

➤ **Summary of 60-Day Notice: Residential Resiliency and Managed Charging Project**

The following 60-Day Notice summarizes Public Service Company of Colorado’s (“Public Service” or “the Company”) action to update stakeholders of the Company’s development of the Residential Resiliency and Managed Charging Project (“Project”) within the Company’s 2021-2023 Transportation Electrification Plan (“TEP”). This 60-Day Notice is issued in compliance with Decision No. C21-0017 in Proceeding No. 20A-0204E.

A copy of this notice will be available on our website at:

https://www.xcelenergy.com/company/rates_and_regulations/filings/transportation_electrification_plan

Residential Resiliency and Managed Charging Project

In Decision No. C21-0017, the Colorado Public Utilities Commission (“Commission”) approved the Company’s proposed Partnerships, Research and Innovation (“PRI”) portfolio. The objective of the PRI portfolio is to ease the process for customers to access electricity as a transportation fuel, minimize system costs, increase environmental benefits for charging, and help inform future Company TEPs. As a part of this portfolio, Public Service is proposing to direct a portion of the PRI budget to fund a Residential Resiliency and Managed Charging Project.

Through this 60-Day Notice, Public Service is providing a description of the Residential Resiliency and Managed Charging Project, the scoring considerations developed to review and evaluate submitted applications, and the metrics that Public Service will report on and provide to stakeholders through its semi-annual TEP reporting. The Project is a collaborative study of the impacts of residential electric vehicle (“EV”) charging on the distribution grid under various, managed charging scenarios. To inform this proposal, the Company conducted several individual stakeholder meetings to present draft pilot designs and gather input.

➤ Residential Resiliency and Managed Charging Project

A. Project Description, Goals, and Key Outcomes

The Residential Resiliency and Managed Charging project is a collaborative study of the impacts of residential EV charging on the distribution grid under various, managed charging scenarios. The results of this study will then be used by the Company to develop a “Charge Ready Tool and Program” and help to prepare the distribution grid for increasing levels of EV adoption in our service territory.

The Project will study the impacts of EV home charging for one or more customers sharing the same transformer and secondary under varying conditions of load, load diversity, customers/transformer, varying lengths of secondary, secondary conductor sizes, transformer sizes, and other variables, such as solar plus storage and Time-of-Use (“TOU”) rates.

In addition, this project will include the impacts of varying levels of EV penetration in an urban setting and optimization of timing, charger locations, and managed charging alternatives to minimize the need for significant additional investments in distribution grid infrastructure. The results of the collective study segments or tasks will inform the Company’s grid planning for EVs as follows:

- Understanding the impacts of EV home charging
- Validating and being able to model impacts on service transformers
- Analyzing diverse grid locations and configurations to determine ‘risk factors’
- Developing and delivering a new design tool that will address our remaining gaps in the residential EV charging planning process
- Developing typical EV load curves for planning purposes based on the analysis of load data that we will be receiving from our new EV programs and associated metering
- Improving upon and issuing new construction standards for transformers, secondaries, and services
- Developing and delivering system impact modeling tools and methodologies for planning and optimizing capital investments in the distribution grid

The goal of this project is to provide the data necessary for the Company to establish construction standards that apply consistently across the grid, at every residential customer segment. The standards will be equipment and configuration based, therefore creating an equitable construction approach across the grid and supporting EV growth consistently across the grid. As the Company establishes construction standards that match the EV growth, a risk exists to overbuild or underbuild the grid. The results of this study will assist the Company in right-sizing the construction to meet the EV needs of our customers. In the same context, the Company intends to implement managed charging approaches to shift EV charging to times of day when capacity is available. The results of this study will also assist the Company with selecting managed charging methods that ensure our investments are prudent and not resulting in adverse financial impacts to other ratepayers or low- or moderate-income communities. Lastly, the Charge Ready tool that will

be used by the Company's distribution planning organization, will provide additional modeling and scenario simulation, enabling the inclusion of various EV chargers at different locations on feeders. It provides the Company with new tools, insights and methodologies that help with the Company's Distribution System Planning process and will aid in the timeliness and targeting of our grid investments.

