Filing Receipt

Filing Date - 2024-05-06 01:48:24 PM

Control Number - 56545

Item Number - 3

DOCKET NO. 56545

APPLICATION OF ONCOR ELECTRIC DELIVERY COMPANY LLC FOR APPROVAL OF A SYSTEM RESILIENCY PLAN	§ § § § §	BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS

TABLE OF CONTENTS

VOLUME 1

VOLUME 2

Testimony

DOCKET NO. 56545

APPLICATION OF ONCOR ELECTRIC DELIVERY COMPANY LLC FOR APPROVAL OF A SYSTEM RESILIENCY PLAN	§ § § § §	**BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS**

APPLICATION OF ONCOR ELECTRIC DELIVERY COMPANY LLC FOR APPROVAL OF A SYSTEM RESILIENCY PLAN

TO THE HONORABLE PUBLIC UTILITY COMMISSION OF TEXAS:

Pursuant to PURA[1] § 38.078 and 16 Tex. Admin. Code ("TAC") § 25.62, Oncor Electric Delivery Company LLC ("Oncor" or "Company") files this Application for Approval of a System Resiliency Plan ("Application"). In support, Oncor respectfully shows the following:

I. INTRODUCTION

With the enactment of House Bill No. 2555 ("HB 2555"), codified in PURA § 38.078, the Texas Legislature established a clear policy to encourage electric utilities to enhance the resiliency of their transmission and distribution ("T&D") systems across the state. Although a focus on system resiliency is nothing new for Oncor, shortly after enactment of HB 2555 and as the Public Utility Commission of Texas ("Commission") developed and adopted 16 TAC § 25.62, Oncor began establishing a comprehensive and forward-looking plan to proactively withstand, mitigate, or more promptly recover from the historical and evolving resiliency events and related risks that have, are, and are expected to continue to materially impact the Oncor T&D system ("Oncor System" or "System"). After months of intensive work, input from and evaluation by subject matter experts across multiple disciplines at the Company, and extensive quantitative and qualitative analysis from independent entities and experts, Oncor finalized its proposed initial system resiliency plan ("SRP") (Attachment C to the Application). The extensive evidentiary support for this Application, outlined below in Sections II and III, shows that Oncor's proposed SRP for the initial three-year period is in the public interest and should be approved. As explained below, Oncor's proposed SRP is best suited to address the unique risks and needs specific to Oncor's System in a cost-effective manner that will benefit Texas and Oncor customers.

Further details about Oncor are provided in the proposed SRP and in the supporting testimony, but the size and breadth of the Oncor System provide context for the measures developed for the proposed SRP. Oncor is the largest electric utility in Texas and serves

[1] Public Utility Regulatory Act, Tex. Util. Code Ann. §§ 11.001-66.016 ("PURA").

approximately 4 million homes and businesses, representing approximately 13 million people and, as such, is critical to the Texas economy. Additionally, the Oncor System is a modern-day system, delivering information associated with over 4 million connected devices across the service area. Oncor has the largest electric distribution system in Texas with a service area spanning over 54,000 square miles, covering approximately 20% of the State of Texas geographically, or approximately equivalent in size to the state of New York. Consequently, the Oncor System is exposed to a diverse set of climate regions with differing sets of resiliency events and risks, including wildfires, extreme weather, physical security threats, and cybersecurity threats. The analysis of the impacts of these unique factors and their impact on Oncor's customers, and the other considerations addressed below, have informed how Oncor tailored the measures included in its proposed SRP.

II. ONCOR'S SYSTEM RESILIENCY PLAN

Oncor's proposed SRP, which covers a three-year period, is Attachment C to this Application. Consistent with 16 TAC § 25.62(c)(2)(G), an executive summary is included in Section II of the SRP, as supplemented by the direct testimony of Company witness Ms. Ellen E. Buck.[2] As described in that executive summary, the overall objective for the Company's proposed SRP is to enhance the resiliency of the Oncor System through the implementation of new and expanded resiliency measures using a systematic approach. More specifically, the Oncor SRP is designed to: (1) mitigate the resiliency events and the related risks that pose a material risk to the safe and reliable operation of the Oncor System; (2) reduce the number of outages on the Oncor System; (3) facilitate more rapid recovery when outages occur; and (4) further enhance the Company's ongoing physical and cybersecurity protections of its key assets.

A. Proposed Resiliency Measures

To that end, Oncor is proposing the seven measures summarized below that are designed to mitigate the resiliency events and related risks identified for the Oncor System. Section IV of the SRP is organized by measure, as required by 16 TAC § 25.62(c)(2), and each of these measures[3] utilizes at least one of the methods authorized in PURA § 38.078(b) and 16 TAC § 25.62(c)(1) for mitigating such events and risks:

[2] Attachment B to the Application (also Appendix A to the proposed SRP) provides a comprehensive summary chart that lists: each measure; the associated programs; the resiliency event/risk to be addressed; the methodologies and activities utilized; the activity scope; estimated structures/equipment involved; and the estimated three-year capital expenditures and incremental operation and maintenance ("O&M") expense for each measure.

[3] Each proposed measure is broken down into one or more "programs," with one or more "activities" assigned to each program. As discussed in the direct testimony of Oncor witness Ms. Jacqui J. Spicer, this structure provides Oncor with the necessary flexibility to implement the SRP measures in a feasible, efficient, and cost-effective manner.

Plan Measure	Descriptions	Resiliency Event
Overhead System Resiliency & Modernization	Harden and modernize distribution overhead facilities through programs such as pole loading capability enhancement, lightning protection, and replacement of vulnerable legacy design equipment.	Extreme Weather, Wildfire
Underground System Resiliency & Modernization	Harden and modernize the underground distribution system by replacing or rehabilitating vulnerable cable segments and equipment to meet the current resilient standards.	Extreme Weather
Flexible and Self-Healing Distribution System	Modernize the distribution system to enable self-healing, enhanced backstand capabilities and withstand elevated electrical loading due to extreme temperatures. Enable automated reconfiguration of the distribution system to isolate damaged areas and minimize impact from resiliency events. Utilize an expanded fleet of mobile transformers where applicable.	Extreme Weather, Wildfire
Vegetation Management Plus ("VM+")	Expands the existing vegetation management ("VM") program to include all applicable laterals. Leverage technology to assess risk conditions and address VM needs across the distribution system.	Extreme Weather, Wildfire
Wildfire Mitigation	Enhance risk modeling capabilities and expand asset management initiatives to mitigate ignition risk and protect Oncor assets from wildfires.	Wildfire
Oncor Secure	Implement physical security at critical facilities and expand situational awareness technology solutions.	Physical Security Threats
Enhanced Digital Grid	Strengthen Oncor's digital grid through enhanced network operations center and security operations center capabilities, data center enhancements, implementation of private broadband communications, communications backhaul enhancements, station local area network communications enhancements, and dedicated strategy and governance functions.	Extreme Weather, Wildfire, Physical Security Threats, Cybersecurity threats

B. Evaluation Metrics and Criteria

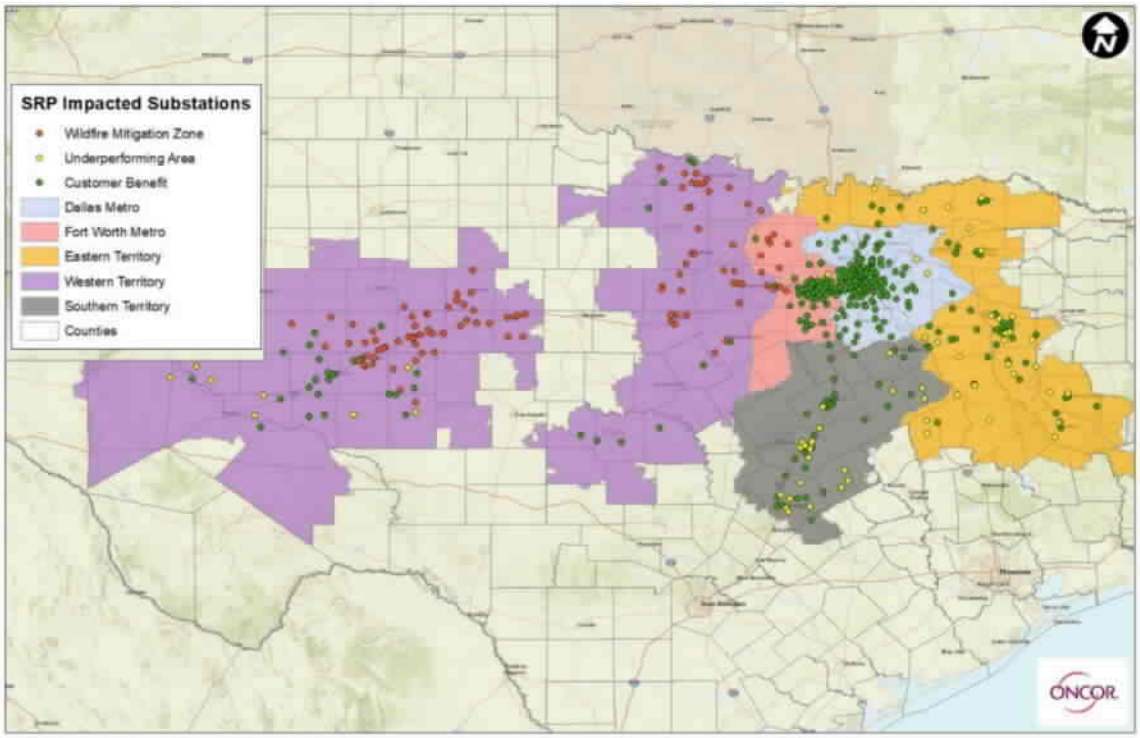
The Company understands the need to evaluate the effectiveness of the proposed SRP. Accordingly, as required by 16 TAC § 25.62(c)(2)(C), Oncor is proposing a suite of metrics and criteria to evaluate the above-referenced measures. Oncor provides further explanation of these proposed metrics in Section V and Appendix J of the proposed SRP, in the direct testimony of Mr. Robel Lulseged, and regarding the Oncor Secure and Enhanced Digital Grid measures, in the direct testimonies of Mr. Alex M. Machoka and Ms. Hilary G. Worrell, respectively.

C. Evidence of Effectiveness and Benefits

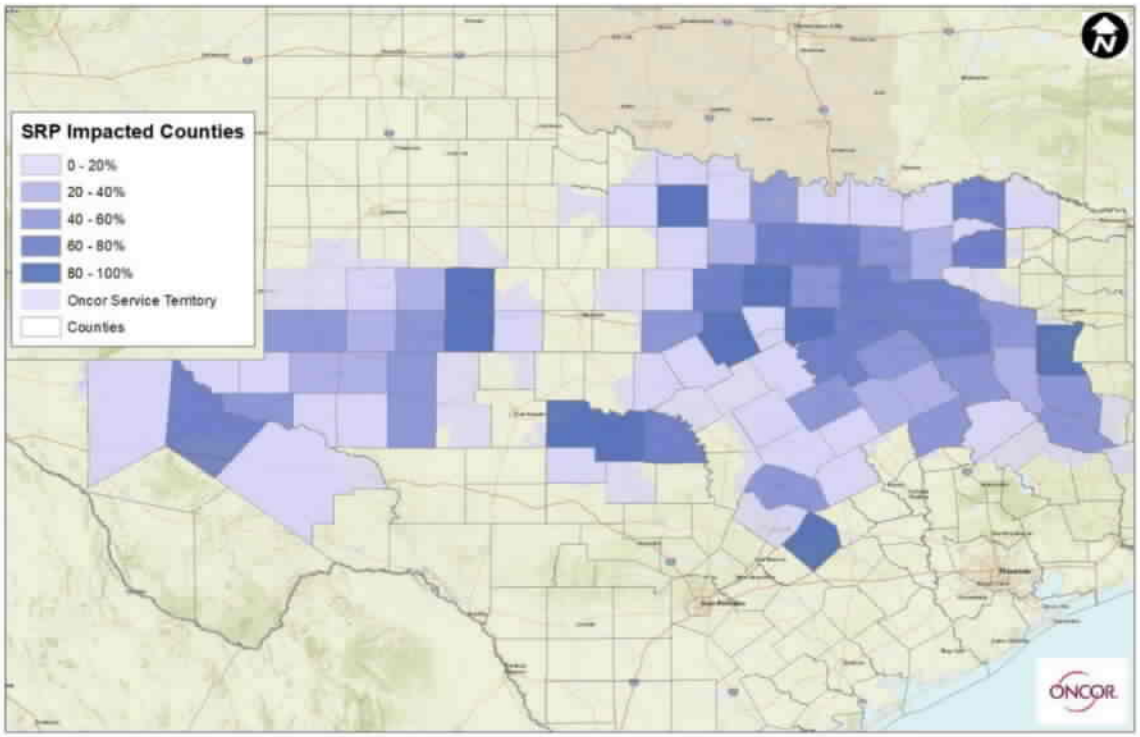
In preparing this Application, Oncor engaged an outside firm with extensive expertise in the electric power industry, among other industries – 1898 & Co. ("1898") – to provide a quantitative, performance-based analysis of the costs and benefits of the measures studied in the proposed SRP. This analysis is reflected in 1898's Oncor System Resiliency Investment Study (the "1898 Report") (Appendix K to the proposed SRP). As detailed in the 1898 Report, 1898 utilized a resilience and risk-based planning approach to identify, prioritize, and perform benefit-cost modeling to support the Company's development of the first four measures listed above. The 1898 Report also provides an assessment of the resiliency risk and potential impacts of events and

risks to be mitigated by the Oncor Secure and Enhanced Digital Grid measures. The direct testimony of Mr. Jason D. De Stigter of 1898 explains the benefit-cost modeling that 1898 performed and the results, including the over $8 billion of potential investment for Oncor's service territory where quantifiable benefits exceeded costs. As the chart in Section II.D below indicates, Oncor is not proposing to undertake this entire level of investment in the first three-year period of its proposed SRP. Rather, the Company has utilized the results from the 1898 Report to develop a prioritization framework supporting its proposed SRP investment, guided by the following principles: (1) comprehensively address wildfire risk in Oncor's currently identified wildfire mitigation zones; (2) address Oncor's historically underperforming feeders; (3) prioritize measures in the areas where the 1898 Report shows the greatest benefit to customers through reduced outage times; (4) significantly expand VM efforts across the service territory; and (5) expand Oncor's efforts to address the ever-changing physical and cybersecurity landscape. The proposed SRP and the direct testimony of Ms. Buck describe this framework further, including that there are foundational investments in information technology and equipment embedded across these priorities to fully unlock the benefits of Oncor's proposed SRP measures.

The map below is from Appendix B-1 of the proposed SRP and provides a high-level view of the result of Oncor's prioritization framework as it relates to the substations and associated feeders:



The map below is also from Appendix B-1 of the proposed SRP and it provides an illustration of the widespread estimated benefit to Oncor customers from five of the seven proposed measures in Oncor's SRP, with activities including overhead structural capacity enhancement and feeder hardening, underground cable modernization, distribution automation, improving lateral capacity and VM.[4] The map provides a color scale based on the percentage of total Oncor customers within each county benefiting from implementation of one or more of the major Oncor resiliency programs. Appendix B-2 to the proposed SRP, the majority of which is submitted confidentially as it includes critical energy infrastructure information ("CEII"), contains a specific list of 527 substations targeted by these measures and programs, including the estimated scope and estimated spend levels based on currently available data sets.



[4] The measures considered for the map include (1) Overhead System Resiliency & Modernization, (2) Underground System Resiliency & Modernization, (3) Flexible and Self-Healing Distribution System, (4) VM+, and (5) Wildfire Mitigation.

D. Systematic Implementation Approach

As required by 16 TAC § 25.62(c)(2)(E), Oncor will implement its proposed SRP through a systematic approach over a three-year period. In addition to the prioritization framework introduced above, Section VII of the proposed SRP and the direct testimony of Ms. Spicer lay out Oncor's systematic approach in detail. Below is a summary of the estimated capital and O&M spend associated with each of Oncor's proposed measures:

Measure[5]	Estimated Capital Spend	Estimated O&M Spend	Total Estimated Spend[6]
Overhead System Resiliency & Modernization	$1,134M	$97M	**$1,231M**
Underground System Resiliency & Modernization	$573M	$27M	**$599M**
Flexible and Self-Healing Distribution System	$480M	$31M	**$510M**
VM+	$9M	$276M	**$285M**
Wildfire Mitigation	$145M	$37M	**$182M**
Oncor Secure	$71M	$9M	**$80M**
Enhanced Digital Grid	$480M	$45M	**$525M**
Total	**$2,891M**	**$521M**	**$3,412M**

Oncor witness Ms. Bonnie L. Clutter's direct testimony details how Oncor proposes to account for and appropriately track SRP-related costs. Both Ms. Clutter and Company witness Mr. Matthew A. Troxle explain that Oncor is proposing to seek deferred recovery of its resiliency-related distribution costs as a regulatory asset in a future distribution cost recovery factor proceeding or a base-rate proceeding as allowed under PURA § 38.078(k) and 16 TAC § 25.62(f)(2).

III. FILING OVERVIEW

This filing consists of the Table of Contents, this Application and its attachments summarized in the chart below, and the direct testimony and exhibits of nine internal Company witnesses and one outside consultant that are summarized in the next chart below.

Application Attachment	Title/Description	Vol./Page
Attachment A	Oncor Resiliency Framework	Volume 1 Page 16

[5] The collective spend level across the various measures' programs and activities that support wildfire mitigation is estimated to be approximately $908 million over the initial three-year SRP period.

[6] These estimates are preliminary and subject to change based on site-specific engineering that will occur and other factors that may arise or fluctuate during implementation.

Application Attachment	Title/Description	Vol./Page
	One-page overview of resiliency measures and estimated spend	
Attachment B	Plan Measure Programs Summary Three-page comprehensive chart listing each measure; associated programs; resiliency events/risks addressed; methodologies and activities utilized; activity scope; estimated structures/equipment involved; and estimated three-year capital expenditures and incremental O&M expense for each measure	Volume 1 Pages 17-19
Attachment C	Oncor's Proposed SRP 441-page document (including appendices) with technical details of Oncor's plan to enhance the resiliency of the Oncor System through a systematic approach over a three-year period	Volume 1 Pages 20-460
Attachment D	Glossary of Plan Acronyms and Defined Terms Glossary to assist in the review of Oncor's proposed SRP	Volume 1 Pages 461-463
Attachment E	Form of Notice See Section VII below.	Volume 1 Pages 464-467
Attachment F	Proposed Protective Order See Section IX below.	Volume 1 Pages 468-487

Oncor's testimony submitted in support of its proposed SRP is listed below with a brief summary of the principal subjects covered therein and where in the two-volume filing package that testimony can be located:

Witness	Principal Subjects Covered	Vol./Page
Ellen E. Buck Vice President, Business & Operations Services	Provides high-level overview of Oncor, its T&D system and services; overview of the Application; description of Oncor's strategy for system resiliency; an executive summary of the proposed SRP; and summary of Oncor's systematic approach for implementation.	Volume 2 Pages 488-525
Lance K. Spross Director, North American Electric Reliability Corporation Compliance	Identifies weather-related resiliency events and corresponding risks; describes and supports VM+ measure.	Volume 2 Pages 526-558
Robel Lulseged Director, Engineering Standards and Maintenance Strategy	Describes information provided to 1898 for Resilience Investment Study; describes and supports Overhead System Resiliency & Modernization, Underground System Resiliency & Modernization, and Wildfire Mitigation measures; describes and supports proposed evaluation metrics or criteria.	Volume 2 Pages 559-619
Jason D. De Stigter 1898 & Co. Director of Utility Investment Planning	Introduces, summarizes, and sponsors 1898's quantitative analysis of potential resiliency measures on the Oncor System; provides anticipated resiliency benefits of individual measures and cost/benefit of each measure studied.	Volume 2 Pages 620-660
Michael C. Stephens, Jr. Senior Manager, Distribution Planning	Describes and supports Flexible and Self-Healing Distribution System measure.	Volume 2 Pages 661-698
Alex M. Machoka Senior Director, Transmission Operations	Identifies primary physical security threats to Oncor's distribution substation assets; describes and supports Oncor Secure measure.	Volume 2 Pages 699-726
Hilary G. Worrell Director, Networks	Identifies cybersecurity-related resiliency events and corresponding	Volume 2 Pages 727-760

Witness	Principal Subjects Covered	Vol./Page
	risks; describes and supports Enhanced Digital Grid measure.	
Jacqui J. Spicer Director, Strategic Sourcing and Procurement	Describes Oncor's approach to sourcing of contract labor and materials; describes and supports systematic approach for SRP implementation.	Volume 2 Pages 761-777
Bonnie L. Clutter Assistant Controller	Describes and supports Oncor's proposed accounting for SRP-related costs; describes tracking and accounting for SRP-related costs; describes recovery of SRP-related costs.	Volume 2 Pages 778-793
Matthew A. Troxle Vice President, Regulatory	Describes and supports Oncor's planned calculation of distribution rate associated with SRP, including regulatory asset; supports requested amortization period for the regulatory asset balance.	Volume 2 Pages 794-815

The testimony, including exhibits, and Oncor's proposed SRP collectively demonstrate compliance with PURA § 38.078 and 16 TAC § 25.62, and support a Commission Staff finding and recommendation that the proposed SRP is sufficient under 16 TAC § 25.62(d)(2). This filing package provides substantial evidence supporting the Commission approving this Application and finding that Oncor`s proposed SRP is in the public interest.

IV. DESIGNATED REPRESENTATIVES

Oncor's designated legal and business representatives for purposes of this proceeding are:

Tab R. Urbantke
State Bar No. 24034717
Myles F. Reynolds
State Bar No. 24033002
Lauren Freeland
State Bar No. 24083023
Hunton Andrews Kurth LLP
1445 Ross Avenue, Suite 3700
Dallas, Texas 75202
214.979.3095
214.880.0011 (fax)
turbantke@HuntonAK.com

Jo Ann Biggs
State Bar No. 02312400
Jaren A. Taylor
State Bar No. 24059069
Vinson & Elkins LLP
2001 Ross Avenue, Suite 3900
Dallas, Texas 75201
214.220.7735
214.999.7735 (fax)

Brian H. Lloyd
Vice President – Regulatory Policy
Oncor Electric Delivery Company LLC
1616 Woodall Rodgers Freeway
Dallas, Texas 75202
469.404.6557
Brian.Lloyd@oncor.com

All pleadings, orders, discovery requests, and other matters related to this Application should be served on Oncor by email at regulatory@oncor.com or fax at 214.486.3221 and at the email addresses listed above.

V. JURISDICTION

Under PURA § 38.078, the Commission has exclusive jurisdiction over this Application.

VI. NOTICE AND INTERVENTION DEADLINE

Oncor is providing reasonable notice of this Application, as required by PURA § 38.078(e) and 16 TAC § 25.62(d)(1), by providing notice of its proposed SRP using the forms of notice in Attachment E to this Application. An Egnyte link to this Application and all accompanying materials, including the proposed SRP (excluding CEII), is included in the notices provided to: all municipalities in Oncor's service area, whether having retained original jurisdiction or not; authorized representatives for all parties in Docket No. 53601, Oncor's last comprehensive base-rate proceeding;[7] the Office of Public Utility Counsel ("OPUC"); and the Electric Reliability

[7] *Oncor Electric Delivery Company LLC for Authority to Change Rates*, Docket No. 53601, Order on Rehearing (Jun. 30, 2023).

Council of Texas, Inc. ("ERCOT").[8] The notices provided to OPUC and ERCOT also include a flash drive with a copy of the Application and all accompanying materials. Oncor will file proof of notice with the Commission upon completion.

VII. PROPOSED TECHNICAL CONFERENCE AND PROCEDURAL SCHEDULE

Based on the deadline for the Commission to enter a final order on an SRP request under PURA § 38.078(e) and 16 TAC § 25.62(d)(1), Oncor respectfully requests that a prehearing conference be scheduled promptly so that a procedural schedule may be adopted, including the adoption of an intervention deadline of June 5, 2024.[9] In the coming days, Oncor will work with Commission Staff and others to propose a procedural schedule that will allow a full and transparent review of this Application and the proposed SRP. As a part of this schedule and to facilitate the discovery process, Oncor looks forward to offering a technical conference where Company representatives and witnesses will be available to address questions and further explain its proposed SRP.

