

MA Electric Sector Modernization Plan 2025-2050

October 2023

Safety Minute

Safety is important to Unitil. We appreciate your time and want you to return home safe.

Avoiding Slips, Trips and Falls

- Be present where your feet are
- Watch out for obstructions and poorly lit areas
- Avoid or use caution on wet, slippery or uneven surfaces
- Wear appropriate footwear



<image>

Preventable injuries, commonly known as "accidents", are the fourth leading cause of U.S. deaths





What is an Electric System Modernization Plan (ESMP)?

- What goes into system planning today, and what do we look at to plan for the future?
 - What does Unitil see as the building blocks needed to modernize the grid?

Project Proposals

- What future projects do we believe are necessary to meet future demands?
 - What parts of the plan are public facing? What's happening behind the scenes?

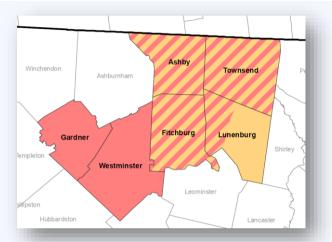
ESMP Customer Benefits

- What does the ESMP mean for you and your community?
 - Training opportunities, job creation, reliability, economic development and personal well-being.



Who is Unitil

Local electric and gas company working to make our community better



Providing electric service to approximately 30,500 customers

• Fitchburg, Townsend, Ashby and Lunenburg

Providing gas service to approximately 16,200 customers

• Fitchburg, Townsend, Ashby and Lunenburg, Gardner and Ashby

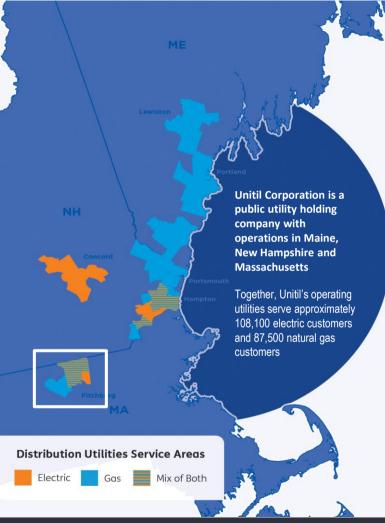


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Exceptional Customer Service

Recorded a 90% customer service approval rating compared to the national average of 85%. Ranked the #1 utility in the northeast.

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What is an Electric Sector Modernization Plan?

What is an Electric Sector Modernization Plan?

Why is an ESMP important to the company, customers and the Commonwealth?

What is an Electric Sector Modernization Plan (ESMP)?

- An ESMP is a comprehensive plan designed to ensure the electric system is capable of supporting the state's climate goals
- Massachusetts General Law Ch. 164 Section 92B

Objectives

- improve grid reliability, communications and resiliency;
- enable increased, timely adoption of renewable energy and distributed energy resources;
- promote energy storage and electrification technologies necessary to decarbonize the environment and economy;
- prepare for future climate-driven impacts on the transmission and distribution systems;
- accommodate increased transportation electrification, increased building electrification and other potential future demands on distribution and, where applicable, transmission systems; and
- minimize or mitigate impacts on the ratepayers of the commonwealth

Transition to a Cleaner Energy Future

The goal of the ESMP is to begin the transition to a cleaner energy future. The electric system as it is designed today is not prepared for the level of electrification and interconnection of distributed energy resources identified in the State's pathway to decarbonization. Investment in the electric system will focus on the overall capacity as well as technological improvements to facilitate an optimized electric system. The long range forecast focuses the investments where they provide the most benefit.

A goal of the Ensuring the benefits of the plan are distributed in an equitable manner. Special attention to mitigating the impacts to historically disadvantaged communities is required for a just transition.

Grid Modernization Advisory Council?

Who is the Grid Modernization Advisory Council?

