

PPL Electric is proposing a \$99 Million project with IJA funding to elevate existing infrastructure to a self-healing SMART grid

Project Value Proposition

Project Overview

Project Title: Grid of the Future

Prime Recipient: PPL Electric Utilities Corporation (PPL Electric)

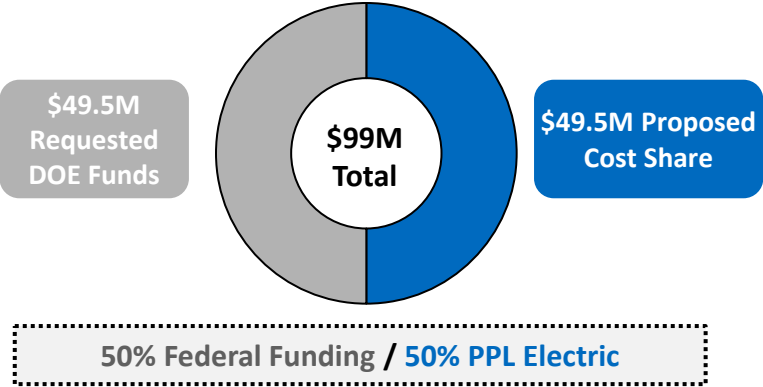
Technical Business Point of Contact: Steven Selkregg

Business Point of Contact: Eric Resch

General Location: Eastern & Central Regions of the Commonwealth of Pennsylvania

Requested DOE Funding: \$49.5M

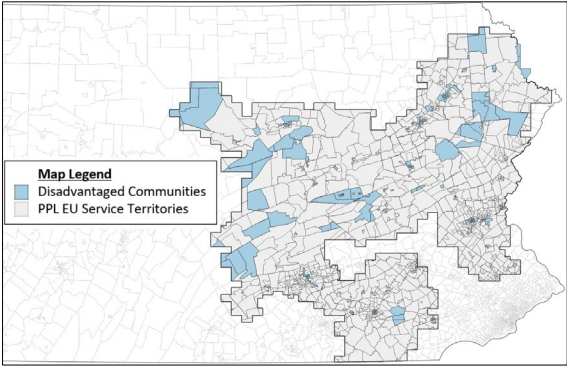
Grant Funding & Cost Share



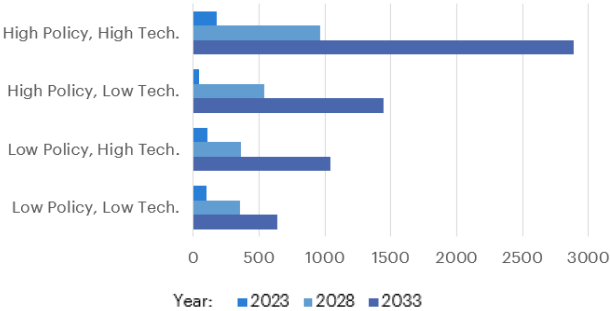
Why DOE Should Invest in This Proposal

Creates a self-healing grid with two-way power and enhanced communication

- The Grid of the Future portfolio accommodates high distributed energy resource (DER) penetration and embraces two-way power flow. This enables real-time control of the grid to enhance smart grid capabilities even further.
- The combination of IT and OT investments will allow for next-generation data collection into centralized hubs capable of using artificial intelligence and machine learning to understand outages, load changes, and fluctuations in DER
- The Grid of the Future will result in a grid tailored to Pennsylvania that expands DER use through increased control and visibility over the service territory



PA Projected EV Adoption Scenarios



Source: Pennsylvania EV Roadmap¹

Urgency of upgraded grid capabilities: Higher numbers of severe storms causing more outages

- PPL Electric observed 42 storms in 2021, the highest in the company’s history. One of these storms caused more than 1,200 cases of interruptions, which affected 85,000 customers
- CAIDI metrics have increased since 2020 and SAIFI metrics have remained stagnant, indicating that investments are necessary to make progress with these measurements
- Accelerated investments are necessary to address the effects of extreme weather on the grid

Preparing for electrification: PPL EU is supporting Pennsylvania state policies

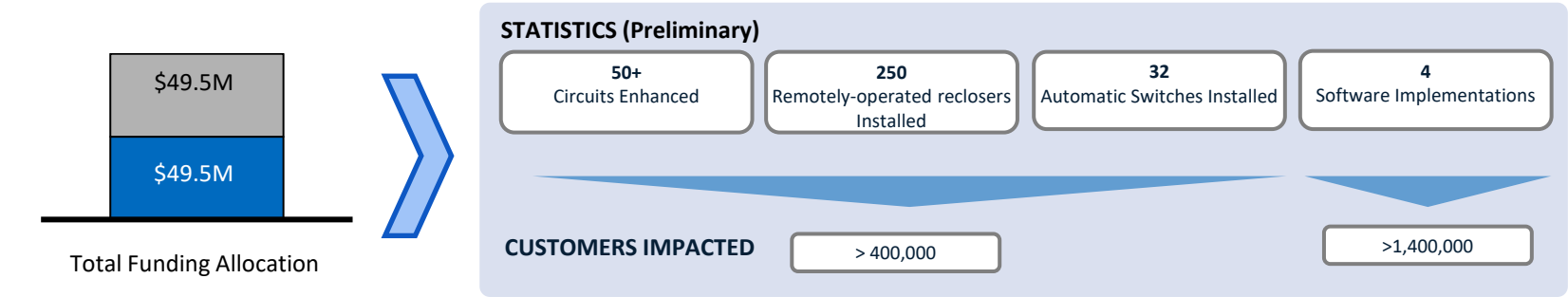
- The National Electric Vehicle Infrastructure (NEVI) Formula Program was approved by PennDOT in Sept. 2022, supporting the installation of Electric Vehicle (EV) charging stations, fleet electrification, and purchase incentives.
- The suite of IT and OT investments will enable the PA grid to embrace the load impacts from electrification.
- The environmental detriments caused by internal combustion vehicles disproportionately harms disadvantaged communities; meanwhile, EVs can result in lower long-term fuel, maintenance, and lifetime costs