VIII. MOTION TO ENTER PROTECTIVE ORDER

With one modification for the express protection of CEII, Oncor requests entry of the Commission's standard protective order, under 16 TAC § 22.142(c), for the protection of submitted materials in this proceeding containing privileged, confidential, competitively sensitive, proprietary trade secret data, and commercial and financial information. Under 16 TAC § 25.62(c)(3), the Commission has provided for the designation of portions of a resiliency plan as CEII. Based on information required by 16 TAC § 25.62(c)(2), Oncor respectfully requests entry of a slightly modified version of the Commission's standard protective order that expressly includes CEII in the definition of "Highly Sensitive Protected Materials." A draft of this proposed protective order is attached to this Application as Attachment F. Oncor requests that the Commission enter this slightly modified standard protective order as soon as possible to protect confidential material and CEII in this proceeding.[10] As Oncor further explains in its statement of

---

[8] Oncor is not requesting to utilize a resiliency cost recovery rider and, therefore, it is not providing notice to each retail electric provider in its service area. *See* 16 TAC § 25.62(d)(1)(C).

[9] *See* 16 TAC § 25.62(d)(1) (setting an intervention deadline of 30 days from the date service of notice of the Application is complete).

[10] Attachment F is identical to the protective order adopted in Oncor's last base-rate case, *see* Docket No. 53601, SOAH Order No. 1 at 3 (May 17, 2022), and substantially similar to protective orders adopted in recent Oncor certificate of convenience and necessity proceedings. *See e.g., Application of Oncor Electric Delivery Company LLC*

confidentiality filed in this docket, Oncor has marked and submitted the confidential information and CEII contained in the filing package as required by the terms of Attachment F.

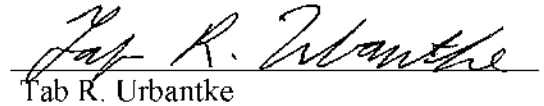
IX. CONCLUSION AND PRAYER

Based on the Application and supporting evidence, Oncor respectfully requests that the Commission: (i) find Oncor's proposed SRP in the public interest and approve it without modification, including the Company's requested flexibility in resiliency measure program implementation as described in the direct testimony of Ms. Buck and Ms. Spicer; (ii) find it appropriate for Oncor to book its SRP-related distribution costs and expenses to a deferred regulatory asset for future cost recovery in a DCRF proceeding or base-rate proceeding; (iii) find it appropriate for Oncor to utilize a 12-month amortization period for its deferred regulatory asset as described in the direct testimony of Mr. Troxle; and (iv) grant the Company such other and further relief to which it may be entitled.

---

to Amend Its Certificate of Convenience and Necessity for the Exchange Switch-Keller Magnolia Substation 138-kV Transmission Line in Tarrant County, Docket No. 55574, SOAH Order No. 4 at 7 (Dec. 1, 2023); *Joint Application of LCRA Transmission Service Corporation and Oncor Electric Delivery Company LLC to Amend Their Certificates of Convenience and Necessity for the North McCamey-to-Sand Lake 345-kV Transmission Line in Crane, Crockett, Pecos, Reeves, Upton, and Ward Counties*, Docket No. 55121, SOAH Order No. 5 at 3 (Aug. 17, 2023); *Application of Oncor Electric Delivery Company LLC to Amend Its Certificate of Convenience and Necessity for the Ramhorn Hill-Dunham 345 kV Transmission Line in Denton and Wise Counties*, Docket No. 55067, SOAH Order No. 3 at 1 (Jul. 14,2023).

Respectfully submitted,

By: 

Tab R. Urbantke
State Bar No. 24034717
Myles F. Reynolds
State Bar No. 2403300
Lauren Freeland
State Bar No. 24083023
Hunton Andrews Kurth LLP
1445 Ross Avenue, Suite 3700
Dallas, Texas 75202
214.979.3095
214.880.0011 (fax)
turbantke@HuntonAK.com
mreynolds@HuntonAK.com
lfreeland@HuntonAK.com

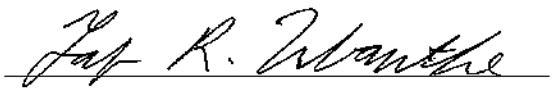
Jo Ann Biggs
State Bar No. 02312400
Jaren A. Taylor
State Bar No. 24059069
Vinson & Elkins LLP
2001 Ross Avenue, Suite 3900
Dallas, Texas 75201
214.220.7735
214.999.7735 (fax)
jbiggs@velaw.com
jarentaylor@velaw.com

Matthew C. Henry
Senior Vice President, General Counsel,
and Secretary
Oncor Electric Delivery Company LLC
1616 Woodall Rodgers Freeway
Dallas, Texas 75202

ATTORNEYS FOR ONCOR ELECTRIC DELIVERY COMPANY LLC

CERTIFICATE OF SERVICE

I hereby certify that on this 6th day of May, 2024, a true and correct copy of the foregoing was provided to Commission Staff, the Office of Public Utility Counsel, and the parties described in Section VI of this Application by electronic mail, first class mail or overnight delivery, in accordance with the Commission's Second Order Suspending Rules issued on July 16, 2020, in Project No. 50664.



Oncor Resiliency Framework

Resiliency Measure	Description	CapEx	O&M
Overhead System Resiliency & Modernization	Modernize & harden legacy overhead system including poles, crossarms, equipment & lighting protection	$1,134 M	$97 M
Underground System Resiliency & Modernization	Modernize & harden legacy underground system with cable injection/replacement, equipment upgrade & automation	$573 M	$27 M
Flexible and Self-Healing Distribution System	Enable and optimize distribution automation through new ties, capacity & intelligent switches	$480 M	$31 M
VM+	Expand VM along laterals & leverage remote sensing capabilities	$9 M	$276 M
Wildfire Mitigation	Enhance risk modeling & awareness, mitigate wildfire risk through fire-safe devices, defensible space & hardening	$145 M	$37 M
Oncor Secure	Physical security, video & event correlation systems & asset protection	$71 M	$9 M
Enhanced Digital Grid	Enhance cybersecurity risk mitigation and enhance/secure digital backbone infrastructure	$480 M	$45 M

SRP Project Prioritization Framework

1. **Wildfire Mitigation Zones**
2. **Underperforming Feeders**
3. **Customer Benefit**
4. **Vegetation Management**
5. **Physical & Cyber Security**

Embedded across these are foundational technology to ensure secure and reliable implementation.

Attachment A

Measure	Program	Resiliency Risk	Methodology	Activity	Activity Scope	Estimated Structures/Equipment/Miles	Plan Estimated Spend
Overhead System Resiliency & Modernization	Structural Capacity Enhancement Program	Ice Storms, High Wind	Harden T&D	1) Structural Loading Assessment 2) High-Impact Pole Hardening 3) Critical Infrastructure Pole Hardening	1.1) Pole Strength Assessment and Load Analysis 2.1) NESC Rule 250B, 250C & 250D 3.1) Critical Equipment Pole 3.2) Critical Equipment Inspection	1,1.1, 2.1.1 & 2, & 3.1.1) 5,596 miles 3,2.1) 14,310 Devices	Capital: $333.2M O&M: $55.3M Total: $388.5M
	Overhead Feeder Hardening Program	Ice Storms, High Wind, Lightning	Harden T&D, Modernize T&D, Lightning Protection	1) Lightning Protection 2) Crossarm Hardening 3) Wood Pole Strength Assessment	1.1) Overhead Lines & Equipment 2.1) Existing Wood Arms 3.1) Wood Poles	1.1.1) 9,196 miles of Lightning Protection 2.1.1) 9,196 miles of Crossarm Replacement 3.1.1) 15,135 miles of Wood Pole Strength Assessment	Capital: $613.6M O&M: $31.8M Total: $645.4M
	Distribution Conductor and Equipment Modernization Program	Extreme Heat/Cold, Ice Storms, High Wind	Harden T&D, Modernize T&D	1) Conductor Modernization 2) Equipment Modernization	1.1) Replace Small Primary Conductor with Modern Design 1.2) Replace Open Wire Secondary with Modern Design 2.1) Single Phase Hydraulic Reclosers/Capacitor Banks 2.2) Airbreak Switches 2.3) Overloaded Transformers	1.1.1) 397 miles of Small Conductor (#6) Replacement 1.2.1) 287 miles of Open Wire Secondary Replacement 2.1.1) 1,036 Single Phase Hydraulic Reclosers/Capacitor Banks 2.2.1) 974 Airbreak Switches 2.3.1) 4,059 Overloaded Transformer Upgrades	Capital: $187.1M O&M: $9.8M Total: $196.9M
Underground System Resiliency & Modernization	UG Cable Modernization Program	Extreme Heat/Cold, Lightning	Harden T&D, Modernize T&D	1) Mainline Cable Health Assessment 2) Life Extension or Replacement of Legacy Design Cable	1.1) Mainline Cable Installed After 1993 2.1) Cable Injection 2.2) Replace with Current Standard (TRXLPE/EPR)	1.1.1) 6,000 segments of Mainline Assessment 2.1.1 & 2) 1,126 miles of Pre-93 Injection 2.2.1, 2, & 3) 672 miles of Pre-93 & PILC Replacement	Capital: $487.9M O&M: $20.6M Total: $508.5M
	UG Equipment Modernization Program	Extreme Heat/Cold, Lightning	Harden T&D, Modernize T&D	1) Replacement of Legacy Design Equipment	1.1) Replace with Dead-Front Equipment	1.1.1) 3,133 Live Front Transformer Replacements 1.1.2) 500 Live Front Switchgear Replacements	Capital: $71.4M O&M: $5.6M Total: $77.0M
	Smart UG Feeder Switching Program	Extreme Heat/Cold, Ice Storms, Lightning	Modernize T&D	1) High-Impact Switchgear Modernization	1.1) Install Remote Supervisory Control (RSC) Switchgear	1.1.1) 70 RSC Switchgears	Capital: $13.3M O&M: $0.7M Total: $14.0M
Flexible and Self-Healing Distribution System	Expanded Distribution Automation Program	Extreme Heat/Cold, Ice Storms, High Wind	Harden T&D, Modernize T&D	1) Enhance DA Readiness 2) Station Automation Readiness	1.1) Feeders Without Existing DA or Limited DA Capabilities 1.2) Upgrade Equipment, Add Ties, and Install Additional Automated Feeder Switching Devices 1.3) Install Single Phase Reclosing Devices 1.4) Install Fault Current Indicators ("FCI") 2.1) Modernize Station Protection and Communication Systems to Enable DA and Replace Legacy Breakers with Modern Magnetically Actuated Breakers 2.2) Modernize Station Protection and Communication Systems to Enable DA and Replace RTUs 2.3) Modernize Station Communication Systems to Enable DA	1.1.1) 129 Feeders 1.1.2) 500 DA Switches 1.2.1 & 2.1.1) 400 Breakers 1.2.2) 216 Switchgears 1.2.3, 4, & 5) 210 Outdoor Panels 1.3.1) 300 Single Phase Recloser Installation Locations 1.4.1) 300 FCIs 2.2.1) 80 RTUs 2.3.1) 150 Communication Upgrades	Capital: $277.9M O&M: $15.5M Total: $293.4M
	Distribution Backstand Capacity Enhancement Program	Ice Storms, High Wind	Harden T&D	1) Enhanced Feeder Backstand Capacity 2) Substation Backstand Capacity	1.1) Upgrade Equipment and/or Establish Ties to Provide Additional Capacity 2.1) Upgrade Substation Equipment to Provide Additional Capacity	1.1.1) 30 Feeders 2.1.1) 9 Substations	Capital: $108.4M O&M: $10.6M Total: $119.0M
	Optimize Lateral Capacity Program	Extreme Heat/Cold	Harden T&D	1) Lateral Review and Hardening	1.1) Upgrade to Enhance Capacity 1.2) Add Ties to Radial Feeder Sections	1.1.1) 262 Miles 1.2.1) 136 Miles	Capital: $63.2M O&M: $4.7M Total: $67.9M
	Mobile Transformer Inventory Program	Extreme Heat/Cold, Ice Storms, High Wind, Wildfire	Harden T&D, Modernize T&D	1) Mobile Transformer Procurement	1.1) Strategic Deployment of Mobile Transformers Across Oncor's Service Territory	1.1.1) 6 Mobile Transformers	Capital: $30.0M O&M: $0.0M Total: $30.0M

Measure	Program	Resiliency Risk	Methodology	Activity	Activity Scope	Estimated Structures/Equipment/Miles	Plan Estimated Spend
Vegetation Management Plus	Comprehensive VM Program	Ice Storms, High Wind, Wildfire	Vegetation Management	1) Comprehensive Lateral Vegetation Management	1.1) Leverage Remote Sensing Data to Prioritize and Enable Effective Vegetation Management	1.1.1) 21,094 Miles	Capital: $0.0M O&M: $270.0M Total: $270.0M
	Remote Sensing Program	Ice Storms, High Wind	Information Technology	1) Data Acquisition and Analytics 2) Program Management System	1.1) Leverage Satellite and LiDAR Technology to ID, Characterize, and Mitigate Vulnerability 2.1) Integrate Remote Sensing Data into Work Management System	1.1.1) Remote Sensing 2.1.1) 1 Program Management System	Capital: $9.0M O&M: $6.0M Total: $15.0M
Wildfire Mitigation	Wildfire Risk Model Enhancement Program	Wildfire	Wildfire Mitigation Response, Information Technology	1) Wildfire Risk Modeling	1.1) Leverage Public and Commercial Datasets to Enhance Risk Modeling & Conduct Fire Spread Modeling from Oncor Assets	1.1.1) Wildfire Risk Model Software	Capital: $6.2M O&M: $1.1M Total: $7.3M
	Situational Awareness Program	Wildfire	Wildfire Mitigation Response, Information Technology	1) Near Real-Time Risk Modeling and Monitoring	1.1) Awareness of Near Real Time Weather and Ground Fuel	1.1.1) Wildfire Risk Model Software	Capital: $8.0M O&M: $1.4M Total: $9.4M
	Asset Protection Program	Wildfire	Wildfire Mitigation Response, Vegetation Management	1) Pole Wrapping 2) Defensible Space 3) Wood Station Hardening	1.1) Wood Poles in High Risk Areas 2.1) Substations in High Risk Areas 2.2) Telecommunication Towers in High Risk Areas 2.3) Critical Poles in High Risk Areas 3.1) Replace Wood Stations Located within High Risk Areas with Modern Steel Design	1.1.1) 17,574 Poles 2.1.1 & 2.2.1) 66 Structures 2.3.1) 1,330 Poles 3.1.1) 12 Substations	Capital: $60.0M O&M: $5.7M Total: $65.7M
	Ignition Mitigation Program	Wildfire	Wildfire Mitigation Response, Modernize T&D	1) Low-Energy Switching 2) Expulsion Device Modernization 3) Pole Clearing 4) Wildlife Guards 5) Enhanced Inspection	1.1) Enable Remote Adjustment of Relay Settings Through Modern Station Equipment and Intelligent Switching Devices 2.1) Install Non-Expulsive Arresters in High Risk Areas 2.2) Install Non-Expulsive Fuses in High Risk Areas 3.1) Removal of All Vegetation Near Equipment Structures Located in High Risk Areas 4.1) Install Wildlife Guards on Equipment Poles and Congested Areas 5.1) Remote Sensing Enabled Inspection	1.1.1) 413 Switches 2.1.1) 13,956 Arresters 2.2.1) 1,775 Fuses 3.1.1) 23,471 Equipment Poles 4.1.1) 8,137 Poles 5.1.1) 13,650 Miles	Capital: $70.9M O&M: $28.6M Total: $99.5M
Oncor Secure	Oncor Aware System Implementation Program	Bad Actor	Physical Security	1) System Implementation	1.1) Implement Video Management System (VMS) and Access Control System	1.1.1) Event Correlation System	Capital: $3.0M O&M: $7.5M Total: $10.5M
	Critical Asset Protection Program	Bad Actor	Physical Security	1) Transformer Bad Actor Protection 2) Theft Mitigation 3) Access Control Upgrades 4) Risk Assessment	1.1) Enable Low Oil Tripping Scheme for Stations with High Risk Intrusion 1.2) Installation of Physical Barriers Surrounding Station Transformers 2.1) Installation of Video Cameras, Sensors, and Electrical Fencing at Station Perimeter 3.1) Installation of Access Control Readers, Video Cameras and Door Reinforcements at Station Control Center 4.1) Physical Security Consultant Assessment and Prioritization of Station per Industry Criteria	1.1.1, 2.1.1, & 3.1.1) 130 Substations 1.2.1) 8 Transformers 4.1.1) 1 Physical Security Assessment	Capital: $67.8M O&M: $1.3M Total: $69.1M

Measure	Program	Resiliency Risk	Methodology	Activity	Activity Scope	Estimated Structures/Equipment/Miles	Plan Estimated Spend
Enhanced Digital Grid	Digital Grid Cyber Resiliency Strategy and Governance Program	Cybersecurity, Physical Security	Cybersecurity, Physical Security, Information Technology	1) Communications Cyber Resiliency Strategy and Governance 2) Digital Grid Connectivity Model 3) Risk Management Framework 4) Personnel Requirements and Training	1.1) Establish Communications Cyber Resiliency Strategy & Governance	1.1.1) Strategy & Governance Framework	Capital: $3.0M O&M: $5.5M Total: $8.5M
	Digital Grid Management – Communications Operations Enhancements Program	Cybersecurity, Physical Security	Cybersecurity, Physical Security, Information Technology	1) NOC Communications Monitoring and Management Enhancements 2) NOC Industrial Control System ("ICS") Communications Monitoring and Management 3) NOC Communications Situational Awareness Enhancements	1.1) Enhance NOC Capabilities	1.1.1) DGM Upgrade	Capital: $10.0M O&M: $6.0M Total: $16.0M
	Private Broadband Communications Deployment Program	Cybersecurity, Physical Security	Cybersecurity, Physical Security, Information Technology	1) Acquisition of Private Broadband Spectrum 2) Broadband Core Network Implementation 3) Radio Access Network Implementation 4) Broadband Network Operation and Endpoint Migration	1.1) Purchase Broadband Network 1.2) Deploy Broadband Network	1.1.1 & 1.2.1) Broadband Network with 500 Devices	Capital: $330.0M O&M: $6.0M Total: $336.0M
	Data Center Enhancements Program	Cybersecurity, Physical Security	Cybersecurity, Physical Security, Information Technology	1) Data Center Hardening 2) Network Fabric Segmentation 3) Network Access Control, Posturing and Compliance	1.1) Enhance and Establish New Data Centers	1.1.1) 6 Data Centers	Capital: $28.0M O&M: $5.0M Total: $33.0M
	Communications Backhaul Enhancements Program	Cybersecurity, Physical Security	Cybersecurity, Physical Security, Information Technology	1) Core Fiber Ring Network Upgrades 2) Backhaul and Access Layer Network Expansion 3) Communication Infrastructure Hardening 4) Communication Network Backhaul Optimization and Segmentation	1.1) Enhance and Establish New Communication Backhaul Sites	1.1.1) 100 Backhaul Sites	Capital: $50.0M O&M: $5.0M Total: $55.0M
	Station Local Area Network ("LAN") Communications Enhancements Program	Cybersecurity, Physical Security	Cybersecurity, Physical Security, Information Technology	1) Station LAN Deployments 2) Station LAN Identity and Access Management 3) Station LAN Physical Security	1.1) Enhance and Establish New Station LAN	1.1.1) 130 Substations	Capital: $14.0M O&M: $3.0M Total: $17.0M
	Digital Grid Management – SOC Enhancements Program	Cybersecurity, Physical Security	Cybersecurity, Physical Security, Information Technology	1) SOC Cybersecurity Network Monitoring and Management Enhancements 2) SOC Industrial Control System (ICS) Communications Monitoring and Management 3) SOC Situational Awareness Enhancements	1.1) Enhance SOC Capabilities	1.1.1) 3 DGM SOC Systems	Capital: $45.0M O&M: $14.5M Total: $59.5M

System Resiliency Plan

Oncor Electric Delivery Company LLC

Date: 05/06/2024

System Resiliency Plan
ONCOR ELECTRIC DELIVERY COMPANY LLC

Contents

I. Introduction

Oncor Electric Delivery Company LLC ("Oncor" or "the Company") operates facilities used to transmit and distribute electricity to customers within the Electric Reliability Council of Texas, Inc. ("ERCOT") controlled area. Oncor's service territory expands across more than 54,000 square miles of West, North, Central, and East Texas. Oncor delivers electricity to approximately 4.0 million points of delivery, representing more than 13 million people, in over 400 incorporated municipalities and over 120 counties in Texas, through the largest electric system in Texas and one of the largest in the United States. As of December 31, 2023, Oncor owns, operates, and maintains approximately 143,000 circuit miles of transmission and distribution lines and more than 1,200 substations and switching stations. Oncor delivers and receives information associated with over 4 million connected devices across its service area using a communications landscape comprised of approximately 150 telecommunications sites, multiple control rooms and data centers. Oncor also staffs multiple service centers across its service area to support those lines and stations. The Company has significant technology resources that are necessary to operate Oncor's System, provide physical and cybersecurity for that System, provide customer service, and support ERCOT market transactions. Figure 1 depicts Oncor's service area in Texas.

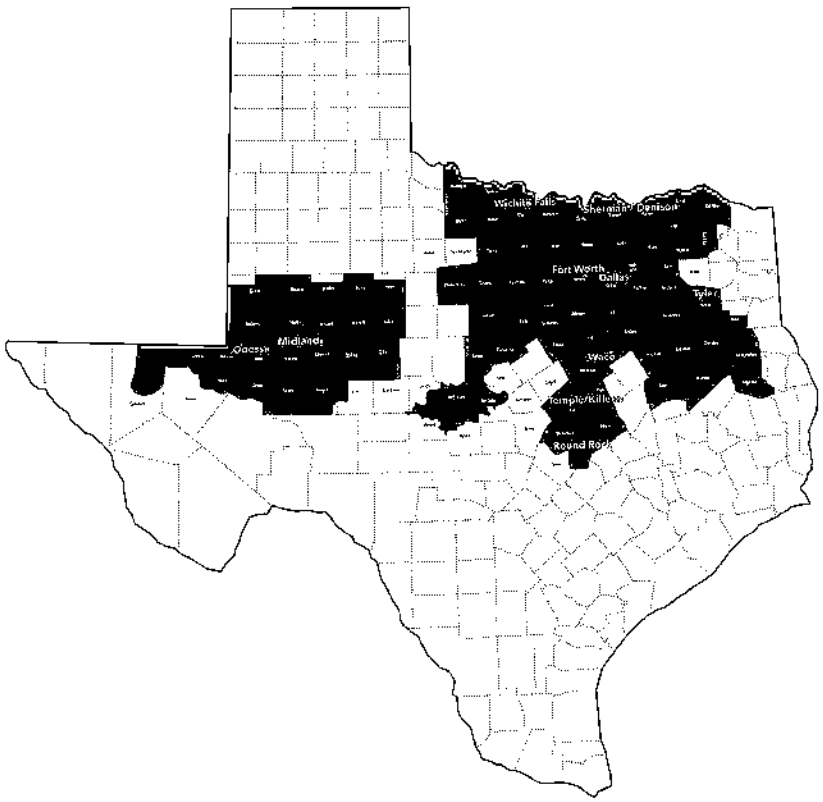


Figure 1: Oncor Service Area

The Oncor service territory encompasses diverse climate regions across the state of Texas. These diverse regions include the hot desert climate in West Texas and the humid subtropical climate of North, Central, and East Texas. Due to the size and geographic diversity of the service territory, Oncor's assets must withstand a range of climatic conditions.

For example, within the arid conditions of West Texas, temperatures can fluctuate greatly from morning to afternoon due to lower humidity levels. In addition, during the late winter and early spring months, the flat plains area with less vegetation offers less resistance to strong winds. These conditions contribute to elevated risk of wildfires in this part of the state. Most of the annual precipitation in the area comes as a result of strong spring and early summer thunderstorms. These storms are usually accompanied by elevated levels of wind, rainfall and occasionally hail. Due to the flat nature of the topography, local flooding can also occur.