Grid Modernization Advisory Council (GMAC)

- The GMAC is charged with reviewing and providing recommendations to the state's investor-owned electric distribution companies' ESMP plans.
- Massachusetts General Law Ch. 164 Section 92C

Council Membership

- Governor appoints GMAC members who serve for five-year terms.
- Commissioner of the DOER chairs the GMAC

Grid Modernization Advisory Council

The GMAC and ESMP system was set in place by "An Act Driving Clean Energy and Offshore Wind" (Climate Law) in 2022. The Climate Law requires that the state's EDCs prepare the ESMPs to proactively upgrade the distribution system. The EDCs develop ESMPs for their respective customer service areas. Unitil submitted their ESMP to the GMAC on September 1, 2023. The GMAC is currently reviewing and commenting on the ESMP. Once the GMAC has reviewed and provided recommendations, the EDCs will make appropriate revisions to their plan and file it with the Department of Public Utilities.

GMAC members include representatives from a wide array of organizations and interests

MA Department of Energy Resources	New Leaf Energy – representing renewable distributed generation industry
MA Attorney General	ENGIE North America – representing energy storage industry
MA Clean Energy Center	Highland Electric Fleets – representing electric vehicle industry
Green Energy Consumers Alliance – representing low and moderate income residential customers	Direct Expansion Solutions – representing electrification industries
Worcester Community Action Council – representing low-income weatherization program	MIT – representing engineering expertise to integrate clean energy
Acadia Center – representing environmental advocacy community	Metropolitan Area Planning Council – representing municipal interests
Barr Foundation – representing the environmental justice community	Dana Farber Cancer Institute – representing large commercial and industrial customers
Enel North America – representing transmission scale renewable energy	Unitil National Grid Eversource

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Stakeholder Engagement

A transparent and open process that is easy to follow, understand and easy to provide comment and consideration to future plans.



Stakeholder Engagement

An effective stakeholder engagement process ensures that customers, municipalities, and other stakeholders understand the ESMP and its role in ensuring the transition to a cleaner energy future. Stakeholder groups will need a foundational understanding of the electric system, the need for electric sector modernization plans and the Commonwealth's net zero goals. A significant portion of Unitil's service territory is designated as an environmental justice community based upon diversity and income levels. It is critical that these customers understand and receive the benefits available through the ESMP, as well as have the opportunity to provide feedback on significant distribution infrastructure projects located within the community. Unitil will work collaboratively with the Community Engagement Stakeholder Advisory Committee to develop a consistent and effective framework for community outreach.

65% 81%

Electric System Planning 101

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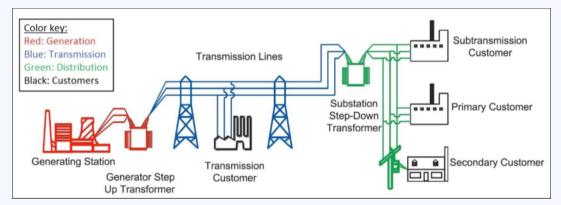
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Traditional Electric System

One-way power flow from large generators to the customers.



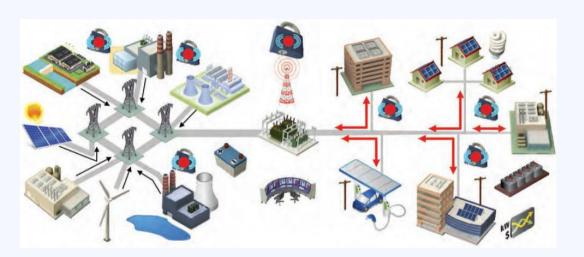
Traditional Electric System (source Electrical Engineering Portal)

Traditional Electric System

In the traditional electric system, power is generated remote from customer. Power is delivered across transmission lines running through rights-of-way at high voltages. Bulk receiving stations reduce the voltage and sub-transmission lines deliver the power to distribution substations. Distribution substations reduce the voltage again to the voltage typically used to serve business and residential customers. Pole mounted and pad mounted transformers further reduce the voltage down to the voltage levels used inside homes and businesses. Power flows in one direction, from the generation to the end customers.

Tomorrow's Electric System

Two-way power flow and distributed energy resources.



Tomorrow's Electric System (source EPRI)

Tomorrow's Electric System

Tomorrow's electric system promotes two-way power flow. Distributed energy resources such as large scale solar, residential solar, wind, battery storage systems, have reduce the reliance on the large scale generation of yesterday. The electric system is more intelligent with remote monitoring and control of field devices designed to automatically restore outages. Loads from electric vehicles and heat pumps increase as people decide to reduce their carbon footprint.



