced to use external resources.
System abnormal configuration	2025	Low	Schedule work to minimize system abnormal time. Most of this work will require system to be abnormal for any extended period of time.

19. References

References
1. **PIB-24-004** - VacuFuse II Quick Reference Guide & FAQs

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

Attachment	Included in Submittal?
A. Cost Estimate	*YES*
B. Locations	*YES*
C. PIB-24-00 VacuFuse II Quick Reference Guide & FAQs	*YES*

A. Cost Estimate:

Design Alternative CD02521-01

Estimate

	Preliminary Estimate Summary
Revision Number:	0
Contingency:	24.00%
SubTotal:	$168,387
Contingency Amount:	$40,413
Estimate:	$208,800
Reimbursement:	$0
Net Amount:	**$208,800**
Description:	

Item Description	CU	$ / Per	Qty	Amount
OTHER OTHER 282 units at 2193	23-ALL14	[redacted]		$129,387.00
OTHER OTHER contractor adder	23-ALL14			$39,000.00

B. Locations



C. Vacufuse II Quick Reference Guide & FAQ

Product Information Bulletin

Field Documentation

EVERSOURCE

Issue Date: 18-Jul-24

Document Number: PIB-24-004

Revision Number: 1

This Bulletin is a(n): ***NOTIFICATION***

Subject: VacuFuse II Quick Reference Guide & FAQs

Overview

Eversource has approved the S&C VacuFuse for use on the distribution system. The VacuFuse is a cutout mounted recloser intended for installation on distribution transformers to prevent temporary nuisance outages such as tree limbs, customer faults, lightning strikes, and animal strikes.

VACUFUSE II BASICS

- **Jaw-End Contact** – Upper contact closes into the top of the cutout door. This contact is fixed and does not move.
- **Hinge-End Contact** – Lower contact closes into the bottom of the cutout door. This contact closes in with the Trunnion.
- **Pull Ring** – Pull ring for use with Loadbuster tool.
- **Vacuum Interrupter** – The vacuum interrupter is internal and opens when the device is interrupting a fault.
- **Trunnion** – Operates to physically cause the VacuFuse II to drop out of the cutout.
- **Manual Operating Lever** – Lever used to **Open** or **Close** device. The position of the lever does NOT indicate if the vacuum interrupter is closed or opened. Moving the lever to the **Down** position will immediately open the internal contacts. Moving the lever to the **Up** position, does not close the contacts, but will allow the device to close when voltage is present.
- **Position Indicator** – Indicates the position of the vacuum interrupter, with a red color signaling **Close** and green color signaling **Open**.
- **Charging/Ready to Close LED** – Charging LED will flash to signal the device is charging and storing energy. The Ready to Close LED indicates enough charge is stored for the device to close.

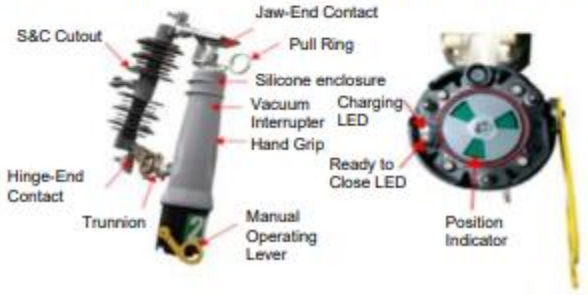

Figure 1 – VacuFuse II Components **Figure 2 – VacuFuse II Position Indicator**

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VacuFuse II Operation

- VacuFuse II can be **Opened** using the mechanically linked yellow manual operating lever with or without power.
- The Vacufuse II cannot be closed manually with the yellow manual operating lever. In order to **Close** the device; voltage must be present, and the yellow manual operating lever must be in the **UP** position.
    - To **Open** the VacuFuse II:
        - Place the yellow manual operating lever to the **Down** position to **Open** the vacuum interrupter. The vacuum interrupter will immediately open and then the VacuFuse II will drop out of the cutout after approximately 1 minute and 45 seconds.
    - To **Close** the VacuFuse II, there are two methods:
        - Automatic Close
            - Place the manual operating lever into the **Up** position prior to closing the unit into the cutout mounting, or less than 35 seconds after the Charging LED has begun flashing.
            - When closed in the cutout mounting in this state, the Charging LED will flash at 1-second intervals if there is sufficient voltage present at the cutout mounting and the vacuum interrupter is **Open**.
            - The unit will automatically **Close** the vacuum interrupter after approximately 45 seconds.
        - Manual Close
            - Place the manual operating lever into the **Down** position prior to closing the unit into the cutout mounting, or before Ready to Close LED is lit.
            - Once the Ready to Close LED is lit, move the manual operating lever to the **Up** position within one minute to close the VacuFuse II. Doing so will immediately close the VacuFuse II.
            - If the manual operating lever is left in the **Down** position, the interrupter will drop out approximately one minute after the Ready to Close LED illuminates.
    - If the VacuFuse II is **Closed** into a fault, the vacuum interrupter will immediately open and the VacuFuse II will then drop out of the cutout door. This will happen independently of the position of the yellow manual operating lever.
- **End of Life**: The VacuFuse II charges but the vacuum interrupter does NOT **Close**.
- **Abnormal Mode**: Charging LED is NOT flashing even when there is sufficient voltage present.

Installation & Maintenance

- VacuFuse II shall be installed on the S&C Type XS Cutout body provided with the unit.
- VacuFuse II has a maximum voltage rating of 9 kV (15 kV systems) or 15.5 kV (27 kV systems). They are pre-factory programmed from 3 to 20 A (K&T Type Fuses).
- If replacing/troubleshooting a VacuFuse II and it is not installed on a type XS S&C Cutout, the cutout body must be replaced.
    - If no cutout available at the time, take the VacuFuse down and replace with a fuse. Submit a follow up ticket or yellow tag for engineering to replace the cutout.

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Product Information Bulletin

- Installations with CLF
  - In the case of a permanent fault, the VacuFuse II will **Open** and drop out of the cutout door. Once the fault is cleared, if the CLF is blown, it shall be replaced prior to placing the VacuFuse II back in service. If the CLF did not blow, the CLF does not need to be replaced.
  - If the CLF is blown and the VacuFuse II is still **Closed** in the cutout, Engineering needs to review for fuse coordination.
  - If the CLF is blown and the VacuFuse II is **Open** and dropped out of the cutout, replace the CLF and close the VacuFuse II back into the cutout.

Contact information:
Lead Engineer – Jason Farrar, jason.farrar@eversource.com
Engineer – Sherif Salem, sherif.salem@eversource.com

Revision History

Revision Number	Date	Summary of Changes
1	18-Jul-24	Added "Installations with CLF" Edited "To Open VacuFuse II" Section Edited "Manual Close" Edited description of when VacuFuse II is closed into a fault
0	10-Jun-24	Original document