In the humid, subtropical climate of North, Central, and East Texas, there is a shorter-term dry season that leads to highly variable precipitation in which thunderstorms, lightning, and high winds may be present. Precipitation is unevenly distributed throughout the year with a typically wet spring and fall and a very dry summer and winter. During the peak summer months of July and August, daytime temperatures are consistently above 90 degrees, often reaching or exceeding 100 degrees with incoming gulf moisture maintaining high levels of humidity. The transition seasons of spring and fall are typically the wettest periods of the year, but the bulk of rainfall is associated with thunderstorms that bring high winds, lightning, and a likelihood of flash flooding. Serving an area with such a wide variety of climates across Texas means interfacing with a broad array of weather conditions across Oncor's service territory.

The Oncor mission is to provide safe, reliable, and cost-effective electric service to all of its customers. Texas' ongoing population and economic growth combined with trends toward digitalization and electrification have made electricity more critical than ever to modern life. At the same time, aging infrastructure, increases in extreme weather events, physical security attacks, and emerging cyber threats related to legacy and new technologies adversely impacting the power grid necessitates new approaches to ensure a safe, reliable, and resilient electric system. Accordingly, Oncor has been, and continues to be, actively engaged in a number of significant activities to ensure reliable performance and enhance the resiliency of its transmission and distribution system. This System Resiliency Plan ("Plan") builds on these activities to systematize Oncor's approach to creating a 21st century resilient transmission and distribution grid for the benefit of our customers and the good of Texas.

II. Executive Summary

The objective of this Plan is to enhance resiliency of the Oncor transmission and distribution system ("Oncor System" or "System") through the implementation of new and expanded system-improvement measures using a systematic approach. The primary focus of this Plan is the distribution system.

With dedication, knowledge, and skill, Oncor has provided reliable electric service for over 100 years. Oncor has been actively engaged in implementing measures to improve the Oncor System reliability and resiliency for decades. Through these measures, Oncor routinely reviews its System performance and takes action through its proactive maintenance programs to ensure that the highest priority projects are addressed. Oncor uses data analytics, operational experience, and engineering analysis of asset conditions, environment, and performance attributes to prioritize the projects that address System reliability and resiliency needs.

This Plan leverages the foundational elements of Oncor's existing reliability and resiliency programs across areas such as transmission, distribution, communications, and cybersecurity. However, in developing this Plan, Oncor has also taken a fresh look at the methods and measures that the Company plans to utilize, as authorized by the Legislature, to withstand, mitigate, or more promptly recover from risks posed by resiliency events. This Plan outlines a systematic approach, tailored to Oncor's distribution system, through which Oncor will implement additional measures designed to mitigate resiliency risks that pose a material risk to the safe and reliable operation of the System, reduce the number of outages on the System, and facilitate more rapid recovery when outages occur. Resiliency risks that will be mitigated by the Plan include extreme weather events, wildfires, cybersecurity threats, and physical security threats.

A. Resiliency Measure Development Approach

As previously discussed, Oncor has a vast and diverse service territory. The development of this Plan began with a data-driven approach to identify, validate, and analyze the most significant resiliency events and risks that impact the Oncor service territory. This was accomplished through:

a. Detailed mapping of the service territory to correlate information such as the locations of historical wildfires, communities, spatial burn probability datasets, and fire intensity potential with the location and configuration of distribution system assets to determine locations most susceptible to wildfire ignition and damage;
b. A comprehensive analysis of the historical weather events that have impacted the System. Weather events were classified and correlated with historical outage records to project future risks to the System based on detailed analysis of environmental data such as vegetation density and asset data including attributes such as design standards, and system configuration;
c. Analysis of Oncor-specific and national historical threat data related to the potential for low-frequency, high impact physical security risks related to vandalism, sabotage, theft, and ballistic attacks; and

d. Assessment of Oncor's threat landscape compared to national and international studies regarding the rapidly evolving and converging Information Technology ("IT") / Operational Technology ("OT") landscape.

B. Withstanding and Mitigating Resiliency Events and Related Risks

After validating the existence and potential impacts of these resiliency events, Oncor considered how, in light of these events, the System could be enhanced to better withstand associated risks. Through historical operating experience, integration of industry best practices, leveraging current technologies, and detailed modeling, the following areas of focus were identified to strengthen the System and significantly reduce the potential for many types of outages and risks:

a. Accelerate wildfire mitigation efforts, both to protect the distribution system from catastrophic loss in wildfire prone areas, but also significantly reduce the potential for Oncor facilities to be an ignition source;
b. Update of legacy distribution system assets to current, more resilient, design standards. Current standards account for extreme weather conditions experienced across the Oncor service territory, allowing for upgraded assets to better withstand these conditions;
c. Significant expansion of existing vegetation management ("VM") programs to address a larger portion of the distribution system. Oncor System performance data has validated that maintaining vegetation within rights of way significantly reduces the potential that damaged vegetation will cause an outage to customers during extreme weather events. New technology will enable proactive identification and prioritization of high-risk areas and optimize the deployment of resources to proactively address vegetation across the distribution system; and
d. Implement measures to deter, detect, and delay bad actors and cyberattacks, including physical hardening of our facilities and private communications networks to better enable us to ensure the security of our systems.

C. Recovering from Resiliency Events and Related Risks

Balancing the cost effectiveness and impracticality of fully preventing outages due to extreme weather events or a persistent bad actor, Oncor next considered how to limit the impact of outages to customers when an event occurs. Through the same factors utilized to minimize outages, the following focus areas were identified to improve Oncor's ability to recover from outages:

a. Implement or enhance monitoring, event correlation, situational awareness, response, and recovery capabilities to prevent or mitigate adverse impact from resiliency events such as wildfires and other physical or cyber threats to its electric and digital grids.
b. Enhance capabilities enabled by communications to precisely detect and isolate outages and automatically or remotely reconfigure the distribution system. This prevents many customers from experiencing sustained outages from resiliency events, if facilities serving them are unaffected or only temporarily affected. In other

cases, many customers' service is automatically restored in a shortened amount of time because outages are quickly isolated to the particular line segments with actual damage.

c. Increase mobile transformer fleet to ensure adequate capacity and distribution of equipment to respond to a catastrophic failure that affects a large number of customers.
d. Increase the number of Oncor-contracted VM and construction crews on the distribution system. The expansion of existing VM, reliability, and resiliency focused programs will have a side benefit of more than doubling the number of Oncor-contracted crews, enabling a more dispersed workforce that will accelerate restoration efforts by reducing the need to wait for crews to mobilize to the location of damage following a resiliency event.

D. Prioritization of Plan Investments

The Oncor System is very large with different risks across different parts of the service area. Resiliency for all customers will be a multi-year journey. For this Plan, we have prioritized our investment based on:

a. Significantly accelerating our wildfire mitigation efforts is our number one priority for this three-year period. Catastrophic wildfires are devastating to communities, have become a matter of serious concern for our investors, ratings agencies, insurers, customers, and other stakeholders. In the past several years, Oncor has formalized and significantly advanced its wildfire mitigation efforts in areas such as the development of risk modeling to inform asset management initiatives and operational protocols during elevated risk conditions. These efforts have informed our Plan Wildfire Mitigation measure to implement long-term and permanent mitigation through device replacement, hardening and modernization of assets, fuel reduction, and improving our wildfire risk model and real time situational awareness.
b. Underperforming area focus to implement measures such as overhead and underground system hardening, modernization, and vegetation management on those areas that have historically been in our lowest performing feeders. Systematic implementation of comprehensive measures at one time ensures performance improvement and efficiency in execution.
c. Foundational investments, including technology and equipment, required to enhance operational capabilities such as a flexible and self-healing grid and physical security. This includes implementation or enhancement of associated systems or applications, communication spectrum, capacity or capabilities, cybersecurity protections and controls, and processes, technologies, or additional resources.
d. Prioritization of our resiliency risk mitigation measures to the areas that show the greatest benefit to customers. This is based on analysis of customer benefit of resiliency investments through reduced restoration costs and impact to customers. The targeted areas are selected based on the highest ratio of customer benefit to implementation cost.

e. Vegetation management has limited capital associated with it, but represents a historic step-up in our contractor capacity and execution to drive substantial customer impacts and place every part of the distribution system on the appropriate cycle. Increasing contractor capacity will reduce response times to restore service during resiliency events.
f. Prioritization of information delivery resiliency for T&D systems and functions (as defined below), including enablement of connected devices.

E. Resiliency Measures

The result of this detailed analysis are seven comprehensive resiliency measures that are comprised in Oncor's Plan. These measures are further detailed in Section IV of this Plan and summarized in Appendix A. Below is a list of the resiliency measures and examples of included activities:

a. Overhead System Resiliency & Hardening – harden and modernize a significant portion of our overhead system, making it able to withstand extreme weather and lightning, including nearly 9,200 miles of lightning protection and crossarm replacement, 15,000 miles of pole assessment and hardening, and over 5,500 overloaded transformer upgrades.
b. Underground System Resiliency & Hardening – modernize our underground system by extending the life or replacing nearly 1,800 miles of our underground system.
c. Flexible and Self-Healing Distribution System - dramatically expand our ability to enable distribution automation ("DA") through rightsizing capacity across the distribution system so we can serve customers from alternate sources, adding or replacing nearly 2,700 switches, relays, reclosers and other real time monitoring and control systems.
d. Vegetation Management Plus ("VM+") - expand our current annual VM efforts to address another approximately 21,000 miles of laterals and implement technology initiatives such as the deployment of a program management system and leveraging remotely sensed data, such as Light Detection and Ranging ("LiDAR") and satellite imagery, to efficiently target the areas of highest risk.
e. Wildfire Mitigation – significantly accelerate our wildfire mitigation programs by enhancing our predictive modeling and situational enhancement, reducing the risk of our assets causing an ignition through fuel reduction, enhanced inspections and the installation of fire-safe devices, and protecting our assets through fire retardant wraps, conversion of wood structure substations to steel, and creation of defensible space.
f. Oncor Secure – expand initiatives such as video surveillance, access control, and barriers to deter bad actors and implement new systems to alert Oncor to facility damage before it causes a catastrophic failure.
g. Enhanced Digital Grid – Strengthen Oncor's digital grid through enhanced Network Operations Center ("NOC") and Security Operations Center ("SOC") capabilities, data center enhancements, implementation of private broadband communications, communications backhaul enhancements, station LAN communications enhancements, and dedicated strategy & governance functions to further mitigate

potential cybersecurity events associated with the supervisory control and data acquisition ("SCADA"), DA, advanced metering system ("AMS"), and mobile workforce functions and enable other distribution measures.

Table 1 below summarizes: (a) the Plan's proposed resiliency measures; (b) resiliency events, threats, and risks the Plan is designed to address; (c) scope of the main activities in each measure; and (d) the Plan's estimated costs. Section V describes our proposed metrics on how to evaluate the effectiveness of these efforts. These metrics will form the basis of the development of future Plan revisions/amendments that will be presented for Public Utility Commission of Texas ("Commission") approval. This Plan is in the public interest as demonstrated by the measure effectiveness and benefits discussed in this document.

Plan Measure	Descriptions	Resiliency Event[1]	Plan Estimated Spend[1]
Overhead System Resiliency & Modernization	Harden and modernize distribution overhead facilities through programs such as pole loading capability enhancement, lightning protection, and replacement of vulnerable legacy design equipment.	Extreme Weather, Wildfire	**$1,231M**
Underground System Resiliency & Modernization	Harden and modernize the underground distribution system by replacing or rehabilitating vulnerable cable segments and equipment to meet the current resilient standards.	Extreme Weather	**$599M**
Flexible and Self-Healing Distribution System	Modernize the distribution system to enable self-healing, enhanced backstand capabilities and withstand elevated electrical loading due to extreme temperatures. Enable automated reconfiguration of the distribution system to isolate damaged areas and minimize impact from resiliency events. Utilize an expanded fleet of mobile transformers where applicable.	Extreme Weather, Wildfire	**$510M**
Vegetation Management Plus	Expands the existing vegetation management program to include all applicable laterals. Leverage technology to assess risk conditions and address vegetation management needs across the distribution system.	Extreme Weather, Wildfire	**$285M**
Wildfire Mitigation	Enhance risk modeling capabilities and expand asset management initiatives to mitigate ignition risk and protect Oncor assets from wildfires.	Wildfire	**$182M**
Oncor Secure	Implement physical security at critical facilities and expand situational awareness technology solutions.	Physical Security Threats	**$80M**
Enhanced Digital Grid	Strengthen Oncor's digital grid through enhanced NOC and SOC capabilities, data center enhancements, implementation of private broadband communications, communications backhaul enhancements, station LAN communications enhancements, and dedicated strategy & governance functions.	Extreme Weather, Wildfire, Physical Security Threats, Cybersecurity threats	**$525M**
		Total	**$3,412M**

Table 1: Plan Measure Summary

[1] Sections in this document provide details on the resiliency events and related risks (Section III), evaluation metrics (Section V), costs (Section VII), and benefits (Section VI) associated with the Plan's proposed measures. While Table 1 reflects the estimated spend amount specific to the Wildfire Mitigation measure alongside other measures, there are activities across other measures that will also positively impact wildfire mitigation. The collective spend level across the various measures' programs and activities that support wildfire mitigation is estimated to be approximately $908M over the 3-year Plan.

III. Resiliency Events/Risks

As discussed in the introduction of this document, the Oncor operational territory spans across a large portion of the state of Texas and experiences a wide range of resiliency events and risks. Outlined below are events identified for mitigation through resiliency measures described in this Plan. The resiliency events and risks include (1) extreme weather conditions, (2) wildfires, (3) physical security threats, and (4) cybersecurity threats. These events are described in detail below.

A. Extreme Weather Events

The National Oceanic and Atmospheric Administration ("NOAA") maintains a database of weather-based events across the entire United States. The database includes named events and non-named events.[2] The named event database includes events and storm paths going back over 170 years, beginning in 1852. For the non-named events, the database includes events going back over 25 years, beginning in 1998.

Oncor engaged 1898 & Co. ("1898") who leveraged this NOAA dataset to identify the types of events impacting the Oncor service area as well as the expected frequency of those events. The event's impact on the System was assessed utilizing Oncor's outage records. 1898 has extensive experience in utilizing a resilience-based planning approach to identify activities and prioritize resiliency investment implementation to maximize customer benefit by reducing future restoration cost and customer impact. Findings from the 1898 analysis is provided in a report titled Oncor System Resiliency Investment Study, and it is included in Appendix K of this document.

The NOAA database records events at the county or sub-county level. 1898 analyzed this data for all the counties within Oncor's service territory. Outlined in Table 2 below are the NOAA defined storm events recorded for Oncor's service area and a mapping of those events to the resiliency events discussed in the Oncor Plan. Reference Appendix K for a detailed description of NOAA defined weather events.

Extreme Weather Events	NOAA Categories
Extreme Wind	Thunderstorm Wind, Hail-Wind, High Wind, Strong Wind, Tornado
Lightning	Lightning, Thunderstorm Wind
Winter/Ice Storm	Winter Weather, Sleet, Winter Storm, Heavy Snow, Ice Storm, Hail-Winter, Blizzard
Extreme Temperature	Heat, Excessive Heat, Cold/Wind Chill, Extreme Cold/Wind Chill
Wildfire	Wildfire
Other	Drought, Tropical Depression, Heavy Rain, Flash Flood, Flood

Table 2: Storm Events in Oncor's Territory

[2] Examples of named events includes hurricanes, and non-named events include thunderstorms and ice storms.

The figure below shows the correlation between NOAA events and the associated customer outages based on the Oncor Outage Management System ("OMS") data from 2014-2022.

Even though NOAA events account for only around 10% of the hours with an outage on the System, the customer interrupted minutes ("CIM") impact of those events is over 50%. This shows the significant impact of extreme weather resiliency events on the Oncor System and demonstrates the potential benefit of measures implemented to mitigate such risks.

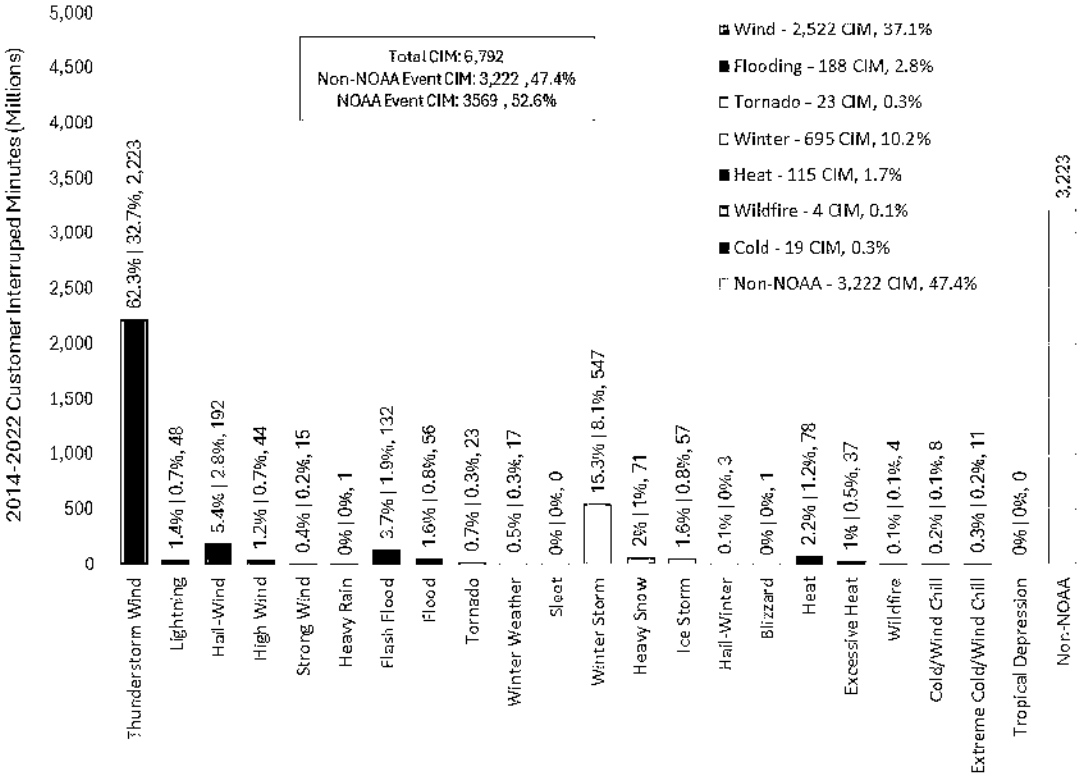


Figure 2: Summary of Weather Events and Customer Outages

Figure 3 below shows storm count by event type for each year since 1998. A wide range of events occur year to year with events related to extreme wind accounting for the highest percentage of events at 70 percent. On average, the Oncor System experiences 208 weather-based resiliency events each year.

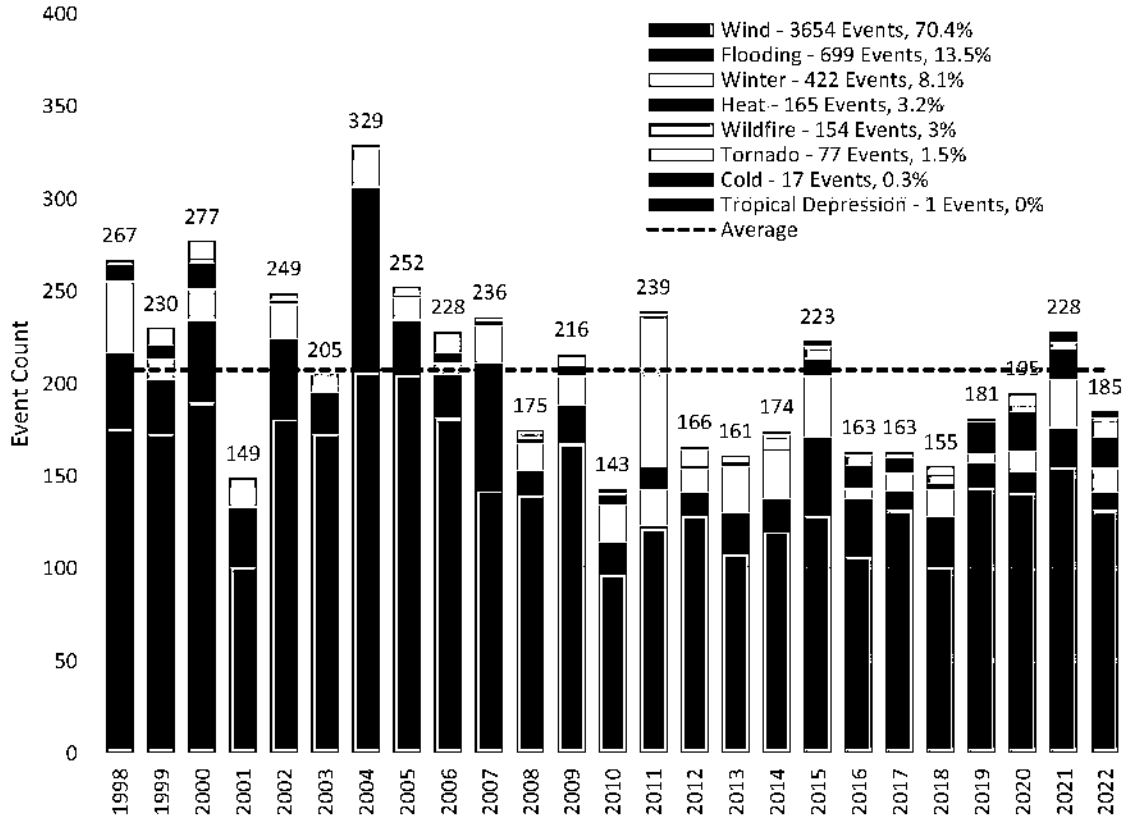


Figure 3: Count of Weather Based Resiliency Events for Oncor's System by Year[3]

[3] Reference Appendix K for 1898's report and details on NOAA events.

1898 also organized the events into 50-mile by 50-mile grids across Oncor's service area to understand the locational differences of the events as depicted in Figure 4 below. Figure 4 highlights a small area of the Oncor System. This is useful to understand how the wide range of events impacts the large Oncor service area. Appendix K to this Plan, which is the 1898 report, includes additional figures and information related to event impact levels across the Oncor System. Figures 2-4 as well as the additional figures and information in Appendix K provide the historical evidence that supports the presence of, and the risk posed by, extreme weather events as required by 16 Tex. Admin. Code ("TAC") § 25.62(c)(2)(B)(iv).