Plan Objectives

What are the building blocks of a modern electric system?

Flexibility

We must ensure the grid remains flexible enough to accommodate and integrate all types of new energy sources.

Safety, Reliability and Resiliency

We must continuously improve safety, reliability and resilience while reducing the effects of outages.

Customer Service

We must improve customer empowerment, engagement, and education and provide tools they need to control their energy usage.

Security

We must ensure the cyber and physical security of the grid remains strong.

Environmentally Friendly We must firmly support the region's goals in reducing emissions in the battle against climate change.

Affordability Energy for life must remain affordable for all.

Demand and Asset Optimization

The grid must be designed to get the most out of the tools and resources interconnected in order to best serve the region

Technology

The grid must enable the easy adoption of new technologies as they are developed to further support customer choice and system operations.

The Company has identified a series of eight objectives that together ensure support of a modern electric system. Our objectives are crafted with guidance from the United States Department of Energy, the DPU and the NH PUC.

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Load Forecast Assumptions

What assumptions make up the load forecast?

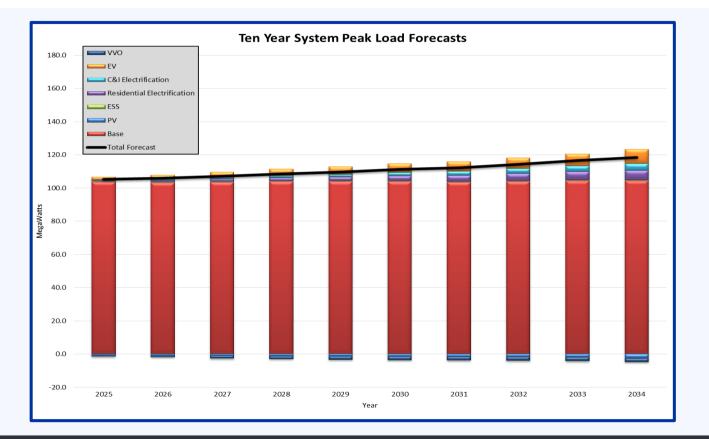


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Load Forecast Assumptions

12.5% forecasted load increase over 10 years?



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Integrated Gas-Electric Planning

Identifying opportunities between gas and electric system planning

Integrated Energy Planning (IEP)

- Prudently build out the electric system in the right locations at the right time to prepare for conversion of fossil heating to decarbonization and
- Make calculated decisions about where on the gas system to prioritize investment in the gas network (e.g., leak prone pipe repair or replacement) and/or plan for conversion to heat pumps.

Process

- LDC-EDC Data Exchange of data and investment plans
- Joint Utility Planning Working Group coordinate longrange capital plan
- Planning tools develop geographic tools to assist in planning
- People requires dedicated staff

Integrated Planning

Gas and Electric utilities generally plan and operate their networks in isolation from one another even when they are affiliated companies within a common parent company because historically there has been little need for coordination.

- Gas utilities need to understand where reinforcements may overlap areas where adoption of electrification may be more advanced
- In locations where electrification adoption is exceeding the electrification hosting capacity, hybrid gas/electric heating solutions may be needed in the short term to maintain system reliability.
- Correspondingly, in areas where the pace of electrification adoption is projected to exceed the electrification hosting capacity, the electric companies may need to accelerate electric improvement plans in those areas



Proposed ESMP Projects

October 2023

Technology

What technology does the company currently have in place or in development designed to benefit customers?







Volt-Var Optimization

Automatically optimize voltage to reduce peak demand, reduce losses and reduce energy consumption for customers



Advanced Distribution Management System Advanced monitoring and control of the electric system, outage reporting and management, real time analysis, and switch order management



Automation

Automatically controlled devices that sense the location of the fault, sectionalize and restore the affected customers from a different source.



Mobile Damage Assessment Mobile system used for gathering damage information following a large scale weather event to

facilitate resource allocation and estimated restoration times.



Field Area Network

Communications system designed to connect field devices with the central office to support automation, VVO, and remote monitoring



Customer Engagement and Experience Mobile app, AI and chat features, and a robust notification engine to proactively alert customers regarding payment activity, changes in usage patterns, outages, and scheduled appointments



Data Sharing

Sharing of customer usage data with customers or approved third parties to assist customers manage their own energy usage. Data sharing through Green Button Alliance.