¹ Policy may include significant early efforts such as expanded rebate values and program size. High tech can be characterized as the positive perceived quality and affordability of EVs

Advancing PPL Electric’s self-healing SMART grid goals with artificial intelligence, machine learning, and enhanced operational technology

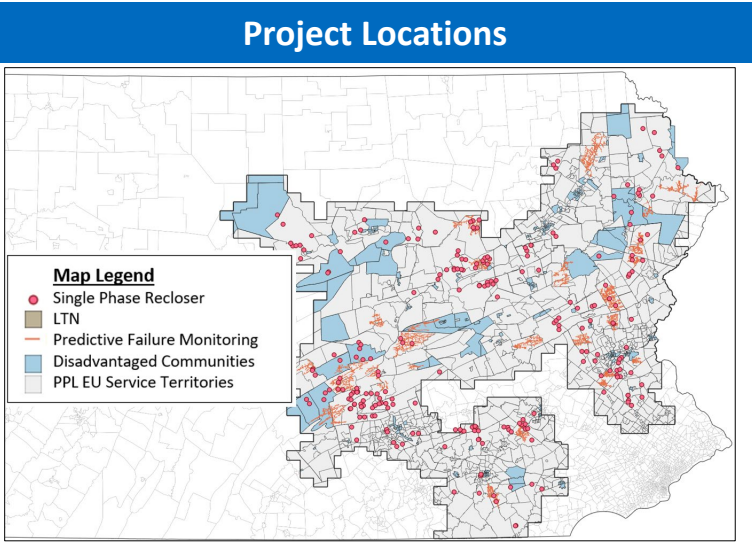
Technology Summary & Impact

Technology Summary



- Technical Impacts**
- Advance PA state electrification goals with a more reliable grid
 - Shorten outage duration and prevent faults due to system disruptions
 - Increase the reach of self-healing technology
 - Facilitate the integration and aggregation of renewables and grid-edge devices
 - Unlock next-generation data analytics utilizing Artificial Intelligence and Machine Learning

Project	Manager	Technical Overview & Purpose
Single Phase Reclosers	1 Steve Selkregg	250 remotely operated, telemetered single-phase reclosers to provide visibility into the 1PH system and allow for constant communication and real-time data flow
Low-Tension Network	2 Steve Selkregg	Upgrading existing LTN automation with advanced technologies including fiber installation, primary circuit fault location, vault upgrades, and secondary monitoring
Predictive Failure Monitoring	3 Steve Selkregg	30 circuits with sensor technology to detect and locate failing equipment, shifting repairs to a proactive approach, improving system reliability and reducing maintenance cost
Advanced Distribution Management System (ADMS)	4 Jim Conrad	Upgrade enterprise software platform to command and control the electric distribution system including outage management, system operations and distributed energy resource management
Advanced Energy Management System (AEMS)	5 Jim Conrad	Implement an enterprise software platform to command and control the electric transmission system and optimize line transfer capacity
Digital Twin	6 Jim Conrad	Update GIS system with an integrated and automated design toolset that creates a digital representation of the electric grid with every asset and subcomponent
Asset Hub	7 Jim Conrad	Create a centralized multi-tiered asset data platform across the enterprise can ingest and store high-velocity and granular asset data from sensors and grid devices






Modernization of PPL Electric's grid will lead to increased reliability, flexibility, and efficiency

Benefits Overview

\$99 Million Investment Impact		
Project	Headline	Project Outcomes
Single Phase Reclosers	1PH Recloser Implementation Optimizes Grid Visibility	Constant communication and real-time data flow between operation centers and grid assets/devices
Low-Tension Network	LTN Implementation Updates Grid Capabilities	LTN works with ADMS to create remote switching capabilities to proactively isolate and mitigate outages
Predictive Failure Monitoring	PFM Implementation Optimizes Maintenance	Quickly detect and locate failing equipment to create a proactive and cost-efficient approach to repairs
ADMS	ADMS Implementation Enables Energy Conservation	Unlocks voltage conservation for energy conservation and distributed energy resource management capabilities for renewables integration
AEMS	AEMS Implementation Optimizes Transfer Capacity	Facilitates dynamic line rating capabilities to optimize and increase electricity transfer capacity
Digital Twin	Digital Twin Implementation Optimizes Grid Design	Enables virtual grid simulation for efficient and accurate design
Asset Hub	Asset Hub Implementation Optimizes Asset Management	Creates the opportunity for data-driven automated decision-making to manage enterprise assets

Community Engagement Priorities

-  Align with Corporate/State/Federal Clean Energy and Carbon Reduction Goals
-  Enable EV adoption, electrification, and integration of DER through improved grid reliability
-  Support economic development and advanced manufacturing in Pennsylvania through improved grid reliability

Highest Impact Benefits

-  **\$5.4M/yr** local reliability improvement¹
-  Nearly **\$150M** GDP increase
-  **150–225** new jobs across the value chain

¹Based on ICE calculator assessment of reliability improvements