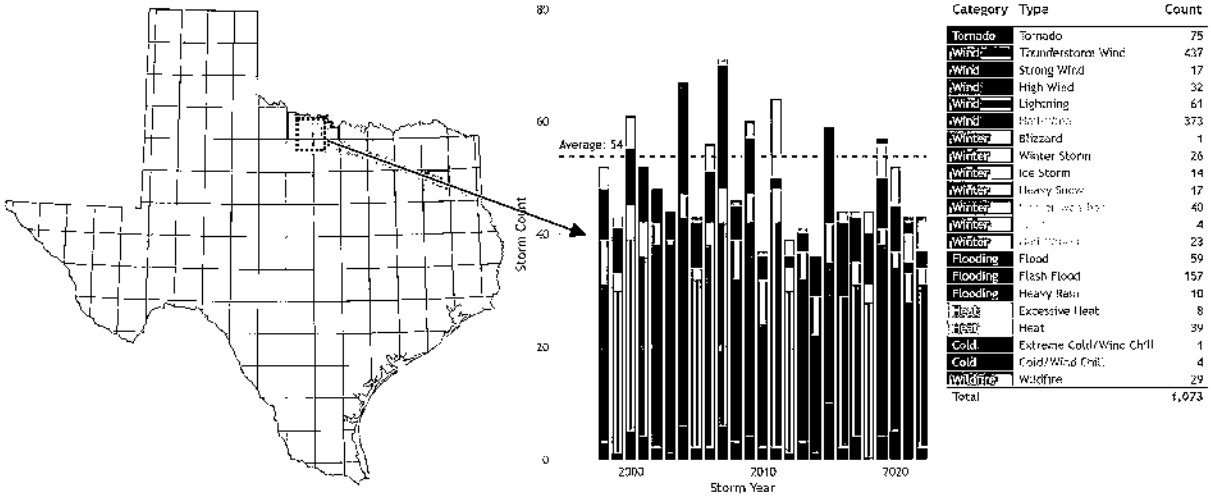


Figure 4: NOAA Event Summary for North Texas Grid Example[4]

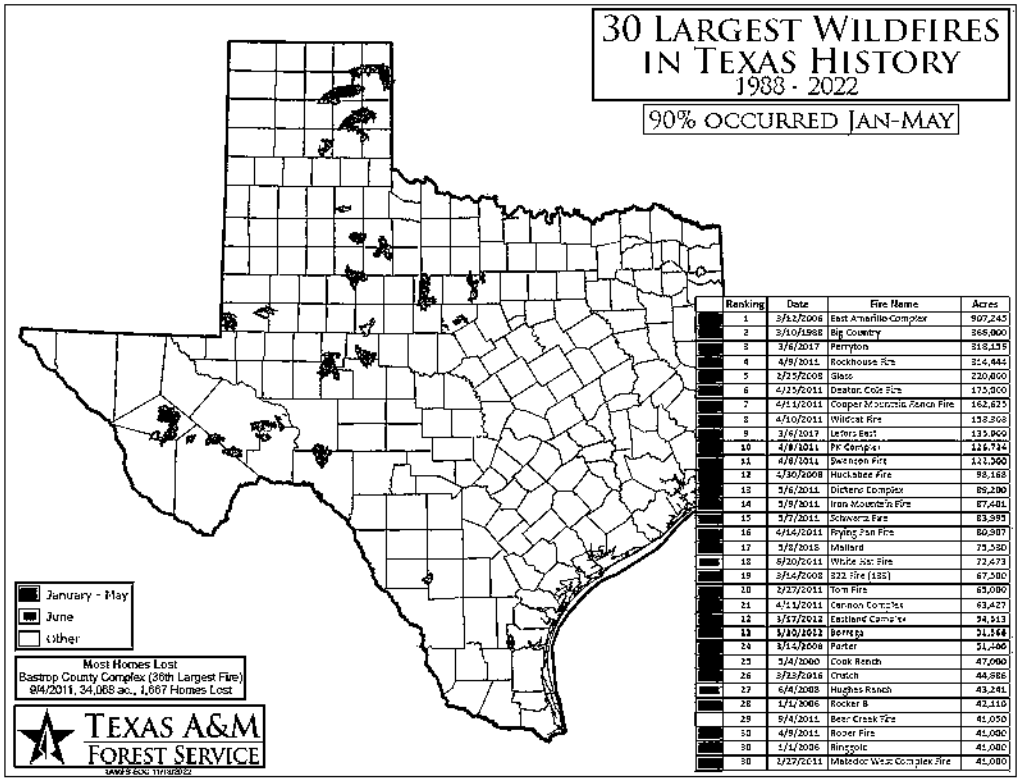
The profile of event types varies significantly across the System, showing the range of measures required to improve System resiliency. The resiliency-related risks and the characteristics of the System that make it susceptible to extreme weather events are as follows: (1) overhead facilities are subject to increased structural loading from elevated wind and ice accretion; (2) a large portion of Oncor's service area has high vegetation density with the potential to make contact with powerlines, causing outages and/or facility damage during wind and ice events; (3) certain legacy design facilities are more prone to failure to operate as designed and are vulnerable to stress from electrical loading due to excessive temperatures; (4) overhead and underground facilities are subject to stress/outages from surges due to lightning events; and (5) above-ground facilities are exposed to damage from wildfire incidents and the potential to be ignition sources in areas with elevated burn probability and high-fire intensity due to ground fuel conditions, topography hazards, and historical weather associated with dangerous fire behavior potential.

[4] Reference Appendix K for 1898's Report.

B. Wildfires

The Oncor System covers a highly diverse range of geographic, climatic, and vegetative regions encompassing over 120 counties across Texas, with widely varying population densities. Average annual precipitation varies from less than 15 inches in the western portions of the Oncor System to more than 45 inches in the eastern portions. Vegetation ranges from desert-scrub in the West to pine forests in the East, with grasslands and other diverse vegetation intermixed. Ground fuel and topography hazards, combined with rapid population growth into wildland-urban interface areas and increased frequency of fire weather conditions, have resulted in a growing risk of wildfire in Texas. Oncor has developed and implemented a proactive Wildfire Mitigation Plan, which is integrated into existing processes established through Oncor's strong culture of safety and excellence. The current Wildfire Mitigation Plan outlines a proactive approach to reduce the risk of Oncor equipment and facilities from becoming a wildfire ignition source, as well as harden structures to better withstand fire incidents.

Based on data from the Texas A&M Forest Service ("TAMFS"), the largest wildfires by acreage in the state of Texas are concentrated primarily in the western half of the state, which overlaps with Oncor's System. This portion of the state also experiences an elevated frequency of extreme fire weather conditions. The next two figures respectively illustrate the 30 largest wildfires in the state of Texas (1988 – 2022) and the annual probability of wildfire occurrence, which is defined as "Burn Probability." In addition to the wildfires listed in Figure 5, several deadly wildfires broke out across the Texas Panhandle in February 2024. Named the largest wildfire in Texas history, the Smokehouse Creek fire had devastating effects burning over 1 million acres of grassland and took nearly three weeks to contain. Separately, the Windy Deuce wildfire burned over 100,000 acres. These recent events further reinforce the need for enhanced wildfire mitigation efforts that go beyond Oncor's current Wildfire Mitigation Plan to help ensure the safety of the electric grid, the public, and the customers we serve.



Ranking	Date	Fire Name	Acres
1	3/12/2006	East Amarillo Complex	907,245
2	3/10/1988	Big Country	365,000
3	3/6/2017	Perryton	318,133
4	4/8/2011	Rockhouse Fire	314,441
5	2/25/2005	Glass	220,000
6	4/15/2011	Deaton Cole Fire	175,000
7	4/11/2011	Cooper Mountain Ranch Fire	162,625
8	4/10/2011	Wildcat Fire	158,868
9	3/6/2017	Lefors East	133,900
10	4/8/2011	Pk Complex	126,724
11	4/8/2011	Swenson Fire	121,000
12	4/30/2008	Huckabee Fire	98,168
13	3/6/2011	Dickens Complex	88,200
14	3/8/2011	Iron Mountain Fire	87,481
15	3/7/2011	Schwarz Fire	83,985
16	4/14/2011	Frying Pan Fire	80,987
17	5/8/2018	Mallard	75,580
18	8/20/2011	White Ash Fire	72,473
19	3/14/2008	322 Fire (185)	67,500
20	2/27/2011	Tom Fire	65,000
21	4/11/2011	Cannon Complex	63,427
22	3/17/2012	Eastland Complex	54,513
23	5/30/2011	Berreya	51,564
24	3/14/2008	Porter	51,486
25	3/4/2000	Cook Ranch	47,000
26	3/23/2016	Crutch	44,886
27	6/4/2008	Hughes Ranch	43,241
28	1/1/2006	Rocker B	42,110
29	9/4/2011	Bear Creek Fire	41,050
30	4/8/2011	Rooer Fire	41,000
30	1/1/2006	Ringgold	41,000
30	2/27/2011	Maledoc West Complex Fire	41,000

Figure 5: "30 Largest Wildfires in Texas", 1988-2022 – Texas A&M Forest Service

The location of the largest wildfires, depicted in Figure 5 above, also has some correlation to a dangerous fire weather phenomenon known as "Southern Plains Wildfire Outbreak" ("SPWO"). The environment conducive to an SPWO is characterized by dry vegetation, dry west-southwest winds across an area with low relative humidity, above average surface temperatures, an unstable atmosphere, and clear, sunny skies. According to TAMFS wildfire records, since 2005, fires on SPWO days account for 3% of reported wildfires but have resulted in 49% of the acres burned. Oncor monitors fire-weather forecasts, such as SPWO, to inform operational protocols designed to mitigate ignition risk.

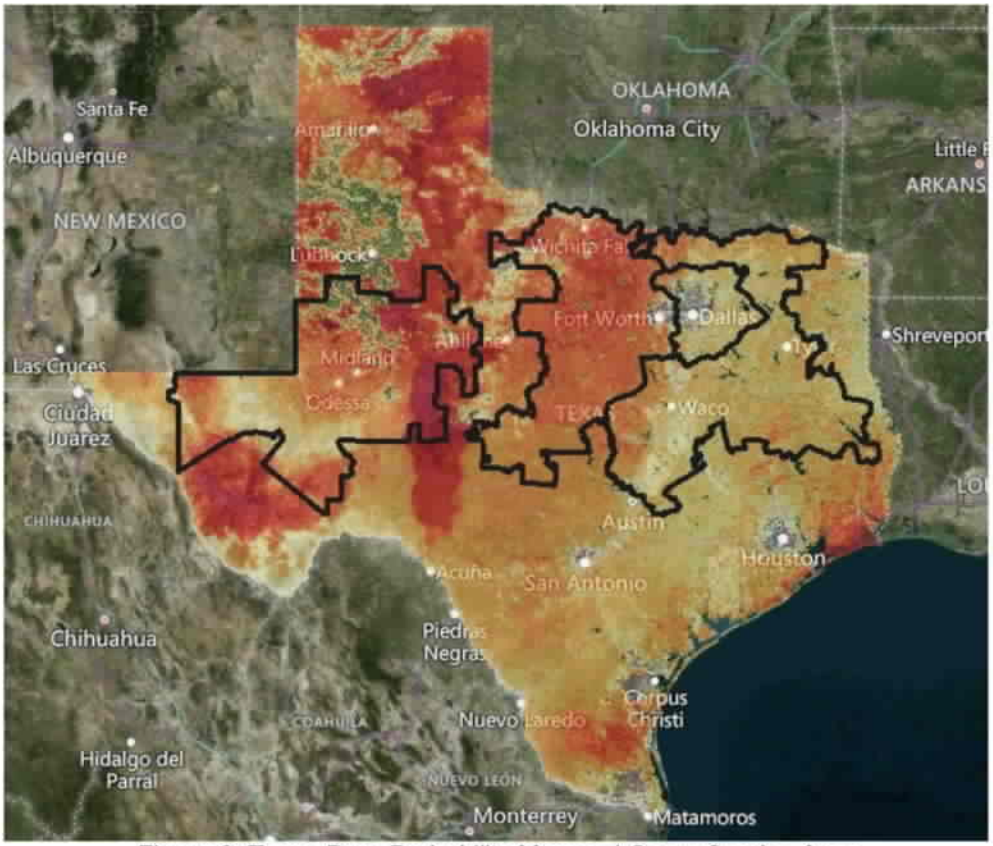


Figure 6: Texas Burn Probability Map and Oncor Service Area

Burn Probability is the annual probability of wildfire burning in a specific location based on historical weather data and fire spread simulations. Figure 6 above shows the Oncor service area and Burn Probability from a national spatial dataset provided by the United States Department of Agriculture.[5] Wildfire Mitigation Zones ("WMZs") for Oncor are established by analyzing Burn Probability along with other risk factors, such as fire intensity, allowing for identification of areas where significant wildfire fuels, topography hazards, and historical weather associated with dangerous fire behavior potentially exist. Oncor also takes into consideration additional risk factors, including population and property exposure, to help focus mitigation measures and address the highest risk areas.

The resiliency-related risks and the characteristics of the System that make it susceptible to wildfire events include (1) Oncor facilities installed above ground that have the potential to be an ignition source in areas with elevated wildfire risk, and (2) Oncor facilities exposed to damage from wildfire events. The resiliency measures outlined in this Plan enable Oncor to better assess the associated risk, enhance situational awareness, and

[5] Source: United States Department of Agriculture. (2021, April 14) *Wildfire Risk to Communities Burn Probability*. U.S. Forest Service – Geospatial Data Discovery. Wildfire Risk to Communities Burn Probability (Image Service) | Wildfire Risk to Communities Burn Probability (Image Service) | U.S. Forest Service - Geospatial Data Discovery (arcgis.com).

implement programs to mitigate ignition risk and protect Oncor assets from wildfire events.

C. Physical Security Threats

1898 also completed a review of the physical security threat environment for the electric utility industry. The details below are a summary of that review. Reference Appendix K for 1898's report for more details.

Bad actors pursue physical security threats and intrusions on critical infrastructure with the objective of inflicting severe impacts on society as well as reliability, and financial impacts on the electric utility. These events can be categorized as vandalism, theft, intrusions, or ballistic damage. According to the Electricity Information Sharing and Analysis Center ("E-ISAC"), physical security risks to substations have increased over the last few years, and the most common assets impacted are power transformers, switches, circuit breakers, and grounding conductors.[6]

Substation vandalism or sabotage is an attempt to damage, disrupt or destroy the function of assets within the perimeter of the substation or switching station. These acts may involve the intentional or unintentional damaging of critical infrastructure assets that results in the disruption of electric service from the transmission or distribution system. The perpetrators of these types of attacks may have sufficient knowledge of the assets inside of substations or switching stations to know what to target.

Asset theft is described as the unauthorized removal of assets or materials by bad actors who do not have the authority to do so. These bad actors' desire to remove the assets for personal gain and do not necessarily intend to cause disruption to the transmission or distribution systems. It is not uncommon that the result in the theft disrupts the proper operation of these systems. Copper grounding conductor is a common and popular target due to its resale value, ground level accessibility, and portability. Bad actors could also attack power infrastructure to target and steal from customers who are left without power due to the attack.

An intrusion or forced entry attack is described as an attacker who breaks through the external barrier or existing physical security measure in place to get access to the assets inside. This can range from cutting or breaking through external fences or walls to cutting off locks to equipment enclosures. The intent of the forced entry attack is to gain access to the assets behind the existing protection. From there the bad actor could intend to vandalize, sabotage or steal assets.

A ballistic attack targets assets from some distance and typically does so from outside existing physical security measures. This reduces the complexity of the attack and is purely meant to damage assets within the station. Bad actors typically position

[6] Source: NERC. (2023) *E-ISAC End of Year Report*. Electricity Information Sharing and Analysis Center.

themselves perpendicular to their target with clear lines of sight. They also may have sufficient knowledge of the assets to identify targets.

Electric utilities can implement measures to deter, detect, delay and respond to these threats in a layered approach to increase physical security for their assets. A holistic approach includes counter measures that employ physical, electronic and operational actions. These counter measures can take the form of physical barriers, lighting, signage, access control, video surveillance, intrusion detection, and rapid response. Table 3 below describes how these counter measures deter, detect, delay, and respond to physical security threats. Reference Appendix K for 1898's report for countermeasures for electric utilities.

Security Countermeasure	Security Provided			
	Deter	Detect	Delay	Respond
Perimeter Barrier	•		•	
Security Lighting	•	•		
Security Signage	•			
Access Control	•		•	
Video Surveillance		•		•
Intrusion Detection System		•		
Response				•

Table 3: Countermeasure Comparison

D. Cybersecurity Threats

1898, along with Oncor, completed a review of the cybersecurity threat environment for the electric utility industry. The details below are a summary of that review. Reference 1898's report in Appendix K for more details.

The key findings noted by 1898 relative to Oncor's potential cybersecurity threats within this plan include: 1) the exponential growth of cyber assets, specifically OT devices, connected to Oncor's digital grid, 2) the complexity and evolution of cybersecurity threats, 3) growth in the number and types of threat actors, 4) the potential cascading impact of cyber threats to Oncor and the Texas market, and 5) the lack of historical data on cybersecurity events and therefore need for flexible approaches to cybersecurity. These factors along with the need to continuously prepare for and prevent the ever-impending cyber storm on the horizon are the purpose of this plan. Given the current cybersecurity

landscape, it is not a matter of "if" but "when" and "how" Oncor prepares for and responds to such an event.

The cybersecurity attack surface size is growing, and the attack surface is getting more complex, distributed, and diverse. Oncor has millions of cyber assets (e.g., meters, radios, routers, gateways, laptops, sensors, monitors, etc.) connected to the digital grid across its transmission and distribution service area. Furthermore, traditional OT devices are becoming more "IT-enabled" with remote connectivity, automation, routable protocols, and situational awareness features. According to 1898's report, "The drive towards IT/OT convergence in the electric utility sector is chiefly motivated by the need for real-time data analysis, decision-making capabilities, and the integration of automation and interconnected devices. This convergence is critical for achieving operational efficiency, ensuring system reliability, and staying compliant with evolving regulatory standards. As a result, the cybersecurity attack surface is undergoing a significant and unprecedented expansion, becoming increasingly complex, distributed, and diverse." The cybersecurity risks associated to the convergence between IT and OT is profound and, similar to weather events, could impact critical transmission, distribution, and communications infrastructure significantly. Key risks noted in the 1898 report include increased attack surface, insufficient insight, legacy systems vulnerability, and start-up developed specialized devices.

Another theme around cybersecurity threats is the number of bad actors attacking electric utilities is increasing, and the attacks are growing more sophisticated. According to 1898's report, "The electric utilities sector has been a prime target for cyber-attacks due to its critical role in maintaining essential services and infrastructure." Furthermore, the Department of Homeland Security has consistently ranked the energy sector in the top three most targeted sectors for cyber-attacks in recent years. The 1898 report provided further guidance that all industries must remain vigilant and proactive in addressing the ever-evolving cybersecurity landscape. Specific types of cybersecurity threats cited in the 1898 report include: Ransomware as a Service, Phishing as a Service, off-the-shelf malware kits, compromise tactics through Dark Web marketplaces, and reduced costs in cloud computing making it easier for bad actors to deploy and scale their operations. Types of bad actors fall into different categories typically characterized by financial, nation-state, insider, and/or activist motives.

Along with increasing bad actors attacking electric utilities, cybersecurity threats are evolving, and the number of attacks is increasing. According to 1898's report, "The evolution of cybersecurity threats has been a dynamic and ever-changing landscape." Due to this evolving threat landscape, it is important to note the need for increased alignment and collaboration with external agencies and partners regarding these evolving cybersecurity threats as well as increased training and resources in the IT/OT and cybersecurity domains. While there is a lack of widely available cybersecurity attack data, the overall trajectory of attacks on electric utilities continues to rise with the introduction of new technologies, continued use of legacy technologies with ineffective protections and controls, and the development of new threats.

As a final point regarding cybersecurity threats, the potential impact of a cybersecurity event could be significant to Oncor's business continuity and have a cascading impact on the ERCOT market. While impacts of typical cybersecurity events range from financial loss to company reputation damage, the stakes for Oncor are higher. A cybersecurity event could result in disruption of electrical services or prolonged customer outages due to the unavailability of critical grid control functions enabled by communications, market-facing or supply chain interfaces, compromised Company data, or impacts to restoration processes and situational awareness systems. Furthermore, given the interconnected nature of the ERCOT market and Oncor's large footprint within it, a cybersecurity event could impact load forecasting abilities as well as overall ERCOT grid stability. The sudden loss of power due to a cybersecurity event could lead to economic impact as well as disruption to other critical and emergency services for the state of Texas. Furthermore, Oncor cannot continue to modernize its grid without secure communications infrastructure as proposed within this plan.

With extreme weather-related storms, there is typically some form of advanced notice along with years of historical data to support predictive patterns and ways to mitigate weather related risk. For "cyber storms" however, there is no advanced notice, the skilled resources required to mitigate a storm are limited, and there are no common tools, tactics, or procedures for restoration of cyber events. This extends the containment, assessment, and restoration phases of cybersecurity events and could lead to a repeat compromise if these phases are not followed properly. By the time an organization finds evidence of a compromise, the damage has typically been done. The threats described here as well as in the 1898 report, combined with the vulnerability and criticality of the digital grid, could cause the equivalent of a "cyber-Uri" event, where customers could be without service for extended periods of time along with significant costs to the utility to restore digital grid components. This further emphasizes the need for flexible, responsive, predictive, adaptive, and proactive approaches to cybersecurity events and risks as outlined in the Enhanced Digital Grid measure.

IV. Resiliency Measures

Oncor has developed the following seven mitigation measures to address risks associated with resiliency events that impact Oncor's System. As described above in Section III, these resiliency events include extreme weather events, wildfires, cybersecurity threats, and physical security threats that pose a material risk to the safe and reliable operation of the System. Each measure described below in this section includes several programs with specific activities, actions, standards, services, procedures, practices, structures, or equipment used to address resiliency risks.

A. Overhead System Resiliency & Modernization Measure

1. Risks Posed by Resiliency Events

This measure mitigates risks of extreme weather events, such as high winds, lightning, winter/ice storms, and high equipment loading caused by extreme heat or cold. Programs in this measure support the mitigation of risks related to extreme weather events by enhancing resiliency through structural hardening, facility modernization, and lightning protection. Additionally, implementing the programs within this measure will also mitigate risks associated with wildfire, such as hardening and modernizing overhead distribution facilities which will reduce structural failures during extreme weather events, which lowers the risk of wildfire ignition. Refer to Section III of this Plan for resiliency event descriptions.

2. Measure Methodology

This measure includes three programs to increase the resiliency of Oncor's overhead system by hardening and modernizing overhead facilities to better withstand extreme weather events. Collectively, the programs under this measure increase Oncor's ability to withstand extreme weather events. This measure utilizes the hardening and modernizing electric transmission and distribution facilities and lightning mitigation methods as identified in 16 TAC § 25.62(c)(1)(A), (B) and (D). This measure also utilizes the lightning mitigation method as described in 16 TAC § 25.62(c)(1)(D). The following programs will be deployed or expanded by Oncor in the Overhead System Resiliency & Modernization measure:

<u>Program A – Structural Capacity Enhancement Program</u>

Activities – This program will include a loading assessment of existing distribution facilities in the highest-impact areas, and an upgrade, as appropriate, to those distribution facilities to meet all National Electric Safety Code ("NESC") load cases (250B, 250C, and 250D), regardless of structure height, and an upgrade of critical infrastructure poles to meet an Oncor defined loading criteria that considers 0.75" inches of radial ice on all conductors. Overhead facilities included in this program will also be hardened through Program B, which is discussed in additional detail below.

Program B – Overhead Feeder Hardening Program

Activities – This program will include a condition assessment of overhead facilities, and an upgrade to those facilities, to install current standard lightning protection, replace vulnerable wood crossarms with fiberglass crossarms, apply life extension treatment to wood poles, and replace or reinforce wood poles as required to meet strength requirements.

Program C – Distribution Conductor & Overhead Equipment Modernization Program

Activities – This program will upgrade targeted, vulnerable overhead conductors and convert them to current standard construction and size. This program will also replace vulnerable, non-standard and overloaded equipment, including air-break switches, hydraulic reclosers, capacitor banks, and transformers.

Table 4 below summarizes each program under the Overhead System Resiliency & Modernization measure. The three-year scope and estimated spend levels are based on proposed Plan funding levels and resource constraints as determined at the time of Plan filing.

Measure Program	Methodology	Activity Description	Plan Estimated Scope	Plan Estimated Spend
Program A: Structural Capacity Enhancement Program	Harden Transmission & Distribution ("T&D")	Conduct loading assessment and upgrade existing distribution facilities at high-impact areas to meet all NESC load cases (250B, 250C, and 250D) and upgrade critical infrastructure poles to meet Oncor defined load case with 0.75" ice.	5,596 miles[7] 44,768 poles[8]	$388.5M
Program B: Overhead Feeder Hardening	Lightning Mitigation, Harden T&D, Modernize T&D	Conduct condition assessment and upgrade all overhead facilities to install current standard lightning protection, install modern fiberglass cross arms, apply life extension treatment to wood poles and replace or reinforce wood poles to meet strength requirements.	15,135 miles[9] 58,118 poles[10] 147,136 crossarms[11]	$645.4M
Program C: Distribution Conductor and Equipment Modernization	Harden T&D, Modernize T&D	Upgrade vulnerable overhead conductors to convert to current standard construction and size. Replace vulnerable, non-standard and overloaded equipment. This program will replace vulnerable, non-standard and overloaded equipment, including air-break switches, hydraulic reclosers, capacitor banks, and overloaded transformers.	684 miles of conductor 6,069 pieces of equipment	$196.9M
			Total	**$1,231M**

[7] Estimated miles of overhead facilities that will be assessed and hardened through Program A.