ESMP Proposed Projects

What are the proposed projects and how will they benefit our customers?

Customer-Facing Projects

- Enable Grid Services
- FERC Order 2222 Implementation
- EV Charging and Make Ready

Projects and initiatives that include technologies that help support the adoption of distributed energy resources and customer access to third-party service providers and markets Grid-Facing Projects

Advanced Distribution Management

- System / Distributed Energy Resource Management System
- Volt-Var Optimization
- Supervisory Control and Data Automation
- Cyber Security
- Lunenburg Substation
- South Lunenburg Substation
- Targeted Reliability and Resiliency

Projects designed to increase capacity, improve efficiency, improve monitoring and control, increase DER hosting capacity, and improve the reliability and resiliency of the electric system.





Enable DER as a Grid Service

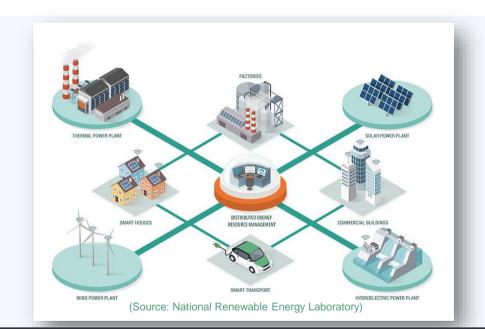
DERs can provide benefits to the electric system if managed and controlled properly.

Enable DER Grid Services

- Study the value of DER and load flexibility as a grid service.
- Compensation fund for dispatchable DERs
- Equitable Transactional Energy Study taking into consideration virtual power plant configuration
- Higher compensation for EJ communities

Customer Benefits

- Compensation fund to promote DERs
- Connect up to 10 DERs greater than 500kW
- 5-10MW demand reduction
- Savings of 100-500 MW-Hr
- Benefits EJ and non-EJ Communities



DER as a Grid Service

DERs have the ability to provide value to the reliable operation of the electric system. This study is designed to develop the use cases and compensation for DERs which provide capacity or voltage support to the system when the system needs it.

FERC Order 2222

Allowing all customers to participate in the wholesale energy market.

FERC Order 2222 Implementation

- · Remove barriers for DERs to connect
- Allows DERs to participate in wholesale markets – same as large facilities
- Opens up wholesale market to new sources of energy
- Lowers wholesale price of electricity

Customer Benefits

- Reduce capacity constraints that drive supply price, lower supply costs
- Reduce GHG emissions
- Defer system investment
- Allows all customers to participate in market
- Benefits EJ and non-EJ Communities



FERC Order 2222

FERC ordered that all DERs that allows aggregators of solar, wind, electric vehicles, battery storage, and other distributed energy resources (DER's) to compete in regional wholesale electricity markets. Up to this point only large generators had the ability to enter the wholesale market.

EV Charging and Make Ready

The Company's EV program is designed to alleviate barriers to EV adoption.

EV Charging and Make Ready

- DPU approved program for 2023-2027
- Proposed to double the program spending for 2028 and 2029
- Public charging make ready incentives
- Residential charging incentives
- Marketing and outreach

Customer Benefits

- TOU rates to promote EV Adoption
- Incentives for residential customers
- Additional incentives for low and moderate income customers
- Up to 2,291 vehicles by 2034
- Benefits EJ and non-EJ Communities



EV Charging and Make Ready

The program is designed to support the growth of electric vehicles in Massachusetts by providing incentives to public and residential charging. The Company's rate offering includes an EV TOU rate and demand charge alternative program for general delivery service applications. The program also offers a make-ready infrastructure for public charging as well as residential charging rebates

ADMS and DERMS

Providing advanced monitoring and control to optimize the electric system.

Advanced Distribution Management System / Distributed Energy Resource Management

- Computer system and communications to monitoring and control of electric system
- Platform for other functionality such as volt-var optimization and automation

Customer Benefits

- Improved outage response
- Improved outage restoration
- Improved monitoring and control allows for an increased amount of clean energy resources
- Facilitates demand response
- Benefits EJ and non-EJ Communities



ADMS and DERMS

ADMS is a computer software model that manages real-time information from the field to make decisions on how best to optimize the electric system. DERMS is portion of ADMS used to actively monitor and control distributed energy resources. ADMS is also the foundation for outage management, VVO, SCADA, FLISR and switch order management.