[8] Estimated replacement quantities based on preliminary engineering analyses and subject to field verifications.

[9] Estimated mile of overhead facilities that will be assessed and hardened through Program B.

[10] *Supra* note 8.

[11] *Id.*

Table 4: Overhead System Resiliency & Modernization Measure Summary

3. Measure Description

Outlined below are descriptions of the activity scope, activities, standards, services, procedures, practices, structures, or equipment associated with each program under this measure:

Program A – Structural Capacity Enhancement Program

The new structural capacity enhancement program is designed to mitigate risk associated with extreme weather events, including high wind and ice storm events, at high-impact areas of the distribution system. This program has three main components: (1) structural loading assessment; (2) pole hardening; and (3) critical infrastructure pole hardening.

Activity 1 – Structural Loading Assessment

As required by the NESC, Oncor designs all new distribution overhead facilities to meet the loading conditions contained within NESC Rule 250B. The hardened design will elevate the overhead distribution structural loading criteria to also include the loading conditions described by NESC Rule 250C and NESC Rule 250D, as summarized below:[12]

- 250B Heavy District Loading – 0.5 inches of radial ice, 4 PSF wind
- 250C Extreme Wind – 87 MPH for Grade C; 93 MPH wind for Grade B; and
- 250D Extreme Ice with Concurrent Wind – 0.75 inches of radial ice.

NESC Rule 250B, *Combined Ice and Wind District Loading*, defines four loading areas – Heavy, Medium, Light & Warm Island - across the United States and associated territories. Within each loading area, this rule defines a specific radial ice thickness, horizontal wind pressure, and temperature that should be considered for structural design purposes. For several decades, the NESC only contained the loading conditions defined within NESC Rule 250B.

NESC Rule 250C, *Extreme Wind Loading*, was introduced in the 1977 NESC Edition in recognition that structures that are designed only in accordance with the loading criteria contained within NESC Rule 250B could be overloaded when subjected to very high wind loads. The wind pressures described by this rule originate from American Society of Civil Engineers ("ASCE") 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures;* however, the NESC does not require application of the loading criteria contained within NESC Rule 250C to structures that are less than 60 feet above ground or water level.

NESC Rule 250D, *Extreme Ice with Concurrent Wind Loading*, was introduced in the 2007 NESC Edition. Similar to NESC Rule 250C, this rule references a map derived from

[12] Reference Appendix C for technical details on hardened design criteria.

historical meteorological data, contained within ASCE 7, to define specific radial ice thickness and concurrent wind speeds for design purposes. As with NESC Rule 250C, the NESC does not require application of the loading criteria contained within NESC Rule 250D to structures that are less than 60 feet above ground or water level.

Although the loading criteria associated with NESC Rule 250B Heavy typically controls the design of overhead distribution structures, in some circumstances the loading criteria associated with NESC Rule 250C or NESC Rule 250D may be the controlling load cases. Incorporating loading criteria within NESC Rule 250C and NESC Rule 250D into the design of overhead distribution facilities, regardless of structure height, will reduce the maximum allowable span lengths for typical overhead distribution facilities, enhancing the ability of these structures to withstand extreme weather events.

As part of this activity, a condition assessment will be performed on poles located in high-impact areas that are targeted by this program; a detailed understanding of pole condition is important to ensure an accurate loading assessment, as localized pole defects discovered through this process may result in reduced pole strength. Upon completion of the pole condition assessment, a detailed structural analysis, leveraging LiDAR survey data of the distribution facilities, and considering the loading criteria contained within NESC Rule 250B, NESC Rule 250C, and NESC Rule 250D will be performed; poles with insufficient structural capacity will be identified and targeted for replacement through this process.

This hardened design standard will be used for all new construction in high-impact areas, which includes those facilities that serve a large number of customers such as the feeder mainline, facilities located within WMZs, as well as chronically underperforming areas. These are further defined as the following:

- Feeder mainline: this section of a feeder is directly protected by the substation breaker or an automated feeder switch. An outage on this section of a feeder impacts all or a large portion of customers on the feeder.
- Underperforming areas: these are areas with either (1) multi-year violations of the Commission's feeder reliability rule, or (2) elevated levels of extreme weather impact resulting in customers experiencing repeated outages.

Activity 2 – High-Impact Pole Hardening

After completion of the structural loading assessment, poles that are identified as overloaded as part of Activity 1 will be remediated, either through the installation of a steel truss, which provides additional structural support to the wood pole, or through the replacement of the existing pole entirely. Minor miscellaneous items (e.g., insulator pins, wire ties) that are identified during execution of the pole hardening program will be addressed concurrently.

Activity 3 – Critical Infrastructure Pole Hardening

Oncor's critical infrastructure pole hardening will target areas in which structural failures present potentially severe impacts; this effort will include (1) pole locations with significant accessibility, maintenance, or easement issues that make restoration lengthy, (2) pole locations with critical equipment and feeder ties that could be damaged, and (3) pole locations that support overhead distribution crossings of major civil infrastructure (e.g., US Highways).

In addition to the NESC loading criteria described within Activity 1 above, an Oncor defined loading condition, based on historical data captured within ASCE 7 that requires a radial ice thickness of 0.75 inches, will be included in the structural assessment of critical infrastructure poles.

This effort will mitigate resiliency risks to poles constructed to lower loading design standards at critical locations, the failure of which would result in a high impact to customers and extended outage durations. Additionally, critical equipment located on overhead distribution facilities that are part of this activity will undergo inspection and maintenance to ensure their readiness to operate as intended during resiliency events. This entails leveraging techniques such as visual and thermal imagery to assess conditions, as well as functionality testing and preventative maintenance activities to ensure that they operate as designed.

Program B – Overhead Feeder Hardening Program

The overhead feeder hardening program is designed to mitigate risks associated with extreme weather events, including high wind and ice storm events, at all the overhead distribution primary locations. Overhead feeder hardening is designed to assess[13] and perform necessary upgrades on overhead distribution primary circuits to ensure all components are continuing to operate as designed, and to address any issues that could result in an outage.

This program has three main activities: (1) lightning protection; (3) crossarm hardening; and (3) wood pole strength assessment.

Activity 1 – Lightning Protection

Oncor's service territory experiences a significant amount of lightning activity. Lightning leads to equipment failures, and associated outages, due to overvoltage. Proper lightning protection for the distribution system requires that surge protection be installed at all equipment locations and at regular intervals along distribution lines where few equipment installations exist. This program will ensure that surge protection is installed in accordance with current design standards at the following locations:

[13] Reference Appendix C for pole assessment processes and standards.

- Overhead equipment (e.g., transformers, capacitors, and reclosers);
- 3-phase gang operated switches;
- Riser pole locations; and
- Overhead distribution lines at regular intervals (1,000' – 1,200'), or for targeted lightning protection (780' – 850') where few equipment installations exist.

Activity 2 – Crossarm Hardening

Deteriorated wood crossarms, which experience significant age-related strength loss, will be replaced with fiberglass crossarms in the high-impact areas targeted by this program; fiberglass crossarm construction is standard design for new construction, and promotes long-term structural resiliency.

Activity 3 – Wood Pole Strength Assessment

Poles will be inspected under this program to ensure that sufficient design strength still remains, and preservatives will be applied to mitigate decay. Poles found to have deterioration resulting in significant strength loss will be replaced or reinforced to ensure original design strength levels are met.[14]

Program C – Distribution Conductor and Equipment Modernization Program

The new distribution conductor and overhead modernization program is designed to mitigate risks associated with extreme weather events such as high winds and ice storms, and mitigate wildfire risk.

This program will target conductors and equipment that are known to be vulnerable due to their outdated construction and installation standards.[15] By replacing these legacy conductors, associated fittings, and attachment hardware with modern designs, this program also mitigates risks associated with wildfire by minimizing ignition opportunities due to conductor failure.

Activity 1 – Conductor Modernization

This program will target: (A) to upgrade small primary conductors and unjacketed secondary conductors; and (B) to replace air-break switches, single phase reclosers, and overloaded transformers. Small conductors are known to be more susceptible to mechanical failure than larger primary conductors; these conductor failures are typically caused by cyclical mechanical stresses initiated by wind or external contact from trees. Unjacketed secondary conductors, more commonly known as open wire secondary, are legacy equipment that are highly susceptible to failure during resiliency events.

[14] Reference Appendix C for technical details on pole treatment, replacement, or reinforcement criteria.

[15] Reference Appendix C for details, characteristics, and standards that result in these conductor vulnerabilities.

Activity 2 – Equipment Modernization

The overhead equipment modernization activity is designed to mitigate risk associated with extreme weather events, including high winds and ice storms.

Equipment targeted under this new program will include the replacement of air-break switches, single phase hydraulic reclosers, legacy capacitor banks and overloaded transformers. These types of equipment have increased failure or mis-operation probability during resiliency events, potentially resulting in extended customer outages or other risks such as wildfire ignition. Overloaded transformers have a higher probability of failure during extreme temperature conditions.[16] Replacement transformers will be sized to ensure that peak demand load is met and that elevated load cases following an extended outage are considered.

Reference Appendix C for complete analysis and construction standards of programs included in the Overhead System Resiliency & Modernization measure.

4. Measure Implementation

Prioritization of Event and Measure

Oncor identified the resiliency event for mitigation based on (a) the event's impact on public safety, and (b) the actual and potential impacts of extreme weather events to Oncor's assets that pose a material risk to the safe and reliable operation of the System. Implementation of the measure is based on prioritization to address the highest risk locations, have the greatest customer impact, and maximize the benefit to cost ratio. Reference Section VII of this document for details of Oncor's systematic implementation approach.

Evidence of Effectiveness

Implementation of this measure mitigates risks posed by the resiliency risk of extreme weather events. The activities proposed are consistent with industry standards, including NESC and Institute of Electrical and Electronics Engineers ("IEEE"). Oncor has engaged 1898, an independent entity with relevant expertise, to ensure measures proposed are effective in preventing, withstanding, mitigating, or more promptly recovering from the risks posed by the extreme weather resiliency events. Reference Section VI of this document for details on the expected effectiveness of this measure.

Expected Benefits

The expected benefits of this measure are the mitigation of risk associated with extreme weather events that pose a material risk to the safe and reliable operation of the System

[16] Reference Appendix C for technical details on overloaded transformer identification.

and the mitigation of the impacts of those events on Oncor assets. Reference Section VI of this document for details on the expected benefits.

Government Program Coordination

Not applicable.

Measure Alternatives

The alternatives considered for this measure include: (1) undergrounding of overhead facilities; (2) maintaining current loading requirements; and (3) installation of wood pole alternatives to meet extreme loading criteria.

Undergrounding of existing facilities would mitigate risks of extreme weather events, such as high winds, lightning, and winter/ice storms; however, universally implementing this alternative across the entire overhead distribution system is cost prohibitive, and costs typically far exceed any anticipated benefits.

For structures less than 60 feet in height, only one NESC loading condition – Rule 250B – is considered for overhead distribution structure design. Although the additional loading requirements that will be applied through this measure are not required by the NESC, historical meteorological data, such as those reflected in relevant standards such as ASCE 7, as well as Oncor's operational experience, support the need to consider structure loading criteria that is more stringent than that which is required by Rule 250B.

Overhead distribution poles can be fabricated from a variety of material types (e.g., steel, concrete, fiberglass, ductile iron). Based on typical design loads within Oncor's traditional service territory, wood poles are an appropriate design choice for most applications, but alternative material types may be considered for specific circumstances that require unique designs, such as very tall structures, major civil infrastructures, or structures subject to large structural loads.

Transmission System Outage Requirement

Implementation of a majority of the programs in this measure does not require an outage on the transmission system. There could be scenarios in which a specific activity may require a transmission outage, but they are not expected to be frequent or extended. Any required outages would be coordinated with ERCOT.

5. Proposed Evaluation Metric and Criteria

The metrics used to evaluate the effectiveness of this measure include improvement of System performance over time, comparison of local area performance before and after measure implementation, and an increase to customer resiliency to the risks caused by the associated resiliency events. Reference Section V of this Plan for details on the evaluation metrics.

6. Measure Comparison to Existing Programs

While the proposed programs in this measure are similar to the existing Oncor feeder review program, this measure systematizes existing activities and includes new activities to further mitigate risks associated with the identified resiliency event(s).

Program (A) – Structural Capacity Enhancement Program: This is a new program developed to assess and enhance structural capacity in high-impact areas on the overhead system to mitigate risks associated with extreme weather.

Program (B) – Overhead Feeder Hardening Program: This includes an existing program that combines a condition assessment and life extension treatment for wood poles, as well as a general visual inspection. Poles that are found to contain substantial decay are reinforced, or replaced entirely, and any other components found to be defective are also replaced. The Plan expands existing activities to include lightning protection enhancement as well, and increases the overall scale of associated activities to enhance the distribution system resiliency.

Program (C) - Distribution Conductor and Equipment Modernization: This program increases the scope and scale of an existing program to upgrade vulnerable conductor and equipment to systematically mitigate risk and enhance the distribution system resiliency.

B. Underground System Resiliency & Modernization Measure

1. Risks Posed by Resiliency Events

This measure mitigates risks posed by extreme weather events, including extreme temperature and lightning events. Such conditions induce electrical stress on legacy design underground ("UG") cable and equipment, increasing the likelihood of their failure.[17] Legacy UG cable becomes more prone to failure due to extreme temperature-driven load or voltage surges resulting from lightning strikes. Similarly, legacy UG equipment, such as live-front transformers and switchgears (i.e., transformers and switchgears with exposed electrical components), are vulnerable to contamination and corrosion of exposed energized parts, increasing the risk of failure during lightning or extreme temperature events when the electrical stress is amplified. For detailed descriptions of resiliency events, refer to Section III of this Plan.

2. Measure Methodology

This measure consists of three programs, which collectively enhance the distribution system's resiliency by hardening and modernizing underground facilities to withstand extreme weather events. Moreover, these programs improve the distributions system's resiliency to such events and facilitate customer service from alternative sources, or redistribute their load to other feeders, thus mitigating outage impacts.

This measure utilizes the hardening and modernizing electric transmission and distribution facilities and lightning mitigation methods as identified in 16 TAC § 25.62(c)(1)(A), (B) and (D). Specifically, the following programs will be expanded by Oncor in the UG System Resiliency & Modernization measure:

Program A: UG Cable Modernization Program

Activities – Through this program, Oncor will conduct condition assessments of all mainline cable installed after 1993 and will upgrade the cable system as required to meet Institute of Electrical and Electronics Engineering ("IEEE") and Insulated Cable Engineers Association ("ICEA") standards.[18] This program will also rehabilitate or replace legacy design cable.[19] In our experience, cable rehabilitation extends the life of the cable by as much as 20 years by restoring the properties of the insulation via silicone injection.[20] Where cable rehabilitation is not feasible, the legacy design cable will be replaced with Oncor's current standard cable.

---

[17] Conductors utilize the air and required distances as the insulation medium, cable utilizes various different semi-conductor, insulation, and shielding to insulate the internal conductor. Reference Appendix D for a diagram of cable construction.

[18] Reference Appendix D for a description of applicable IEEE/ICEA standards.

[19] Reference Appendix D for legacy design cable characteristics.

[20] Reference Appendix D for cable injection details.

Program B: UG Equipment Modernization Program

Activities – This program will replace Oncor's legacy design equipment.[21] such as live-front transformers and live-front switchgears, with dead-front equivalents.

Program C: Smart UG Feeder Switching Program

Activities – This program will modernize UG feeders by replacing manual switchgears with Remote Supervisory Control ("RSC") switchgears at strategic locations.

Table 5 below summarizes each program under the UG System Resiliency & Modernization measure. The three-year scope and estimated spend levels are based on proposed Plan funding levels and resource constraints, as determined at the time of Plan filing.

Measure Program	Methodology	Activity Description	Plan Estimated Scope	Plan Estimated Spend
Program A: UG Cable Modernization Program	Harden T&D, Modernize T&D, Lightning Mitigation	Conduct health assessment of UG feeder mainline cable every 10 years. Replace cable that does not meet applicable IEEE/ICEA standards. Inject or replace legacy design cable installed prior to the current standard.	6,000 segments of cable testing 1,798 miles of injection and replacement of legacy design cable	$508.5M
Program B: UG Equipment Modernization Program	Harden T&D, Modernize T&D, Lightning Mitigation	Proactively replace legacy design UG equipment with dead-front equipment.	3,133 live front transformers 500 live front switchgears	$76.9M
Program C: Smart UG Feeder Switching Program	Modernize T&D	Review feeders with extensive UG cable and large customer impact and install RSC gears at strategic locations to reduce outage duration.	70 RSC switchgears	$14.0M
Total				**$599M**

Table 5: UG System Resiliency & Modernization Measure Summary

3. Measure Description

Outlined below are descriptions of the activity scope, activities, standards, services, procedures, practices, structures, or equipment associated with each program under this measure:

[21] Reference Appendix D for legacy design equipment characteristics.

Program A – UG Cable Modernization Program

The UG cable modernization program is designed to mitigate risks associated with extreme weather events. Approximately 28% of Oncor's distribution circuit miles are UG facilities. UG cables have the benefit of minimized exposure to high winds and vegetation but are still susceptible to outages in extreme temperature and lightning events. UG cable failures typically result in extended outages.[22] This is due to the difficulty of locating the failed cable and the time it takes to replace it once it is located. This program has two main activities: (1) mainline cable health assessment; and (2) life extension or replacement for legacy cable.

Activity 1 – Mainline Cable Health Assessment

The mainline cable health assessment program is designed to mitigate risk of extended outages related to cable failures. While UG cable is designed to withstand electrical stress, its resilience diminishes as the cable insulation or neutral conductor degrades, or if manufacturing, or installation defects are present. Even minor defects, which may not cause failures under normal operating conditions, can lead to cable failures when electrical stress increases as a result of lightning strikes or due to high current loading during extreme temperature events.

Under this program activity, Oncor will proactively assess the condition of all existing feeder mainline cable installed after 1993. Feeder mainline, i.e., the section of a feeder that is directly protected by the substation breaker or by an automated feeder switch, is considered a high-impact area because an outage on this section impacts all or a large portion of customers on the feeder.

The assessment is performed in accordance with the IEEE/ICEA standards described above. Cable not meeting the standard design specification is replaced.

Activity 2 – Life Extension or Replacement of Legacy Design Cable

In addition to mainline cable assessment of post-1993 cable, this Plan will also target the rehabilitation or replacement of all remaining legacy design cable on the Oncor distribution system. Legacy design cable consists of cable installed prior to 1994. As described above, legacy design cable is more susceptible to failure during lightning or extreme temperature events because of its diminished capacity to mitigate the elevated electrical stress associated with these types of events.

This vulnerability stems from the following design specifications and construction practices:

[22] Reference Appendix D for details on how UG construction impacts outage restoration time.

- Pre-1994 cable lacks a protective outer jacket, exposing neutral conductors to environmental elements and leads to corrosion over time. Corrosion can cause neutral conductor overheating during high-load, extreme temperature events, which in time can cause the neutral conductor to fail.
- Vulnerable insulation, such as Cross-linked Polyethylene ("XLPE") and High Molecular Weight Polyethylene ("HMWPE"), is prone to defects like water treeing, diminishing their ability to withstand voltage surges induced by lightning strikes and leading to eventual failure.
- Paper Insulated Lead Cable ("PILC") is susceptible to water ingress, especially at terminations or joints, leading to insulation breakdown and eventual failure
- Accessibility issues stemming from legacy design cable being installed in backyards directly in the ground, which makes the troubleshooting and repair process take longer, resulting in longer outages.

Under this program activity, Oncor will target the rehabilitation or replacement of the vulnerable legacy design (pre-1993) cable on the distribution system. Cables meeting rehabilitation criteria[23] undergo upgrades with new accessories and silicone fluid injection. Those not meeting the rehabilitation criteria are replaced with Oncor`s current standard cable.[24]

Program B – UG Equipment Modernization Program

The UG equipment modernization program is designed to reduce the risk of extended outages by replacing legacy design UG equipment, particularly vulnerable live-front pad-mounted transformers and switchgears, with modern design dead-front equipment.

Activity 1 – Replacement of Legacy Design Equipment

Legacy design UG equipment utilizes fully exposed energized components, making them susceptible to accumulation of contamination and corrosion over time. The accumulated contamination compromises the insulating properties of the equipment and reduces its ability to withstand overvoltage events induced by lightning strikes or accommodate outage restoration switching during extreme weather events. The equipment's diminished insulating properties increase the potential for failure due to voltage flashover.

In contrast, modern design dead-front equipment fully encapsulates terminations from environmental exposure. This modern design minimizes contamination and corrosion accumulation, which significantly reduces susceptibility to failure and improves safety by eliminating exposed energized components.

[23] Reference Appendix D for a description of the rehabilitation process.

[24] Reference Appendix D for current standard cable description.

Under this program activity, Oncor will target the replacement of vulnerable legacy design UG equipment on the distribution system with its current standard for UG equipment, the dead-front switchgear and dead-front transformer.

Program C – Smart UG Feeder Switching Program

As noted above the UG system is susceptible to outages associated with extreme weather events, including extreme temperature events. The Smart UG Feeder Switching Program is designed to mitigate outage risk by segmenting feeders and allowing isolated segments to be energized from different sources.

Activity 1 – High-Impact Switchgear Modernization

This program will facilitate service restoration to un-faulted sections of the feeder through remote switching of RSC switchgears strategically positioned to optimize customer benefit. Installing RSC switchgears at feeder ties also improves backstand between adjacent feeders as detailed in the Flexible and Self-Healing Distribution System measure below. RSC switchgears are connected to the digital grid to enable remote operation of the switching compartments.

RSC switchgears are only appropriate in select applications, costing three times as much as their manual counterparts. Oncor's current design standard limits RSC switchgear installations to two-way feed schemes and other targeted critical locations. Two-way feed setups offer service redundancy to critical loads or customers, with the associated cost typically paid by the customer. Other RSC switchgear installations are determined by System reliability requirements, often linked to heavily undergrounded feeders. Oncor has already expanded the use of RSC gears in such applications, resulting in significant reliability improvements and customer benefits.[25]

Under this program activity, Oncor will expand the deployment of RSC switchgears to strategic locations, including high-impact underground feeder ties and key sectionalizing points on underground feeders serving a high number of customers.

High-impact areas are defined as follows:

- UG feeders with a significant customer impact,[26] or
- Feeders where the mainline is predominantly underground, with significant customer impact, and where implementing overhead Distribution Automation is impractical. In such cases, RSC switchgear is installed approximately halfway along each feeder based on customer count, and an additional switch is placed at the normally-open point between the two feeders.

[25] Reference Appendix D for RSC reliability improvement information.

[26] Customer impact is based on number of customers impacted, historical outage information, and reliability metrics.

Reference Appendix D for complete analysis and construction standards of programs included in the UG System Resiliency & Modernization measure.

4. Measure Implementation

Prioritization of Event and Measure

Oncor identified the resiliency event for mitigation based on (a) Customer impact, and (b) impacts to Oncor's assets that pose a material risk to the safe and reliable operation of the System. Implementation of the measure is based on prioritization to address the highest risk locations. Reference Section VII of this Plan for details of the systematic implementation approach.

Evidence of Effectiveness

Implementation of this measure mitigates risks posed by extreme weather events. The activities proposed are consistent with industry practices to mitigate such risks. Oncor has engaged 1898, an independent entity with relevant expertise, to ensure measures proposed are effective in preventing, withstanding, mitigating, or more promptly recovering from the risks posed by the physical security resiliency event. Reference Section VI of this document for details on the effectiveness of this measure.

Expected Benefits

The expected benefits of this measure are the mitigation of risks associated with extreme weather events and the mitigation of the impacts on Oncor assets that pose a material risk to the safe and reliable operation of the System. Programs in this measure support the mitigation of risks related to extreme weather events by helping to lower the chance of an outage happening, and when one does happen, minimizing the impact of the outage and reducing restoration times. Reference Section VI of this Plan for details on the expected benefits.

Government Program Coordination

Not applicable.