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Volt-Var Optimization (VVO) Saving customers money without them even knowing it.

Volt-Var Optimization

- Field equipment and communication system designed to optimize system voltage and power factor
- Entire system will have VVO installed so all customers will achieve the benefits

Customer Benefits

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- Customer bill savings without any • interaction from the customer
- Reduced system peak demand and • system losses reduces costs
- Lower system peak loads defers cost of • system improvements
- Benefits EJ and non-EJ Communities •



(Source: General Electric)

Volt-Var Optimization

VVO is a voltage and power factor optimization routine designed within ADMS to automatically reduce the voltage to the point needed. Reducing the voltage will reduce system losses, lower system demand and reduce energy consumption to save customers money. Think of a water faucet, you do not need the water faucet turned all of the way up every time to use it.

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Automation

Saving customers money without them even knowing it.

Automation

- Automated switching and restoration schemes
- Increased monitoring and control further out on electric system
- Volt-Var Optimization

Customer Benefits

- Improved outage awareness
- Reduced outage response and restoration times
- Automated restoration of outages reducing the impact to customers
- Reduced cost of restoration
- Benefits EJ and non-EJ Communities



Automation

Historically, the electric distribution system was operated by a line worker in a bucket truck. While that is still needed, automation is being deployed to facilitate remote switching and restoration of the system so dispatchers in our central office can remotely operate the electric system.

Cyber Security

Ensuring the integrity of the electric system as well as customer data.

Cyber Security

- Improved cyber security monitoring of operational and corporate networks
- Sectionalize and secure networks
- Identify and mitigate risks
- Critical to the safety and reliability of the electric system.

Customer Benefits

- Reduced exposure to cyber risks
- Faster notification of cyber incidents
- Improved resiliency to cyber attacks
- Improved data security and customer privacy
- Benefits EJ and non-EJ Communities



Cyber Security

Unfortunately, there are bad actors everywhere. Electric system around the world have been a target for cyber attacks. We are enhancing our protection against cyber attacks to protect customer data as well as the safe and reliable operation of the electric system.

Lunenburg and South Lunenburg Substations

Adding substation capacity to address the increasing load needs of the system.

Lunenburg and South Lunenburg Substations

- Expansion of capacity at Lunenburg Substation to address load growth in Lunenburg
- New South Lunenburg substation alleviates loading on system supply and sub-transmission system.

Customer Benefits

- Alleviate loading constraints
- Increased electrification and DER hosting capacity
- Improved reliability and flexibility
- Location does not affect an EJ Community
- Benefits EJ and non-EJ Communities



Lunenburg Substation Expansion 2026 Addition of substation equipment at the existing Lunenburg Substation to alleviate loading constraints.

New South Lunenburg Substation 2030 New substation to alleviate system loading constraints and provide a second supply point from the local transmission system.

System Capacity

Load growth is forecast to continue into the future with as the adoption of electrification continues. These two projects are designed to ensure the system has the capacity required to safely and reliably serve the load. Non-wires alternatives are considered when project needs meet size and timeframe criteria.

Reliability and Resiliency

Focusing on mitigating the impact of outages on our customers.



 Targeted installation of undergrounding, spacer cable or automation in areas where less costly options are not available

Customer Benefits

- Improved reliability to day-to-day outage events
- Improved resiliency to severe storm events
- Reduced impact on customers
- Reduced storm restoration costs
- Benefits EJ and non-EJ Communities

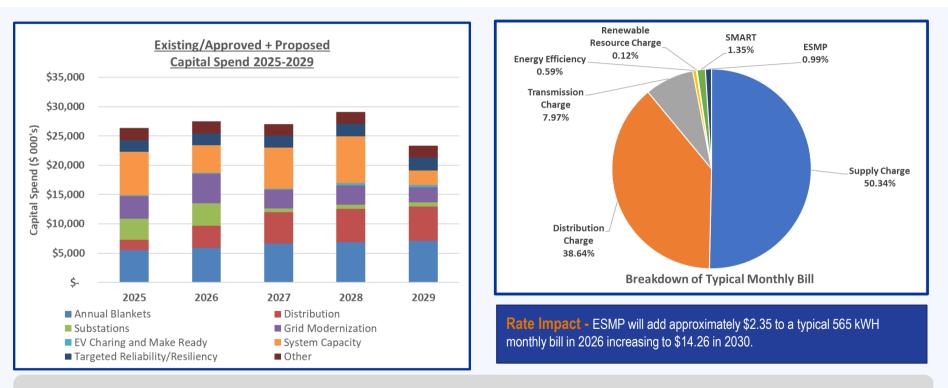


Reliability and Resiliency

We understand that outages impact our customers. The Company is proposing to increase spending to mitigate the affects of outages during blue sky as well as major storm events. Investments in targeted undergrounding and spacer cable will minimize damage during outage events resulting in a faster restoration.

2025-2029 Proposed Capital Spending Plan

Overall view of the 5-year view of existing/approved spending and proposed spending.



The proposed spending plan ensures safe and reliable service to our customers while supporting the State's decarbonization goals.





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Benefits to our Customers

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November 6, 2023

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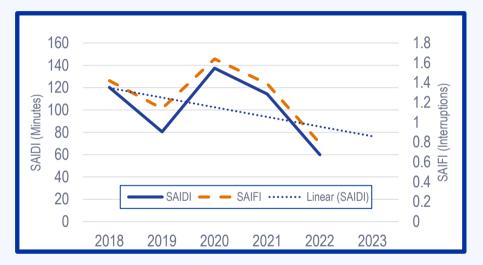
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Reliability and Resiliency analysis

Constantly analyzing the system for ways to mitigate the impact to customers



Goal

Minimize the impact of outages on our customers during blue sky outages and severe weather events. Targeted implementation of undergrounding, spacer cable and automation where traditional solutions may not be effective.

Continuous Reliability/Resiliency Analysis

- **Daily** focuses on system improvements that could be made in order to prevent that outage from reoccurring or other resiliency measures to reduce the size or duration of the outage
- Weekly This review is used to track the current year reliability and resiliency performance and benchmark it against company goals and historical performance
- **Monthly** The goal of this reporting is to identify trends and potential causes for the trends and initiate system improvements to address those trends
- **System Event Reports** The goal is to identify ways that the outage could either be avoided or the response shortened in the future
- **Annual** analysis on an annual basis that is focused upon the overall reliability and resilience performance of the system



Climate Vulnerability Assessment

Mitigate the impact climate change will have on our customers

Framework to Address Climate Vulnerability



Goal

The goal of the framework is to identify areas of risk, implement mitigation measures to reduce risk and improve the resilience of the system

- Vulnerability Assessment focuses on system improvements that could be made in order to prevent that outage from reoccurring or other resiliency measures to reduce the size or duration of the outage
- **Evaluate and Prioritize Risk** evaluating and prioritizing the relative risks associated with each scenario
- **Develop Mitigation Options** develop mitigation strategies considering and prioritizing the impact the mitigation and benefit has on environmental justice communities and low to moderate income customers
- **Prioritize Mitigation Options** Once the mitigation strategies are identified, each of the strategies should be prioritized and implemented in order
- Evaluate Success Evaluate the success of the mitigations implemented to ensure the mitigations are providing the expected improvements to reliability
- **Repeat** Conduct the vulnerability assessment again to identify and evaluate and new or emerging threats that may not have been identified in the last assessment

Economic Benefits

What economic benefits does this plan provide?

This plan helps to keep investment local:

- Job Creation
 - Benefits the communities within our service territory.
 - Good paying labor, vocational and technical positions which will drive income growth for the communities.
 - Expect these jobs will be filled by applicants within our service territory
- Increased Tax Base
 - Investment in the electric system increases the value of the taxable assets within a certain town.
 - Increased tax revenues are reinvested within the town in job creation, town improvements and reducing the tax burden on residents
- Location of Investments
 - Possible substation locations are evaluated for any burdens that may be placed on the surrounding neighborhoods
 - Consideration given to reduce the impacts to historically disadvantaged neighborhoods
- Regional Input-Output Modeling System ("RIMS II") model developed by the Bureau of Economic Analysis



Economic Impact

The RIMS II methodology uses the Company's base capital spending, in-progress capital programs and ESMP proposed investments. The RIMS II multiplier for "electric power generation, transmission and distribution" projects is 1.244. Incremental benefits calculate to \$32 million.