Measure Alternatives

The alternatives considered for this measure include: (1) replacing all legacy design cable instead of cable rehabilitation; and (2) continuing to serve areas with substantial underground facilities without remote switching capabilities.

Cable rehabilitation is a proven, cost-effective industry solution that, in our experience, extends the lifespan of existing legacy design cable by up to 20 years, at half the cost of replacement. This offers customers a significant benefits-to-cost ratio while effectively

addressing vulnerabilities associated with legacy design cable. See Appendix D for further details on the rehabilitation process and feasibility assessment.

Underground facilities offer greater resilience to extreme weather events like thunderstorm winds and ice storms. However, troubleshooting outages on the underground system is more challenging and repairs take longer. Consequently, customers often experience extended outage durations, and in areas with substantial underground facilities, this results in a bigger customer impact. Additionally, the Distribution Automation[27] solution associated with overhead construction is not applicable to underground facilities, hindering our efficiency in power restoration. Feeders equipped with RSC switchgears have experienced a notable reduction in customer impact during outage events.

Transmission System Outage Requirement

Implementation of a majority of the programs in this measure does not require an outage on the transmission system. There could be scenarios in which a specific activity may require a transmission outage, but they are not expected to be frequent or extended. Any required outages would be coordinated with ERCOT.

5. **Evaluation Metric and Criteria**

The metrics used to evaluate the effectiveness of this measure include improvement of System performance over time, comparison of local area performance before and after measure implementation, and reduction in customer vulnerability to the risks caused by the associated resiliency events. Reference Section V of this Plan for details on the evaluation metrics.

6. **Measure Comparison to Existing Programs**

While the proposed programs in this measure are similar to the existing Oncor feeder review program, this measure systematizes existing activities and includes new activities to further mitigate risks associated with the identified resiliency event(s).

Program A: UG Cable Modernization Program: This existing program focuses on rehabilitating or replacing legacy design cable. The Plan program expands these activities to include health assessments of post-1993 mainline cable and increases the scale of associated activities to enhance the distribution system resiliency.

Program B: UG Equipment Modernization Program: This existing program focuses on replacing live-front transformers. The Plan program expands these activities to encompass the replacement of live-front switchgears and increases the overall scale of associated activities to enhance the distribution system resiliency.

[27] Reference the Flexible and Self-Healing Distribution System measure below for details.

Program C: Smart UG Feeder Switching Program

This existing program targets locations with significant customer impact. The Plan program increases the overall scale of associated activities to enhance the distribution system resiliency.

C. Flexible and Self-Healing Distribution System Measure

1. Risks Posed by Resiliency Events

This measure mitigates risks posed by extreme weather events, such as high winds, lightning, winter/ice storms, and high equipment loading caused by extreme heat or cold and minimizes the number of customers impacted by outages. This measure also mitigates risks posed by wildfires by enhancing substation relays and the ability to sectionalize the distribution system. Programs in this measure support the mitigation of risks related to extreme weather events by enhancing resiliency through System hardening and modernization. Reference Section III of this Plan for resiliency event descriptions.

2. Measure Methodology

This measure includes four programs to increase the resiliency of Oncor's overhead distribution system by hardening and modernizing overhead facilities to better withstand extreme weather events. Collectively, the programs under this measure increase the ability for Oncor to implement distribution automation, enabling customers to be served from alternative sources or have their load redistributed to other feeders or mobile transformers so as to minimize the impact of an outage by reducing the number of affected customers.[28]

This measure utilizes the hardening and modernizing electric transmission and distribution facilities methods and information technology as identified in 16 TAC § 25.62(c)(1)(A) & (B). Programs that Oncor will deploy or expand in the Flexible and Self-Healing Distribution System measure include the following:

Program A – Expanded Distribution Automation Program

Activities – This program will enhance DA readiness by installing additional Automated Feeder Switches ("AFS") to feeders with existing DA to reduce customer outage duration and frequency for a single event, and optimize feeders with existing DA by upgrading conductors and adding additional feeder ties to improve DA availability. This program will also include the modernization of legacy relays to microprocessor units, and the connection and enablement of AFS and relays to leverage the digital grid, and replace legacy circuit breakers with modern magnetically actuated units.

Program B – Distribution Backstand Capacity Enhancement Program

Activities – This program will identify feeder ties where transfer capacity is limited by conductors and/or other upstream equipment and upgrade those elements to optimize the feeder transfer capacity. This program will also identify feeders that are loaded above

[28] After sectionalization and reconfiguration, the affected area is easier to trouble shoot, which decreases the overall duration of the outage.

their backstand rating and redistribute load to existing feeders with available capacity,[29] or to new feeders, providing load transfer flexibility during extreme weather events. Another activity will identify substations where the ability to enable automatic switching during extreme weather is limited[30] and upgrade or modernize transformers and substation designs to meet Oncor's current design standards.

Program C – Optimizing Lateral Capacity Program

Activities – This program will identify lateral lines[31] with loading constraints during extreme temperature events and upgrade conductor capacity and protective devices as necessary to reduce extreme weather-related outages. Oncor will identify lateral lines with a large customer count and longer than typical outage restoration times and add an alternate source in the form of a loop design or feeder ties to minimize outages from extreme weather.

Program D – Mobile Transformer Inventory Program

Activities – This program will procure additional mobile transformers for strategic deployment to minimize service interruptions by increasing the availability of units and decreasing the time needed to deploy units when catastrophic or significant damage has occurred.

[29] "Backstand rating" refers to the amount of load that a feeder may carry determined by thermal limits minus the capacity reserved to enable restoration of service to an adjacent feeder if the adjacent feeder experiences an outage event.

[30] For example, this might occur with substations that contain single transformer installations or transformers of different sizes or operating voltages, and substations with sub-standard contingency designs.

[31] A lateral is a feeder section that is not considered to be part of the mainline which means the feeder breaker is not the primary protective device. A lateral can be single phase or multi-phase and must have a protective device separating it from the mainline.

Table 6 below summarizes each program under the Flexible and Self-Healing Distribution System measure. The three-year scope and estimated spend levels are based on proposed Plan funding levels and resource constraints, as determined at the time of Plan filing.

Measure Program	Methodology	Activity Description	Plan Estimated Scope	Plan Estimated Spend
Program A: Expanded Distribution Automation Program	Harden T&D, Modernize T&D	Optimize DA to improve switching availability and review DA feasibility systemwide. Enable reliable utilization of DA capabilities through station equipment modernization.	100-200 feeders without DA or limited DA switching ability 300 electronic fuse locations 300 FCI locations Breakers - 400 Relay Panels (Switchgear) - 216 Relay Panels (Outdoor) - 210 RTU Replacements - 80 Communication Upgrades – 150	$293.4M
Program B: Distribution Backstand Capacity Enhancement Program	Harden T&D	Identify and upgrade feeders and substations with limited or insufficient backstand capacity; strategically deploy mobile transformers.	20-50 feeders 5-10 substations	$118.9M
Program C: Optimizing Lateral Capacity Program	Harden T&D	Improve lateral capacity to better withstand extreme temperature loading, add an alternate source to radial lines with high customer count and long restoration time.	262 miles of small conductor laterals 136 miles of high customer count radials	$67.9M
Program D: Mobile Transformer Inventory Program	Harden T&D, Modernize T&D	This program will procure additional mobile transformers for strategic deployment to minimize service interruptions.	6 mobile transformers	$30.0M
			Total	**$510M**

Table 6: Flexible and Self-Healing Distribution System Measure Summary

3. Measure Description

Outlined below are descriptions of the activities, actions, standards, services, procedures, practices, structures, or equipment associated with each program under this measure:

Program A – Expanded Distribution Automation Program

Expanded DA is designed to mitigate outage risk during forced outages caused by extreme weather by automatically isolating faulted segments and re-energizing un-faulted segments from different sources. This program will (1) enhance DA readiness, and (2) increase station automation readiness.

Oncor's current DA philosophy is designed to mitigate risk associated with outages across the distribution system by: (1) facilitating automatic service restoration to the un-faulted sections of feeders; (2) enabling remote switching capability to select three-phase reclosers and DA switches; (3) reducing the number of outages resulting from temporary faults through the use of electronic reclosers; and (4) enabling faster fault locating and repairing/restoration through the use of fault current indicators ("FCI").

Oncor's current standards for DA design consists of:

- Establishing switch-and-a-half automation schemes between any two feeders where adding DA is feasible. In this context, a switch is added at the approximate mid-point of each feeder (by customer count) and another switch is added at the normally-open point between the two feeders.
- Replacing non-reclosing, single-phase devices on selected lateral lines with cutout mounted electronic reclosers.
- Installing FCIs on underground lines at equipment.

[redacted]

Activity 1 – Enhance DA Readiness

Under this Plan, Oncor will (1) expand the current DA approach to feeders without automation where DA is a feasible solution with the implementation of other resiliency measures; and (2) review feeders with existing DA to further optimize availability by (a) installing additional DA switches to reduce the number of customers within each automated feeder section that has a significant number of customers at risk of interruption, (b) mitigating constraints related to conductor capacity and insufficient feeder ties by upsizing conductors and establishing high-capacity feeder ties, and (c) increasing substation DA capacity and readiness, as described below. [redacted]

Similarly, Oncor will review existing feeders and expand its current approach for installing electronic reclosers on laterals at the first location off the mainline and FCIs on underground lines at strategic switchgear and transformer locations.

Additional electronic reclosers may be installed as part of the Oncor Wildfire Mitigation measure as outlined in the description of that measure. The installation of those devices will be in addition to any devices installed as part of this measure but there may be mutual benefits between the two programs. Any Automated Feeder Switches incorporated in the Distribution Automation Program may also provide similar support to the Wildfire Mitigation measure and additionally, there may be Automated Feeder Switches installed in the Wildfire Mitigation measure outside of what is outlined in this measure.

Activity 2 – Station Automation Readiness

This activity is focused on continuing to enable reliable DA capabilities at Oncor's load-serving substations. The specific scope of this program will vary between sites, but generally includes replacing legacy equipment with modern equipment that enables distribution system automation and provides enhanced resiliency during extreme weather. Legacy equipment utilizes antiquated technologies that are incompatible with modern requirements needed to enable DA.

Legacy protective relays within the substation will be replaced with modern microprocessor-based units. These devices are responsible for identifying abnormal system conditions, such as a line fault caused by a broken conductor, and directing isolating devices (e.g., circuit breakers) to quickly de-energize this asset.

These modern protective devices are necessary to coordinate sectionalizing with downstream equipment; older technology such as the electromechanical relay cannot facilitate this type of coordination and will require replacement. Additionally, microprocessor-based relays are an important wildfire mitigation tool, as fault conditions can be accurately and quickly detected, thereby facilitating remote adjustments of relay settings as appropriate in response to local conditions.

Communication equipment is installed at substations to enable and connect distribution devices to the digital grid to support local interactions and coordination at the substation. Including installation of upgraded Remote Terminal Units ("RTUs") to enable the sectionalizing devices installed on a downstream distribution line, and the near real-time remote interactions and coordination with the Operations centers.

Legacy medium voltage circuit breakers within the substation, including feeder breakers that protect downstream distribution lines and tie breakers that are intended to minimize the duration of customer outages, will be replaced with modern vacuum breakers.[32] These new breakers are magnetically actuated and contain very few moving parts compared to legacy designs, minimizing opportunities for mis-operation.

[32] Reference Appendix E for technical details on magnetically actuated breakers.

Historical experience gained during the 2011 load-shed event and 2021 Winter Storm Uri, which included more than 1,000 and 1,600 feeder breaker operations to reduce System load, respectively, provide additional evidence that magnetically actuated breakers are significantly more reliable during extended periods of cold weather.

Reliable operation of this equipment is critical to ensure customers realize the full benefits of DA capabilities; a feeder breaker that fails to reclose after a fault has cleared, or a tie breaker that fails to transfer load to an adjacent transformer, would negatively impact all downstream distribution customers and increase outage duration.

Program B – Distribution Backstand Capacity Enhancement Program

The distribution backstand capacity enhancement program is designed to mitigate risk associated with extreme weather events, including extreme temperatures, high wind, and ice storm events across the System. The program will accomplish this by: (1) adding feeder ties that help restore service to unfaulted sections of the feeder that are experiencing an outage; (2) Adding substations transformers to existing substations or establishing new substations, when appropriate, that help restore service when another substation transformer fails; and (3) strategically deploying mobile transformers across Oncor's service territory to help restore service in situations where substation transformers are unavailable.

Activity 1 – Enhanced Feeder Backstand Capacity

Oncor's current design standard for feeder backstand is reliant on having ties to adjacent feeders at various locations, which allows for load transfer between feeders during contingency situations, such as extreme weather events. Ties between feeders are established organically as more customers are added to the feeders and distribution lines are extended towards neighboring facilities.

Oncor will review existing feeder ties where the conductor or other upline equipment is undersized for the amount of load that needs to be transferred during contingency conditions, and make upgrades to those facilities to maximize their load-carrying capability.

Oncor will also review feeders where the feeder backstand rating is exceeded by the feeder's peak load and will transfer some of the load to adjacent feeders with available capacity or establish new feeders / substations as necessary.

Activity 2 – Substation Backstand Capacity

Oncor's current standard for substation backstand is based on a design that allows for automatic service restoration via ties when another transformer fails. Restoration is generally accomplished through ties within the substation.

Oncor will expand the current approach to all existing substations built prior to the current standard and to substations where loading on the surviving transformer(s) exceeds their respective backstand ratings. This includes (1) substations with only one transformer; (2) substations where one transformer is smaller than the rest; (3) substations where one transformer has a different operating voltage than the rest; (4) substations without automatic restoration capability inside the substations; and (5) substations with transformer(s) that have insufficient available capacity for contingency situations. In each case, the current equipment requires modernization for the substation equipment to be able to transfer load in the event of outages caused by extreme weather.

Program C – Optimize Lateral Capacity Program

Optimizing Oncor's lateral capacity will mitigate risks associated with extreme weather events, including extreme temperatures, high wind, and ice storm events, across the System. High winds and ice cause mechanical failures on facilities. This program will enable Oncor to restore service to healthy parts of the distribution system by increasing electrical carrying capacity of lateral feeder ties.

Activity 1 – Lateral Review and Hardening

Oncor will review and harden the distribution system by: (1) upgrading small conductors on laterals to improve capacity and reduce the impact of extreme loading due to extreme temperatures; (2) adding an alternate source via loop design or new feeder ties to feeder sections with a significant number of customers at risk of longer-than-typical outage restoration times; and (3) relocating lines that may have accessibility issues during extreme weather. Prolonged extreme temperature events lead to excessive power flow through power lines and equipment, often causing them to exceed their design criteria and capability.

Program D – Mobile Transformer Inventory Program

The mobile transformer inventory program is designed to mitigate risk associated with extreme weather events by expanding the Company's mobile transformer fleet. Oncor's existing fleet of mobile transformers is used across the service territory to facilitate new substation construction, maintenance of existing substation equipment, and as part of emergency restoration efforts due to extreme weather and equipment failure.

Oncor operates a fleet of mobile transformers that are typically staged at 15 locations across Oncor's distribution service territory. This staging is based on the number of transformers in each area, transformer voltage and loading needs, and the amount of construction on Oncor's capital projects in each area. As a result of robust and sustained load growth, a majority of existing units are leveraged to support capital construction projects. During these construction projects, mobile transformer availability is reduced in certain areas of Oncor's service territory.

Additional inventory will ensure that a mobile transformer is staged strategically near a local Transmission Operations Work Center, even when a locally based mobile transformer is already in use supporting capital construction or planned maintenance.

Activity 1 – Mobile Transformer Procurement

Oncor plans to procure additional mobile transformers from 2025 through 2027 to reduce transportation logistics of mobile transformers for distribution customer outages that require a mobile transformer to restore service.

Additional mobile transformers will be placed into inventory and strategically staged across Oncor's service territory to ensure this equipment can be quickly deployed to restore electric service that is disrupted due to extreme weather.

Reference Appendix E for the complete analysis and construction standards of programs included in the Flexible and Self-Healing Distribution System measure.

4. Measure Implementation

Prioritization of Event and Measure

Oncor identified the resiliency event for mitigation based on (a) the event's impact on public safety, and (b) the actual and potential impacts of extreme weather events on Oncor's assets that pose a material risk to the safe and reliable operation of the System. Implementation of the measure is based on prioritization to address the highest risk locations, underperforming areas and more. Reference Section VII of this Plan for details of the systematic implementation approach.

Evidence of Effectiveness

Implementation of this measure mitigates risks posed by the resiliency risk of extreme weather events. The activities proposed are consistent with industry practices to mitigate such risks. Oncor has engaged 1898, an independent entity with relevant expertise, to ensure measures proposed are effective in preventing, withstanding, mitigating, or more promptly recovering from the risks posed by extreme weather events. Reference Section VI of this Plan for details on the effectiveness of this measure.

Expected Benefits

The expected benefits of this measure are the mitigation of risk associated with extreme weather events and the mitigation of the impacts of extreme weather events on Oncor assets that pose a material risk to the safe and reliable operation of the System. The mitigation of risk will help to reduce the chance of an outage occurring, and when an outage does occur, minimize the impact of the outage and reduce restoration times. Reference Section VI of this Plan for details on the expected benefits.

Government Program Coordination

Not applicable.

Measure Alternatives

The alternatives evaluated for this measure were: (1) the procurement and additional deployment of mobile generation and mobile transformers; (2) standard facility repairs; and (3) establishing new facilities (e.g., substations, feeders).

Mobile generation and mobile transformers are limited by their availability during extreme weather events. Procuring mobile generation and mobile transformers to provide a comparable benefit to the above programs do not provide a cost-effective benefit. Mobile transformers do provide benefits as outlined in program D but are not a cost-effective alternative to programs A through C.

Standard facility repairs maintain Oncor current standard operating practices and have a minimal benefit to overall System resiliency. They have reliability improvements for the immediate repair area but may not improve the overall feeder resiliency because not all potential facilities are improved. There may be an upfront cost reduction, however, in some instances repairs can be just as costly as upgrading equipment and do not have a long-term impact compared to the proposed programs described above.

Establishing new facilities (e.g., substations, feeders) may provide additional capacity amongst Oncor's distribution system in the direct area of the new facilities, but may not address areas as effectively and holistically as the programs described above.

Transmission System Outage Requirement

Implementation of a majority of the programs in this measure do not require an outage of the transmission system. There could be scenarios in which a specific activity may require a transmission outage, but they are not expected to be frequent or extended. Any required outages would be coordinated with ERCOT.

5. Evaluation Metric and Criteria

The metrics used to evaluate effectiveness of this measure include improvement of the distribution system performance over time, comparison of local area performance before and after measure implementation, and reduction in customer vulnerability to the risks caused by the associated resiliency events. Reference Section V of this Plan for details on the evaluation metrics.

6. Measure Comparison to Existing Programs

Programs in this measure are similar to the existing Oncor feeder design philosophy for new and upgraded facilities. This measure expands existing activities to address additional legacy equipment and includes new activities to further mitigate risks associated with the identified resiliency event(s).

Program A – Expanded Distribution Automation Program: Oncor does not currently have a program in place to retrofit distribution facilities with new or upgraded DA equipment/capabilities that have not been addressed in Oncor's standard DA philosophy. The resilient DA philosophy will allow customers on feeders not meeting the current criteria[33] needed to install DA, to enjoy the benefits of DA, including improved restoration times and lower likelihood of an outage during extreme conditions. [redacted] Reducing the number of customers within each protection zone may reduce the impact of outages.

Program B – Distribution Backstand Capacity Enhancement Program: Oncor does not currently have a dedicated program in place to increase feeder or station capacity specifically to address backstand capabilities. Capacity upgrades that result in backstand improvements are currently driven by limitations based on maximum continuous ratings or an aggregated number of issues rather than based independently on backstand capability.

Program C – Optimizing Lateral Capacity Program: Oncor currently allows feeder ties to develop organically. Under this program, Oncor will establish ties at strategic locations to maximize the benefit of backstand and minimize the number of customers at risk of a single outage event. Similar to program B, lateral capacity is evaluated based on maximum continuous ratings at normal temperatures, whereas this program will evaluate lateral capacity at extreme temperatures.

Program D – Mobile Transformer Inventory Program: This program will expand, and strategically deploy, mobile transformers to ensure availability for emergency restoration purposes when locally based mobile transformers are not available due to ongoing capital construction projects and planned maintenance.

[33] Existing feeder ties capable of supporting 75% of peak load on 1.5 switch scheme.

D. Vegetation Management Plus Measure

1. Risk Posed by Resiliency Events

The VM+ measure is designed to improve the distribution system resiliency and mitigate risks posed by extreme weather events, including high wind and winter/ice storms. These events can cause conductors to come in contact with encroaching vegetation and result in an outage. Wildfire is another resiliency event that the measure helps to mitigate. Reference Section III of this Plan for resiliency event descriptions.

2. Measure Methodology

This measure includes two programs to increase the resiliency of Oncor's overhead system with VM and information technology solutions to better withstand extreme weather events and vegetation-related outages.

This measure utilizes the VM and Information Technology methods as identified in 16 TAC § 25.62(c)(1)(F) & (I). VM+ is an enhanced and more resiliency-focused version of Oncor's current program that addresses VM needs on laterals across the entire distribution system. Oncor will maintain vegetation on a risk-based dynamic cycle and establish advanced analytics to further harden the distribution system from extreme weather events. Due to many factors, proactive VM is far more cost efficient than reactive VM.[34] Programs Oncor will deploy in this measure include the following:

Program A – Comprehensive VM Program

Activities – This program will perform enhanced and expanded VM activities on laterals of feeders across the distribution system.

Program B – Remote Sensing Program

Activities – This program leverages remote sensing technology such as LiDAR, aerial imagery, and satellite imagery to identify, characterize, and mitigate areas of vulnerability with increased efficiency. This program also includes implementation of a program management system to support increased levels of VM activity, process the information from remote sensing data, track progress, and report on Plan execution.

Table 7 below summarizes each program under the VM+ measure. The three-year scope and estimated spend levels are based on proposed Plan funding levels and resource constraints, as determined at the time of Plan filing.

[34] Reference Appendix F for details on why proactive VM is more cost efficient than reactive VM.

Measure Program	Methodology	Activity Description	Plan Estimated Scope	Plan Estimated Spend
Program A: Comprehensive Vegetation Management Program	Vegetation Management	Performing vegetation management work on laterals across the distribution system based on a location specific, risk-based dynamic cycle.	21,094 miles	$270.0M
Program B: Remote Sensing Program	Information Technology	Leveraging remote sensing technology such as LiDAR and Satellite imagery to identify, characterize and mitigate areas of vulnerability with an increased level of efficiency. Implement a program management system to support an increased level of vegetation management activity, process the information from remote sensing data, track progress and report on Plan execution.	3 LiDAR data Captures (15,000 miles) 3 Satellite data captures (90,000 miles) 1,500 miles of partial discharge detection 1,500 miles of UAS inspections 1 Program Management System	$15.0M
			Total	**$285M**

Table 7: VM+ Measure Summary

3. Measure Description

Outlined below are descriptions of the activity scope, activities, standards, services, procedures, practices, structures, or equipment associated with each program under this measure.

Program A – Comprehensive VM Program

Oncor has an existing VM program that maintains vegetation clearances in accordance to industry regulations and safety rules.[35] The existing program maintains the clearances and reduces the impact of vegetation outages on the distribution system through the following three activities: (1) line clearance pruning, (2) herbicide application, and (3) hazard tree removal. These activities largely maintain the mainline of the feeder that is protected by the feeder breaker, but also includes limited laterals on an as needed basis. The existing program is designed to optimize reliable energy delivery, prevent damage to Company equipment, and avoid access impairment for the safety of Company employees and contractors.

The comprehensive VM program is an expansion of the line clearance pruning of the existing VM program. It is designed to mitigate risks associated with extreme weather events, including extreme wind and winter/ice storm events. Extreme winds and ice accumulation can cause conductors to swing and tree limbs to sway, sag, and break.

[35] Reference Appendix F for a detailed list of regulations and safety rules.

These conditions increase the risk of electrical contact with encroaching or broken branches resulting in an outage. This program makes the distribution system more resilient by targeting vegetation encroachments on laterals that have not been programmatically maintained. Oncor anticipates laterals programmatically maintained under this program will experience less interruptions due to vegetation during extreme weather events. Additionally, implementation of this measure in wildfire prone areas, reduces the potential for wildfire ignitions due to reduced likelihood of trees making contact with energized conductors that could be a potential ignition source.

Activity 1 – Comprehensive Lateral Vegetation Management Program

Oncor aims to utilize the latest technology and work practices to perform VM work. Oncor's current VM program is reliability focused and targets areas with greatest customer impact and underperforming areas as required by 16 TAC § 25.96(e)(6).[36] The comprehensive VM Program will maintain vegetation clearances on all laterals by performing line clearance pruning. This program will prioritize high-impact laterals, but all applicable laterals will be maintained in addition to line miles already maintained by the existing VM program.[37]

High-impact laterals are critical areas where there is a significant consequence of failure due to high customer count, history of underperformance or wildfire ignition risk. High-impact laterals are further defined as the following:

- A high-impact feeder lateral is a lateral that has a significant downline customer count. An outage on this section of a feeder impacts a large portion of customers on the feeder.[38]
- Underperforming areas are served by select mainlines and lateral segments of distribution feeders, where the reliability or customer experience can use improvement. For the Plan, this will consist of feeders that are multi-year violation feeders as defined in 16 TAC § 25.52 and feeders with customers who have experienced multiple outages over multiple years.
- Laterals that are identified within Oncor's WMZs.[39]

The comprehensive VM program, in addition to the existing program, addresses the needs across the entire distribution system on a preferred dynamic cycle, as informed by enhanced condition assessment practices.[40] These practices include vegetation-caused

[36] Oncor's existing VM program fully maintains all mainline circuit miles and select laterals for the greatest reliability impact.

[37] A subset of laterals are expected to not be applicable to this program due to no vegetation being present.

[38] Reference Appendix E for the definition of a lateral.

[39] Reference Section IV(E)(3) for the Wildfire Mitigation measure and WMZ details.

[40] Oncor currently utilizes a varying prune cycle for sub-operational areas of the distribution system based on previous growth studies. This practice will become dynamic with the utilization of remote sensing data to defer areas with low growth and prune other areas sooner with higher growth and risk of outages.

outage analysis, along with remotely sensed data, leveraged to identify trends and establish dynamic cycles. Annual plans will be prioritized to maximize resiliency impact, customer impact and reliability through the previously mentioned high-impact laterals.[41]

The current VM program provides for line clearance pruning activities of roughly 3,100 miles of distribution primary circuits per year, or roughly 9,300 miles over a three-year period. The Plan will expand the current VM program to include line clearance pruning of an additional estimated 21,000 miles of feeder laterals over three years.

Addressing VM encroachments across the distribution system mitigates the risk of vegetation-related outages from extreme weather events and will facilitate better access to repair facilities when outages occur. Where feasible, removing hazard trees along the rights-of-way significantly reduces the impact of VM caused electrical and mechanical failures. Hazard trees pose a fall in risk and are currently addressed in the existing VM program. The Plan will not directly affect the number of hazard trees Oncor addresses each year, but the remote sensing program will provide tree health data to better inform the existing program.

Program B – Remote Sensing Program

The remote sensing program is designed to mitigate the risk of tree-caused outages associated with extreme weather events, like extreme wind and winter/ice storms, by enhancing the VM program's awareness, efficiency and impact. It also facilitates the technological use of remote sensing data to assess assets in high impact areas, underperforming areas and support other measures like the Wildfire Mitigation measure. This program consists of (1) the capture, storage, and utilization of remote sensing data, and (2) the establishment of a program management system to enable effective information integration, program execution and reporting.

Activity 1 – Data Acquisition and Analytics

The Remote Sensing and Program Management System implements the use of technology such as LiDAR and satellite imagery analytics to identify, characterize, and inform the VM program to support mitigation of vulnerability across the distribution system. The remote sensing aspect of the program will be used in the planning phase for the comprehensive and existing VM program. The additional data will be critical to enable a dynamic VM program that optimizes the reliability and resiliency impact of the VM activities. With the LiDAR and satellite data, Oncor will be able to address emergent issues, defer areas of slow growth, identify trees of concern, thereby optimizing the VM

[41] Reference Appendix G for additional prioritization factors.

program.[42] Additional benefits of a remote sensing program include optimized bid packages and post work validation.[43]

In addition to the LiDAR and satellite acquisitions for VM purposes, Oncor will utilize remote sensing data for areas such as high-impact and underperforming areas by utilizing aerial imagery from unmanned aircraft system ("UAS") and partial discharge detection. Partial discharge detection will provide information useful to the Overhead System Resiliency & Modernization measure and the Wildfire Mitigation measure regarding equipment with an elevated risk of failure.

Activity 2 – Program Management System

The program management system uses technology to better leverage remote sensing data and to manage VM work more efficiently across the distribution system. This program will visualize the vegetation risk in the field on a digital map of the distribution system. These maps will then be used in bid package documents, and Oncor anticipates the additional data will make bids more competitive due to a uniform understanding of vegetation conditions across projects as well as aide contractors in reducing the time and effort associated with bidding each project. In addition to improved bids, Oncor anticipates that the additional data will foster better resource allocation across the distribution system.

As noted above, the Plan will increase three-year planned VM work from roughly 9,300 miles to include an approximate 21,000 miles of additional laterals to mitigate the risks posed by the associated resiliency events. The Plan's substantially increased scope for the comprehensive VM program poses logistical challenges to Oncor's existing processes to plan, bid, and implement work. A program management system will be essential to enable effective information integration, program execution, and reporting.

Please see Appendix G for a complete analysis and overview of programs included in the VM+ measure.

4. Measure Implementation

Prioritization of Event and Measure

The resiliency event has been identified for mitigation because it poses a material risk to the safe and reliable operation of Oncor's overhead system. Implementation of the measure is based on prioritization to address the highest impact areas. Reference Section VII of this Plan for details of the systematic implementation approach.

[42] A tree of concern is a tree that is unhealthy and with the potential risk of falling into a line.

[43] A bid package is a set of project documents with identified areas and scopes of work that are compiled and presented to VM contractors during the bidding phase of a project.

Evidence of Effectiveness

Implementation of this measure mitigates the resiliency risks posed by vegetation in close proximity to Oncor's facilities. The activities proposed in the Plan are consistent with industry practices to mitigate such risks. Oncor utilizes line clearance companies, herbicide applicators, contract foresters, and contract field auditors to perform and monitor vegetation work. Oncor's VM contractors follow applicable parts of ANSI A300 Standard Practices while performing work around Company facilities. Oncor's VM contractors follow ANSI Z133 Safety Requirements for Arboricultural Operations. Oncor has engaged 1898, an independent entity with relevant expertise, to ensure measures proposed are effective in preventing, withstanding, mitigating, or more promptly recovering from the risks posed by the extreme weather resiliency event. Reference Section VI of this Plan for details on the effectiveness of this measure.

Expected Benefits

The VM+ measure will mitigate the resiliency risks caused by vegetation during extreme weather events. In addition to reducing vegetation-related power outages, this measure improves access to facilities, and increases the number of Oncor-contracted VM and construction crews on the distribution system, positively impacting restoration efforts. Additional benefits include the mitigation of wildfire ignition risks caused by vegetation contact in areas with elevated wildfire risk. Reference Section VI of this Plan for details on the expected benefits of this measure.

Government Program Coordination

Not applicable.

Measure Alternatives

Alternatives considered for this measure include: (1) undergrounding of facilities identified to have a high risk of vegetation-related impacts; and (2) a time-based approach whereby vegetation is addressed on a set schedule.

Undergrounding of existing facilities would mitigate risks of extreme weather events, such as extreme winds and winter/ice storms; however, universally implementing this alternative across the entire overhead distribution system is cost prohibitive, and the cost would vastly exceed the anticipated benefits.

Oncor also considered a time-based approach where vegetation is addressed on a set schedule across the distribution system. This alternative was deemed to be inefficient compared to the program proposed in this measure. A risk-based approach, informed by remote sensing data, prioritizes areas of interest based on risk level and results in a higher customer benefit in excess of cost of implementation. Reference Appendix K of this Plan for 1898's report and additional details on alternatives.

Transmission System Outage Requirement

Implementation of the programs in this measure do not require an outage of the transmission system. There could be scenarios where a specific activity may require a transmission outage, but they are not expected to be frequent or extended. Any required outages would be coordinated with ERCOT.

5. Evaluation Metric and Criteria

The metrics used to evaluate effectiveness of this measure include improvement of distribution system performance over time, comparison of local area performance before and after measure implementation and reduction in customer vulnerability to the risks caused by the associated resiliency events. Reference Section V of this Plan for details on the evaluation metrics.

6. Measure Comparison to Existing Programs

Program A – Comprehensive VM Program: This program is similar to the existing VM program and makes the program more resilient. The existing program performs VM on mainline and select laterals to include line clearance pruning, herbicide application, and hazard tree mitigation. The comprehensive VM program will prune laterals to the same standard as the existing program but will expand that coverage to the vast majority of its laterals. For further details on the existing VM program, please see Oncor's filing with the Commission pursuant to 16 TAC § 25.96.

Program B – Remote Sensing Program: Oncor does not currently have a remote sensing program or a program management system to the support activities on the distribution system. Oncor does acquire LiDAR annually on the transmission system for vegetation and line clearance purposes, but does not currently acquire this data or satellite data for the distribution system. The Company does capture limited UAS imagery but not programmatically.

E. Wildfire Mitigation Measure

1. Risks Posed by Resiliency Events

This measure mitigates risks posed by wildfires.[44] Programs in this measure support the mitigation of risks related to wildfire ignition and the protection of Oncor's facilities during a wildfire event. Reference Section III of this Plan for resiliency event descriptions.

2. Measure Methodology

This measure includes five new or expanded programs that will enhance Oncor's ability to better assess risk across the distribution system, mitigate ignition risk, and protect Oncor's assets from active wildfire events. Collectively, the programs under this measure increase the ability for Oncor to mitigate risks posed by wildfires.

This measure utilizes the Wildfire Mitigation and the Information Technology methods, as identified in 16 TAC § 25.62(c)(1)(F) & (J). Programs in the other measures also have a positive impact on wildfire mitigation and utilize additional methods. See Measures in Sections IV.A, C, and D in this Plan for details. Programs that Oncor will deploy or expand in the Wildfire Mitigation measure include the following:

Program A: Wildfire Risk Model Enhancement

Activities – Leverage publicly and commercially available datasets to increase recency and granularity of landscape/population fire risk modeling; conduct fire-spread modeling with Oncor's assets as potential ignition points for numerous weather and environmental conditions to better establish risk levels and classify areas based on wildfire probability; develop additional capabilities including an asset and wildlife-caused ignition fire risk model to further enhance risk assessment; and prioritize and implement mitigation activities.

Program B: Situational Awareness

Activities – Enhance situational awareness resources and capabilities to monitor and forecast real-time fire danger, distribution system conditions, and vulnerabilities to adjust distribution system operations and field activities in accordance with escalating fire danger to minimize ignition risk and respond to and recover from a wildfire event.

Program C: Asset Protection

Activities – Enhance the distributions system's ability to withstand wildfire incidents by wrapping wood poles with fire retardant material, establishing defensible space around

[44] Programs in other measures, such as the Overhead Resiliency & Modernization measure, the Flexible and Self-Healing Distribution System measure, and the Vegetation Management Plus measure also have a positive impact in mitigating wildfire ignition risk.

critical facilities such as substations and telecommunication towers, and rebuilding wood-structure substations with current standard steel structures.

Program D – Ignition Mitigation

Activities – Install remote operable switches with the ability to use low-energy switching and disable automatic re-energization of faulted circuits during elevated risk conditions to mitigate ignition risk; replace lightning arresters and fuses with non-expulsion equivalent; install animal guards at equipment and congested poles to limit powerline contact from animals leading to an ignition; clear to bare ground around equipment poles where elevated ignition risk is deemed to be present; and perform periodic enhanced inspections, including inspections of asset and vegetation conditions by leveraging technologies such as LiDAR, infrared thermography, and aerial imagery.

Table 8 below summarizes each program under the Wildfire Mitigation measure. The three-year scope and estimated spend levels are based on proposed Plan funding levels and resource constraints as determined at the time of Plan filing.

Measure Program	Methodology	Activity Description	Plan Estimated Scope	Plan Estimated Spend
Program A: Wildfire Risk Model Enhancement	Wildfire Mitigation Response, Information Technology	Leverage publicly and commercially available datasets to increase recency and granularity of model; conduct fire-spread modeling with Oncor assets as ignition points for numerous weather and environmental conditions to better establish risk levels; develop an asset and avian/wildlife-caused ignition risk model.	1 GIS-based Landscape / Population / Asset Wildfire Risk Model 1 GIS-based Avian/Wildlife-Caused Ignition Risk Model	$7.3M
Program B: Situational Awareness	Wildfire Mitigation Response, Information Technology	Enhance situational awareness resources and capabilities to monitor fire danger, distribution system conditions, and vulnerabilities and adjust distribution system operations and field activities in accordance with escalating fire danger to minimize ignition risk and respond to and recover from a wildfire event.	1 system to monitor wildfire danger, establish operating conditions, alert/communicate danger levels to operations, implement work mitigations / restrictions, dispatch resources, and related verifications.	$9.4M
Program C: Asset Protection	Wildfire Mitigation Response	Enhance ability to withstand wildfire incidents by wrapping wood poles with fire retardant material; establish defensible space around critical facilities such as substations and telecommunication towers;	17,574 Pole wraps 45 Substations/21 Telecom Towers/1,330	$65.7M

Measure Program	Methodology	Activity Description	Plan Estimated Scope	Plan Estimated Spend
		rebuild wood structure substations with current standard steel structures.	Critical Poles defensible spaces 12 Wood substation rebuilds	
Program D: Ignition Mitigation	Wildfire Mitigation Response	Install remote operable switches with the ability to disable automatic re-energization of faulted circuits during elevated risk conditions to mitigate ignition risk; replace lightning arresters and fuses with non-expulsion equivalents; install wildlife guards at equipment and congested poles to limit powerline contact from wildlife leading to an ignition; and clear to bare ground around equipment poles to mitigate. Perform periodic enhanced inspections including asset and vegetation conditions leveraging technologies such as LiDAR, and aerial imagery.	413 Remote operable switches 15,731 Expulsion lightning arresters & fuse replacements 2,005 Equipment pole clearing 8,137 Wildlife guard locations 13,650 inspection miles	$99.5M
			Total	**$182M**

Table 8: Wildfire Mitigation Measure Summary

3. Measure Description

Outlined below are descriptions of the activity scope, activities, standards, services, procedures, practices, structures, or equipment associated with each program under this measure:

Program A – Wildfire Risk Model Enhancement Program

The wildfire risk model enhancement program is designed to add capabilities that will better inform Oncor's risk mitigation efforts. Under the current Oncor Wildfire Mitigation Plan, Oncor currently has a proactive wildfire mitigation strategy in place with focused initiatives in areas such as asset management, operational protocols, VM, system protection technology, and stakeholder engagement.[45] The foundation of the Oncor Wildfire Mitigation Plan is a risk modeling tool developed in an internal Geographical Information System ("GIS") platform. The risk modeling tool utilizes publicly available datasets coupled with information on Oncor's asset locations to assess risks across

[45] Reference Appendix G for the current Oncor Wildfire Mitigation Guidelines.

Oncor's service territory. Landscape and population wildfire risk factors such as burn probability, wildfire intensity scale, community protection zones, and current fire weather conditions are analyzed to inform long-term initiatives by establishing WMZs and real-time operational protocols.

Activity 1 – Wildfire Risk Modeling

The risk modeling program enhances Oncor's existing modeling capabilities to better identify areas with elevated risk and support prioritization of mitigation efforts. This includes partnering with external entities with relevant expertise to advance and utilize the risk modeling tool. Additional capabilities include access to more granular weather forecasting, paired with an asset-specific ignition risk model, to provide a more accurate risk assessment. This will help prioritize and operationalize wildfire mitigation and protection mitigations.

There are two broad foci for utility wildfire risk modeling: (1) ignition mitigation; and (2) asset protection. In the case of an ignition mitigation model, the goal is to estimate the risk to human life, property, and natural resources due to ignitions caused by a utility's facilities. Thus, the focus is on prioritization for ignition risk mitigation. In the case of an asset protection model, the goal is to estimate the risk to the utility's facilities due to ignitions caused by any source. Thus, the focus is on prioritization for facility defense. These models require the evaluation of several risk factors such as landscape wildfire hazard, vulnerable population/resource data, and risk associated with utility facilities. This program will employ both modeling approaches to inform activities related to ignition mitigation and asset protection.

Wildlife contacting overhead powerlines and substation equipment is a leading outage cause. Each wildlife-caused outage is a thermal event and represents a potential ignition source. To further enhance its risk modeling, Oncor will develop a GIS-based wildlife electrocution/fire risk model and perform an avian/wildlife caused ignition risk assessment to identify and prioritize facilities for wildlife-caused ignition mitigation work. Such mitigation work will provide the added benefit of enhancing System reliability.

Program B: Situational Awareness Program

The situational awareness program is designed to enhance Oncor's access to critical forecasted and near-real-time information to mitigate risks associated with and response to wildfires.

Activity 1 – Near real-time risk modeling and monitoring

This activity enhances Oncor's capabilities in various areas, including forecasting the likelihood of wildfire weather and incidents, understanding local weather patterns, monitoring fire danger and identifying at-risk landscape, populated areas and resources. Additional risk factors for monitoring include critical customers and assets, infrastructure

conditions and vulnerabilities, and the quantity and locations of trees of concern. Collectively, this information will help Oncor mitigate, withstand, and recover from a wildfire event. In addition, Oncor will be able to monitor escalating fire weather conditions and adjust distribution system operations and field activities in accordance with fire danger to minimize ignitions potentially caused by Oncor activities. It will also enable Oncor to dispatch alerted internal resources accordingly to more effectively respond to and recover from escalating wildfire danger conditions and/or a wildfire resiliency event.

Program C – Asset Protection Program

The asset protection program is designed to mitigate ignition risks associated with utility facilities and protect Oncor's assets during active wildfire events regardless of cause. This program has three main components: (1) pole wrapping; (2) creating defensible space; and (3) wood station hardening.

Activity 1 – Pole Wrapping

To protect wood poles from wildfire incidents, this program installs fire retardant wraps around poles located in elevated wildfire probability and fire intensity areas.[46]

Activity 2 – Defensible Space

The program also establishes defensible space around substations and communication towers to protect them from wildfires. Additionally, defensible space is established around poles identified as critical by the Overhead Resiliency & Modernization measure. This activity is prioritized to address facilities in the areas with the highest fire danger and heightened customer impact, which will be determined by using the enhanced risk modeling capabilities developed in Program A of this measure.

Activity 3 – Wood Station Hardening

Many of the earliest substations were constructed around wood box structures. In these stations, the wood structures typically support a combination of switches, insulators, and overhead conductors that serve as the station bus. Other large equipment, such as circuit breakers, power transformers, and voltage regulators, are often installed directly beneath or adjacent to this box structure.

While many of these stations have reliably served customers for several decades, these facilities are faced with a unique wildfire and lightning risk due to the potential for a complete catastrophic loss of station capability in the event of a fire. In such cases, customers served by such a substation will experience a lengthy outage period, as restoration will require a full rebuild of the station. To mitigate the risk associated with this design, wood stations that operate in areas of historically elevated wildfire risk will be targeted for replacement with a modern steel design.

[46] Reference Appendix G for pole wrap technical details.

Program D – Ignition Mitigation Program

The ignition mitigation program is designed to mitigate the risk of ignitions and wildfires caused by distribution system equipment. This program has five main components: (1) low-energy switching; (2) expulsion device modernization; (3) pole clearing; (4) wildlife guards; and (5) enhanced inspections.

Activity 1 – Low-Energy Switching

The ignition mitigation program installs new equipment and replaces elevated-risk equipment to mitigate wildfire ignition risk. Equipment installations include the placement of an AFS across the three-phase section of feeders in WMZs. These devices have the capability to use a low-energy pulse to verify a fault has cleared before re-energizing a faulted circuit. In addition, an AFS allows System operators to remotely engage a fire-safe protection setting during high-risk conditions.

Substation relays and communication equipment will also be modernized as part of this program to facilitate remote adjustments of relay settings as appropriate in response to local environmental conditions.

Activity 2 – Expulsion Device Modernization

This program also replaces expulsion fuses with fire-safe, non-expulsion fuses or cutout mounted electronic reclosers to mitigate the risk of wildfire ignition during an operation. Lightning arresters are also replaced in WMZs with a non-expulsion equivalent.

Activity 3 – Pole Clearing

Vegetation clearing to remove groundline fuels is conducted within a 10-foot radius of equipment poles within the WMZs. Vegetation clearing reduces risk of ignition from an overhead equipment operation. This is different from typical VM activities, which focus on pruning vegetation away from powerlines to avoid contact. To reduce cost and ensure long-term sustainability of this activity, implementation considerations include the use of herbicide application along with manual clearing of the target locations.

Activity 4 – Wildlife Guards

Based on the results from the wildfire risk activity in Program A, pole configurations that exhibit high wildlife outage risk and are in fire-prone areas will be prioritized for further field investigation and potential retrofitting and mitigation to reduce overall ignition risk. For example, a wildlife guard will be installed at equipment poles and other locations identified as having elevated risk for wildlife contact that may lead to an ignition.

Activity 5 – Enhanced Inspection

The enhanced inspection activity is designed to mitigate the risks of wildfire by identifying assets exhibiting signs of degradation and other risk conditions such as vegetation encroachment. The inspection activity assesses risk across feeders in the WMZs or other fire-prone areas to mitigate potential equipment or facility-caused ignition risks. Enhanced inspection techniques include visual observation, partial discharge detection to pin-point pre-failure signatures, and use of high-resolution imagery collected using UAS to enable top-down viewing and virtual asset inspections by qualified inspectors.

Reference Appendix G for complete analysis and overview of programs included in the Wildfire Mitigation measure.

4. Measure Implementation

Prioritization of Event and Measure

The resiliency event has been identified for mitigation based on its potential impacts to public safety and property and to Oncor assets, constituting a material risk to the safe and reliable operation of Oncor's System. Implementation of the measure is based on prioritization of the highest-risk locations per the risk modeling tool outlined in the current Oncor Wildfire Mitigation Plan (Appendix G). Activities in this measure are prioritized to address facilities in the highest fire danger areas and those with elevated impacts to customers. Facilities prioritized include dead-end and other non-tangent poles, critical poles as identified by the Overhead Resiliency & Modernization measure, and substation and telecommunication towers with the highest customer and operational impact. Activities across various programs and activities are crosschecked to ensure duplicative work is avoided and resource allocation is optimized. For example, poles identified to be wrapped are crosschecked with planned pole replacements to ensure that resources are not expend wrapping a pole that will soon be replaced. A repeatable process is in place to leverage data analysis and inspection of facilities and their surrounding ground conditions, to address the identified work based on criticality and risk.

Evidence of Effectiveness

Implementation of this measure mitigates risks posed by wildfire. The activities proposed are consistent with industry prevalent practices to mitigate such risks. Oncor has engaged EDM International Inc. ("EDM"), an independent entity with relevant expertise, to ensure measures proposed are effective in withstanding, mitigating, or more promptly recovering from the risks posed by and associated with wildfires.

Expected Benefits

The expected benefits of this measure are the mitigation of risks associated with ignition of wildfires and the actual and potential impacts of wildfire to Oncor assets, which pose a material risk to the safe and reliable operation of the Oncor distribution system. Reference Section VI of this Plan for details on the expected benefits of this measure.

Government Program Coordination

Not applicable.

Measure Alternatives

The alternatives considered for this measure include (1) undergrounding of facilities identified to be in a WMZ, (2) using covered conductors to mitigate ignition risk from vegetation and other foreign object coming into contact with power lines, and (3) deploying weather stations and wildfire camera networks for enhanced situational awareness.