Workforce Benefits

What workforce benefits does this plan provide?

The modernized grid requires a skilled workforce:

- Awareness
 - Job openings, career fairs, community events, interesting stories and other community events
 - Social Media
 - Internships
- Diversity, Equity and Inclusion
 - Equal Opportunity Employer
 - Focus on diversity, equity and inclusion of women, people of color, and people who speak English as a second language.
 - Diversity, Equity and Inclusion Council
- Language Barrier
 - Offers training and assistance where required to ensure success within the Company
- Training Barriers
 - Encourage individuals of all backgrounds to apply
 - We can teach you the skills you need to be successful

https://www.unitil.com/our-company/careers





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Workforce

MACEC estimates 38,000 additional jobs required, 3,794 jobs in the transmission and distribution sector. The RIMS II multiplier for "electric power generation, transmission and distribution" projects is 1.920 resulting in the addition of 250 jobs by companies within the service territory.

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Health Benefits

What health benefits does this plan provide?

The modernized grid supports clean energy:

- Reduction of Greenhouse Gas Emissions
 - Direct impact on improving air quality,
 - Result in less respiratory illness
 - Prevent other health related conditions due to increased temperatures
- Integration of Renewable Resources
 - Enabling platform minimize GHG emissions by integrating greater renewable energy DER
- System Optimization
 - Improved energy efficiency leading to decreases in demand and reduction in greenhouse gas emissions
 - AMI allows data and tools necessary for customers to control their own energy usage
 - Demand response opportunities continue to increase: LED lights, smart thermostats, EV, heat pumps,
- Cost Savings
 - Reductions in energy usage and peak demands translate to reduced GHG emissions and costs savings to customers.



Health Impact

Enabling interconnection of renewable DERs reduces GHG emissions and has a direct impact on reducing harmful pollution, improved air quality resulting in less respiratory illnesses.

Training Benefits

What job training benefits does this plan provide?

The modernized grid requires more jobs:

- New jobs in transmission and distribution
 - MACEC 3,794 jobs
 - Commonwealth Clean Energy Roadmap 2050 16,000 jobs
 - Utilities, craft workers, clean energy workers, etc.
- Unitil supports developing the skills of the new workforce
 - Computer based equipment
 - Communications networks
 - Programming, testing, troubleshooting
 - Union and non-union workforce
- Unitil controls costs through knowledge transfer
 - Internal sharing of skills and knowledge produces savings for customers
- Union Workforce
 - Excellent relationship with our union workforce
 - Typically field based jobs
 - Line workers, meter workers, substation workers, technicians, etc.
- Non-Union Workforce
 - Typically office based jobs
 - Accounting, finance, regulatory, administration, human resources, engineering, information technology



Training

Awareness is important, if potential employees are not aware of good paying jobs, they will not apply. Eliminating barriers to the workforce will be required: DEI, Language, and Training Barriers



ESMP Next Steps

What is next for ESMP?

GMAC Comments

- On September 1, filed ESMP with GMAC
- GMAC has 80 days to provide comments back to EDC
- EDCs address comments within the ESMP
- Upcoming GMAC Public Meetings
 - October 26th, 1-4 PM GMAC Meeting
 - October 30th, 6-7:30 PM Public Listening Session
 - November 1st, 12-1:30 PM Public Listening Session
 - November 9th, 1-4 PM GMAC Meeting
 - November 16th, 1-4 PM GMAC Meeting

Upcoming Stakeholder Engagement Sessions

- October 24th public hearing on ESMP
 - November 3rd virtual public hearing on ESMP
 - November 15th EDCs joint stakeholder workshop on ESMP
 - November 28th EDCs joint stakeholder workshop on ESMP

File Final ESMP with DPU – 1/29/2024



For more information on the Grid Modernization Advisory Committee: https://www.mass.gov/info-details/grid-modernization-advisory-council-gmac

To provide feedback to the Grid Modernization Advisory Committee: MA-GMAC@Mass.gov







Thank you for your time and interest!

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