Undergrounding of facilities identified to be in target areas would reduce ignition risk and also protect Oncor assets from sustaining damage from wildfire incidents. This alternative has been reviewed but determined to be an activity for consideration in the future following full deployment of the currently proposed measure. Implementation of programs in this measure, such as enhanced risk modeling, will support the continued evaluation of this alternative based on risk level and consideration of cost and resource availability.

The use of covered conductors is beneficial in areas where facilities are prone to contact with windblown debris and nearby vegetation, and there are challenges related to vegetation management activities due to access constraints. This alternative is not leveraged by Oncor because the vegetation management program is able to adequately implement its activities in wildfire risk areas. There is also an added complexity with conversion to covered conductor associated with the development of new standards, changes to construction practices, sourcing of new material, and necessary training for field crews. Also, covered conductor installations have an increased cost due to the aforementioned complexities and because they increase loading on structures, which requires additional distribution system upgrades.

Deployment of weather stations and wildfire camera networks has benefits of enhancing situational awareness. These alternatives have been reviewed but, similar to the undergrounding alternative, were determined to be activities for consideration in the future following full deployment of the currently proposed Oncor measures. Implementation of the programs and activities within the proposed Wildfire Mitigation measure, such as enhanced risk modeling, will inform future analysis to determine if weather stations and camera networks will greatly enhance situational awareness and, if so, what is the optimal deployment strategy.

These alternatives have been reviewed by Oncor and EDM and are not recommended by EDM as a measure for wildfire risk mitigation at this time.

Transmission System Outage Requirement

Implementation of a majority of the programs in this measure does not require an outage on the transmission system. There could be scenarios where a specific activity may require a transmission outage, but they are not expected to be frequent or extended. Any required outages would be coordinated with ERCOT.

5. Evaluation Metric and Criteria

The metric used to evaluate effectiveness of this measure is related to execution of associated programs. An index is calculated to identify the level of resiliency of each asset inside WMZs as compared to the activities implemented by this measure. As the activities in this measure are implemented, the resiliency index is calculated to demonstrate reduction in the associated risk. Additional metrics include the number of ignition risk events related to facilities in the WMZs compared to similar facilities outside those areas. Reference Section V of this Plan for details on the evaluation metrics.

6. Measure Comparison to Existing Programs

While some of proposed programs in this measure are similar to the existing Oncor programs, this measure systematizes existing activities and includes new activities to further mitigate risks associated with wildfires. The programs proposed in this measure are similar to existing programs at Oncor

Program (A) – Wildfire Risk Model Enhancement Program: This program enhances an existing program where various wildfire risk factors and Oncor assets are modeled to inform long-term risk mitigation efforts. The activity in this program expands Oncor's capability by leveraging more granular weather forecasting and recent landscape and environmental data, paired with an asset-specific ignition risk model, to provide a more accurate risk assessment.

Program (B) – Situational Awareness Program: This program enhances an existing capability to monitor fire-weather and current condition data to inform near-real time operational protocol. The activity in this program leverages near-real time weather models, in combination with Oncor asset conditions, to assess ignition risk for mitigation. The added capability also allows Oncor to better monitor active incidents and more effectively respond to mitigate further ignition risk and protect Oncor assets.

Program (C) – Asset Protection Program: This is a new program designed to implement activities in an effort to mitigate damage to Oncor assets as a result of wildfires.

Program (D) – Ignition Mitigation Program: This program expands and greatly enhances existing programs that positively impact the reduction of wildfire ignition risk associated with Oncor assets. Existing programs inspect Oncor assets to identify outage risks to be

mitigated. These outage risks are also potential wildfire ignition sources addressed through existing feeder inspection programs. This program implements new activities, such as installation of non-expulsion fuse and arresters, to further reduce risk through initiatives identified as good industry practice for ignition mitigation.

Existing Oncor programs are summarized in the Wildfire Mitigation annex of the Oncor Emergency Operations Plan.

F. Oncor Secure Measure

1. Risks Posed by Resiliency Events

This measure mitigates risks posed by physical security threats, including vandalism, theft, intrusions, and ballistic damage to equipment. Programs in this measure help to mitigate physical security threats and enhance the protection of Oncor facilities during a physical security threat. Refer to Section III of this Plan for resiliency event descriptions.

2. Measure Methodology

This measure includes two programs to increase the protection of Oncor's physical assets to prevent, quickly identify, and mitigate damage to Oncor's critical infrastructure from bad actors.

This measure utilizes the physical security and information technology methods as identified in 16 TAC § 25.62(c)(1)(H) and (F). Programs Oncor will deploy or expand in the Oncor Secure measure are as follows:

Program A – Oncor Aware System Implementation

Activities – This program implements three systems: a video management system, an electronic access-control system, and an event correlation system.

Program B – Critical Asset Protection

Activities – This program will protect transformers from physical security threats by utilizing low oil tripping detection and protection and installing ballistic barriers. This program will also deter theft by implementing end-point devices such as video cameras, access controls, and detection systems, to support an event correlation system. A physical security assessment that includes site-specific scoping will be provided by an external consultation firm, optimizing the implementation and protection strategy.

Table 9 below summarizes each program under the Oncor Secure measure. The three-year scope and estimated spend levels are based on proposed Plan funding levels and resource constraints, as determined at the time of Plan filing.

Measure Program	Methodology	Activity Description	Plan Estimated Scope	Plan Estimated Spend
Program A: Oncor Aware System Implementation	Physical Security; Information Technology	Establish an event correlation system to provide secure and remote access to electronic devices used for event response and restoration, and analytics.	1–Event Correlation System	$10.5M
Program B: Critical Asset Protection	Physical Security	Engineering, construction, and commissioning activities for enabling low oil trip protection for station power transformer; where necessary, material and construction costs for ballistic barriers to prevent gunshot damage to transformer; Installation and commissioning of video cameras, sensors, and physical barriers to detect, deter, and identify vandals; Engineering and construction activities associated with the deployment of access controls, video cameras, and door reinforcement measures for security enhancement of station control centers. Consulting firm to perform physical security assessment and validate Oncor's prioritization of stations.	130 Stations 8 Transformer Ballistic Barriers	$69.1M
			Total	**$80M**

Table 9: Oncor Secure Measure Summary

3. Measure Description

Outlined below are descriptions of the activity scope, activities, standards, services, procedures, practices, structures, or equipment associated with each program under this measure:

Program A – Oncor Aware System Implementation Program

The Oncor aware system implementation program is designed to mitigate risks associated with bad actors intruding into Oncor facilities. The program consists of modernizing Oncor's System as detailed below.

Activity 1 – System Implementation

An event correlation system modernizes the analysis of data captured through video, facility access controls, and security sensors. This system would encompass a video management system and access control system, which would allow Oncor personnel to review attempted or successful intrusions and provide evidence to law enforcement. This system will require enablement and connection to the LAN and backhaul communications for this Activity to be useful. In addition, the event correlation system would support Oncor's development of metrics regarding suspicious activity, intrusion, and vandalism. This data would support the refinement and development of future strategies related to physical security.

Program B – Critical Asset Protection Program

Substation equipment is vulnerable to gunshot damage and theft. [redacted] Options to replace damaged transformers include (1) using a temporary mobile transformer, (2) using a permanent spare transformer (if available), or (3) ordering a new transformer from the manufacturer. These replacements are shipped and commissioned to restore system configuration. The duration from shipping to commissioning mobile transformers may extend from a few hours to several days depending on station location, weather conditions, and the station's physical configuration. A mobile transformer is a temporary solution. The lead time for a replacement transformer will depend on availability of in-stock spares, the time needed to transfer one from an existing capital project, or the time needed to order and receive one from the manufacturer. As of March 2024, new transformer order lead times vary from 2 to 3 years. Oncor plans to implement two solutions to prevent and minimize damage to station power transformers: a low oil tripping transformer protection scheme and ballistic barriers.

Activity 1 – Transformer Bad Actor Protection

In the event a station power transformer is damaged by gunfire or other means, the low oil tripping protection scheme mitigates the possibility of a catastrophic transformer failure. The scheme protects the transformer [redacted] Future Oncor protection standards will require the implementation of low oil tripping on all future transformer installations. The addition of ballistic barriers surrounding the transformer minimizes the probability of gunshot damage [redacted] Station power transformers

will be evaluated to determine the need for ballistic barrier protection, and such criteria may include: crime threats in the area, intrusion history, frequency and severity, customer criticality, and distribution system backstand capability.[47] Oncor plans to collaborate with an external physical security consultant, Burns & McDonnell, to validate the methodology and criteria.[48]

Activity 2 – Theft Mitigation

A total of 253 physical security incidents occurred at Oncor substations from 2019 to 2023, resulting in approximately $2 million in theft-related damages, with 13 substations experiencing multiple instances of theft and/or vandalism. Copper ground conductor is a common target for theft during these intrusions. Removal of ground conductor from the substation creates a significant safety hazard – both for Oncor employees that may enter the station as well as the individual removing the ground conductor. Additionally, substation equipment may be damaged during these incidents, even if it is not a motivating factor for entering the station in the first place. Appendix H provides an overview of station physical security incidents from 2019 to 2023.

To prevent hazardous situations created by missing ground conductors, and to promote the reliable operation of Oncor's substation facilities, additional technologies like video cameras, fence proximity sensors and physical barriers will be installed at select stations to detect, deter, delay, and deny instances of theft or vandalism.[49]

Activity 3 – Access Control Upgrades

Oncor utilizes a risk-based strategy to deploy mitigation solutions that minimize damage to station equipment, deny intruder access inside station control centers, and detect intruder activity. This strategy takes into consideration the risks associated with station location, incident history (frequency and severity), station and System configuration, critical station equipment, and customer criticality. More details are provided in Appendix H. [redacted] To mitigate damage inside the station control center, access controls, magnetic locks, and door plates will be installed to prevent intrusion. Video cameras will be mounted to identify intrusions and any compromised systems.[50]

[47] Reference Appendix H for prioritization details.

[48] Reference Appendix B for the project portfolio and targeted substation transformers under Program B.

[49] These technologies will feed into and be monitored by the video management system that is part of the event correlation system.

[50] These video cameras will feed into and will be monitored by the video management system that is part of the event correlation system.

Activity 4 – Risk Assessment

Oncor will develop a tiered ranking of stations to ensure Critical Asset Protection activities are deployed strategically to maximize risk reduction. Prioritization criteria includes, but are not limited to, the critical customers served, security incident history (including the frequency of physical threats and types of incidents), and station configuration. As part of this activity, Oncor will partner with Burns & McDonnell to perform site assessments, utilizing Oncor's criteria and ranking system, thereby helping to ensure that the other programs and activities are being positioned and deployed at the specific locations that would most benefit from those programs and activities. Each station provides different implementation challenges; thus, Burns & McDonnell will provide recommended solutions for each station per Oncor Critical Asset Protection activities.

Reference Appendix H for complete analysis and overview of programs included in the Oncor Secure measure.

4. Measure Implementation

Prioritization of Event and Measure

The resiliency event has been identified for mitigation because it poses a hazard to public safety and to Oncor assets, which in turn poses a material risk to the safe and reliable operation of the Oncor System. Implementation of the measure is based on prioritization to address the highest risk locations identified through previously observed suspicious activity, vandalism, or theft, and station criticality, public safety, and assessment by an external consultant.[51]

Evidence of Effectiveness

Implementation of this measure mitigates risks posed by physical security threats. The activities proposed are consistent with industry best practices to mitigate such risks.

Oncor has engaged Burns & McDonnell, an independent entity with relevant expertise, to ensure measures proposed are effective in preventing, withstanding, mitigating, or more promptly recovering from the risks posed by the physical security resiliency event. Reference Section VI of this Plan for further details on evidence of effectiveness.

Expected Benefits

By mitigating the risks associated with physical security threats, Oncor's assets will be less vulnerable to intrusion, attacks, and theft, and Oncor's assets will be able to better withstand and/or recover from attacks. In the event of a physical security attack, the security methods are also expected to lessen the degree of damage that Oncor will

[51] Reference Appendix H for additional details on prioritization.

sustain, thereby reducing the risks to public safety, the risk of outages, and the costs of repairs or replacements. These methods will enable Oncor to employ a strategic coordination of appropriate barriers and detection systems, implementing a risk-based ranking system to assess and respond to potential intrusions. Reference Section VI of this Plan for further details on expected benefits.

Government Program Coordination

Not applicable.

Measure Alternatives

The alternatives considered for this measure include, among others: (1) installation of ballistic protection at every station transformer and control center; (2) implementation of electronic devices such as station rover, acoustic gunshot detection, and license plate detection; (3) using additional signage and enhance lighting in the station; and (4) manual review of video and sensor information.

Installation of ballistic protection at each station transformer and control center would reduce the impact of firearms; however, universally implementing this alternative across every station is cost prohibitive, and the cost would exceed the anticipated benefit.

New technologies such as a station rover, acoustic gunshot detection, and license plate detection provide the means to monitor intrusion or bad actors. These technologies have their use cases, as well as complications. For example, they require maintenance and calibration, may increase the number of false alarms, and may only detect activity after intrusion or damage has occurred. The cost of maintenance and the possibility of false alarms outweigh the anticipated benefits.

Current Oncor standards require the installation of station signage warning unauthorized personnel of the hazards inside the station, as well as station lighting to deter access. However, these existing methods do not provide near real-time sensing and detection. Independently, the installation of additional signage and lighting will not enhance Oncor's detect, deter, delay, and deny physical security methodology.

The manual review of data captured through Oncor field end-point devices such as cameras, sensors, and associated systems is a limiting factor during a physical security threat. Analysis, after the fact, is challenging to perform without advance analytics and logic. The status quo fails to reduce the mean time to respond when a physical security threat occurs. Thus, the manual review of incoming information would hinder personnel deployment and emergency response times as more field end-point devices are deployed across the Oncor system.

Transmission System Outage Requirement

Implementation of a majority of the programs in this measure does not require an outage on the transmission system. If ballistic barriers are implemented, a transformer outage would be necessary to address safety concerns regarding electrical clearances. The implementation of low oil tripping will require a transformer outage due to modifications at the transformers and relays. Any required outages would be coordinated with ERCOT.

5. Evaluation Metric and Criteria

The metric used to evaluate effectiveness of this measure is related to execution of associated programs. Oncor proposes to develop and utilize a resiliency metric to track the implementation and demonstrate the reduction in risk. Once the event correlation system is implemented, Oncor anticipates utilizing the following two metrics: reported suspicious activity near a facility fence line and reduction of repeated theft. Reference Section V of this Plan for details on the evaluation metrics.

6. Measure Comparison to Existing Programs

While programs in this measure are similar to activities currently undertaken in strategic locations based on station criticality and public impact, this measure expands existing activities and includes new activities to further mitigate risks associated with the identified resiliency event.

Program A – Oncor Aware System Implementation Program: This is an enhancement to an existing program that provides a modernized package for monitoring station facilities through physical security end points such as video cameras, sensors, and door access controls. The enhancements would provide integration with the electronic access control system, the detection system, and the monitor system to create a cohesive event correlation system. Advance analytics and trends are provided to reduce response time for physical security threats.

Program B – Critical Asset Protection Program: This program increases the level of protection for station power transformers and reduces the vulnerability of stations engaged by bad actors. Oncor's existing activities require the deployment of chain link metal fencing, pad locks, station signage, and lighting. These existing methods do not have the capability to detect ongoing intrusions or activities of bad actors. All new physical security technologies, such as cameras and sensors, provide a path to integration with the event correlation system. In addition, the protection of critical assets through the use of relay protection schemes and physical barriers, such as ballistic walls and electric fences, reduces disturbances and provides faster restoration time.

G. Enhanced Digital Grid Measure

1. Risks Posed by Resiliency Events

Oncor's digital grid includes cyber assets associated with transmission and distribution ("T&D") SCADA, DA, Advanced Metering System ("AMS") and mobile workforce functions ("T&D systems and functions"). The digital grid is comprised of complex public and private cyber infrastructure across Oncor's transmission and distribution service area, including communication systems, used to manage, protect, route and control data flows between millions of cyber assets. These cyber assets include devices such as computers, remote terminal units, electronic meters, routers and gateways, SCADA equipment, and various systems that support transmission and distribution functions such as outage and work management systems. Oncor's digital grid represents a large and complex attack surface that must be protected from resiliency events related to the integrity of its data and the functional impact to the digital and/or electric delivery grids. Refer to Figure 53 in Appendix I for a high-level overview of the Oncor digital grid landscape and the associated internal and external cyber threat vectors.

The Enhanced Digital Grid measure will utilize the information technology method, cybersecurity method, and the physical security method to protect digital grid cyber assets from events and risks related to extreme weather conditions, wildfires, cybersecurity threats, and physical security threats. The Enhanced Digital Grid programs directly protect digital grid assets and data integrity involved during extreme weather conditions (i.e. hardening of telecommunications infrastructure), cybersecurity threats (i.e. improved security operations capabilities), and physical security threats (i.e. physical security of substation local area network switches, telecommunications infrastructure, etc.) to cyber assets. Furthermore, the Enhanced Digital Grid programs indirectly support additional measures such as the Flexible and Self-Healing Distribution System measure and the Oncor Secure measure by enabling more resilient and scalable communications required for the detection, response, and recovery activities during all resiliency events (extreme weather conditions, wildfires, cybersecurity threats, and physical security threats).

2. Measure Methodology

This measure includes seven programs to increase the resiliency of Oncor's System to anticipate and withstand cyber threats against its large, complex, and diverse landscape. This measure also includes support for the Plan's other resiliency measures to design, build, enhance, implement, connect, and operate cyber assets and/or systems using Oncor's digital grid.

This measure utilizes the information technology, cybersecurity, and physical security methods identified in 16 TAC § 25.62(c)(1)(F), (G), and (H). The programs under this measure will utilize the National Institute of Standards and Technology ("NIST") cyber resiliency framework in anticipating, withstanding, recovering, and adapting the digital grid cyber assets to improve its private communications technologies used by the

transmission and distribution functions. The seven programs and associated activities included in this measure are as follows:

Program A – Digital Grid Cyber Resiliency Strategy and Governance

Activities – The Digital Grid Cyber Resiliency Strategy and Governance program sets the foundation and framework for how the other programs defined within this measure will approach digital grid cyber resiliency related to T&D systems and functions. The activities within this program will establish a communications cyber resiliency strategy and governance function, build a digital grid connectivity model, establish a risk management framework, and evaluate personnel requirements and training.

Program B – Digital Grid Management ("DGM") – Communications Operations Enhancements

Activities – This program will focus on detection, response, and recovery activities for resiliency events where communications capabilities of transmission and distribution systems with the digital grid are impacted. The program will prioritize monitoring and maintaining aspects of communications operations that may adversely impact Oncor's electric delivery operations during resiliency events. The activities within this program will enhance Oncor's NOC communications monitoring and management capabilities and situational awareness.

Program C – Private Broadband Communications Deployment

Activities – This program will design, build, implement and integrate a private broadband network technology to be added to Oncor's existing private network. The activities within this program will acquire private broadband spectrum, implement a broadband core network, implement a radio access network, migrate endpoints, and operate the broadband network.

Program D – Data Center Enhancements

Activities – This program will focus on enhancing Oncor's data center facilities and infrastructure in order to avoid potential cyber incidents that would adversely affect transmission and distribution electric delivery services for T&D systems and functions. The activities within this program will expand data center hardening, implement network fabric segmentation, expand network access control, posturing, and compliance.

Program E – Communications Backhaul Enhancements

Activities – The program will enhance Oncor's existing private backhaul network based on the cyber resiliency objectives developed through the Digital Grid Cyber Resiliency Strategy and Governance program. The activities within this program will upgrade the core fiber ring network, expand the backhaul and access layer network, harden communication infrastructure, and implement communication and segmentation.

Program F – Station Local Area Network ("LAN") Communications Enhancements

Activities – This program will include the design, build, implementation, and integration of a station LAN with Oncor's private backhaul network. The activities within this program will conduct station LAN deployments, implement station LAN identity and access management, and implement station LAN physical security.

Program G – Digital Grid Management – Security Operations Center Enhancements

Activities – This program focuses on the direct response to cybersecurity resiliency events used to adversely impact Oncor's transmission and distribution electric delivery operations. The activities within this program will enhance SOC monitoring and management capabilities and situational awareness.

Table 10 below summarizes the Plan's estimated total spend for each program under the Enhanced Digital Grid measure. The three-year scope and estimated spend levels are based on proposed Plan funding levels and resource constraints, as determined at the time of Plan filing. The Enhanced Digital Grid measure does not include technology costs associated with the other measures in this Plan. Further breakdown of the estimated total spend by the capital, operations and maintenance ("O&M"), transmission, and distribution categories is provided in Plan Summary Table shown in Appendix A.

Measure Program	Methodology	Activity Description	Plan Estimated Scope	Plan Estimated Spend
Digital Grid Cyber Resiliency Strategy and Governance	Cybersecurity, Physical Security, Information Technology	Establish a Communications Cyber Resiliency Strategy and Governance function as part of the information technology, cybersecurity and physical security measures that can anticipate, withstand, recover, and adapt to extreme cyber incidents including weather.	Communications Cyber Resiliency Strategy and Governance Function Digital Grid Connectivity Model Capability assessments across Digital Grid functions Digital Grid Cyber Resiliency technology solution	$8.5M
Digital Grid Management ("DGM") – Communications Operations Enhancements	Cybersecurity, Physical Security, Information Technology	Enhance the NOC monitoring and management capabilities related to the digital grid cyber assets based on cyber resiliency objectives related to contextual awareness, privilege restriction, coordinated	At least 60 stations or locations to support the development of a NOC communications network monitoring and management framework.	$16.0M

Measure Program	Methodology	Activity Description	Plan Estimated Scope	Plan Estimated Spend
		protection, segmentation, and diversity techniques included in the Digital Grid Cyber Resiliency Strategy and Governance program.		
Private Broadband Communications Deployment	Cybersecurity, Physical Security, Information Technology	Design, build, implement and integrate a private broadband network technology based on the information technology measure with Oncor's existing private network to further support the increasing communications requirements associated with T&D systems and functions.	Private broadband network across Oncor service territory. At least 500 cyber assets converted from public to private communications network.	$336.0M
Data Center Enhancements	Cybersecurity, Physical Security, Information Technology	Identify and separate network traffic into segments based on environments and domains. Enhance and expand the processes and associated tools used to identify and validate endpoints connected to Oncor's network meet required security standards and associated levels of network access.	6 Core locations Modernize, replace or build new technology infrastructure within or in addition to two data centers and two control rooms. Separate network traffic into at least one more zone.	$33.0M
Communications Backhaul Enhancements	Cybersecurity, Physical Security, Information Technology	Enhance Oncor's existing private backhaul network based on the cyber resiliency objectives developed through the Digital Grid Cyber Resiliency Strategy and Governance program.	6 Core locations and corresponding fiber communication paths Diverse failover and redundant communications capabilities at least 100 transmission, distribution, or communication sites	$55.0M

Measure Program	Methodology	Activity Description	Plan Estimated Scope	Plan Estimated Spend
			At least 50 telecom tower and facility hardening projects Enhanced communication configurations for at least 40 transmission or distribution stations.	
Station Local Area Network ("LAN") Communications Enhancements	Cybersecurity, Physical Security, Information Technology	Design, build, implement and integrate a station LAN with Oncor's private backhaul network based on the information technology, cybersecurity, and physical security measures to further support the increasing requirements associated with the transmission and distribution services during extreme weather conditions.	Approximately 260 LAN switches across 130 Stations Identity Access Management controls associated with wired or wireless station LAN connectivity for at least 130 transmission or distribution stations Physical security controls for the wired or wireless station LAN technology at 130 transmission or distribution stations.	$17.0M
Digital Grid Management – Security Operations Center ("SOC") Enhancements	Cybersecurity, Physical Security, Information Technology	Enhance the SOC monitoring and management capabilities related to the digital grid cyber assets based on cyber resiliency objectives related to contextual awareness, privilege restriction, non-persistence, security orchestration and automated response, analytic monitoring, coordinated protection, data risk management, and segmentation included in the Digital Grid Cyber Resiliency Strategy and Governance program.	At least 60 stations or locations to support the development of a SOC communications network monitoring and management framework.	$59.5M