Public Service will partner with the National Renewable Energy Laboratory ("NREL"), to serve as a site host for the study and provide academic researchers to design, manage, and provide results from the study. The study will be performed onsite at the NREL facilities. The Company will provide initial feeder and loading data to the NREL researchers. The NREL researchers will then build models, algorithms, and execute simulations in their laboratories on the NREL site. In addition, physical construction of various residential transformer, secondary, service, and EV charger combinations will be built on-site, and tests conducted to measure impacts of EV charging. All study results will be formulated and published by the NREL researchers and made available to the public.

B. Project Tasks

To accomplish the intended results, the study will be conducted with nine overall tasks:

1. Develop and evaluate EV charging profiles.
2. Develop an EV load dataset for use in system models.
3. Refine and advance managed charging control strategies.
4. Select Public Service feeders for overall study.
5. Develop EV charging and distribution system impacts modeling.
6. Perform Grid Analysis for the modeled Public Service feeders.
7. Extend analysis to a representative set of feeders from the rest of Public Service's territory.
8. Evaluate transformer thermal loading and line voltage impacts from EVs.
9. Complete technology transfer and results reporting.

C. Estimated Costs, Benefits, Value to Customers

The Project is estimated to cost \$1.8 million dollars.

Overall, the Project will provide technical validation of the assumptions made by the Company in building its capital budget to support EV adoption. These technical validations will provide an equitable, technical basis for improving the grid in all areas of the Company's distribution service territory.

EV charging is a significant load change for residential customers, so this project will be critical in ensuring Public Service is prepared for the load increase. Managing charging using various control strategies will keep costs low by helping shift new charging demand to existing capacity while optimizing grid improvements in those areas that are capacity-constrained.

The Charge Ready tool offers detailed analysis capabilities, critical to understanding the systemic impacts of EV charging, which complement the Company's existing grid planning tools. The addition of this Charge Ready tool provides the company additional analysis capability at a fraction of the cost of purchasing and implementing a new, comprehensive planning tool.

D. Equity

With this emerging technology, the customer behavior attributes will change over time and EV technology, including battery and charger sizes, will result in load patterns that differ from traditional energy consumption. This study will help the Company understand the new dynamic and ensure that grid upgrades are sufficient to maintain reliability, resiliency, and power quality for all connected customers.

E. Education and Outreach Efforts

The results of the study will be made public by Public Service and NREL for utilization throughout the industry to assist utilities in making grid investment decisions in support of EV adoption and growth.

F. Reporting, Measurement, and Evaluation

There are two key outcomes expected from the study effort:

1. Charge Ready Tool – an Open DSS tool that will be delivered to the Company with training provided for all Company distribution engineers.
2. Charge Ready Program – the summary of study results will be the foundation of a Charge Ready program, structured from 2024-2030, to ensure the Company performs needed upgrades to the distribution grid to add capacity where needed and to support EV growth.

As part of the Company's semi-annual reporting for TEP programs, the Company proposes to track and report on the progress of the following metrics that summarize the results of the Residential Resiliency and Managed Charging Project:

- Impact of transformer size on voltage.
- Impact of secondary wire length and size on voltage.
- Impact of multiple chargers along with other load on voltage.
- Ability to detect various EV charger signatures through Advanced Metering Infrastructure ("AMI").
- Ability to predict and notify future voltage issues with AMI.
- Ability to notify existing voltage issues with AMI.
- Ability to predict and notify future transformer loading issues with AMI.
- Ability to notify existing transformer loading issues with AMI.
- Understand charger size and onboard charger demand.
- Understand voltage sag impacts to charging.

- Impacts of photovoltaic (“PV”) on daytime charging peak and voltage.
- Impacts of PV and battery on daytime charging peak and voltage.
- How to use information gathered to forecast individual transformers and secondary system issues with system wide AMI.
- Value of using known EVs and test bed information to predict voltage and overload issues.
- Impact of multiple chargers along with other load on overall system load.
- How does managed charging change peak and voltage and loading impact?
- How to use information gathered to predict overall quantity of system issues as penetration increases with system wide AMI.

G. Partners

In addition to partnering with NREL, Public Service will be exploring partnerships with Colleges and Universities who can provide research support while also engaging with communities where Public Service may apply future studies in the field.

H. Stakeholder Involvement

During the development of the methodology and the identification of proposed Residential Resiliency and Managed Charging Project, the Company engaged numerous stakeholders to gather feedback and refine its approach. The table below summarizes stakeholder involvement:

Stakeholder Group	Meeting Date
Transportation Electrification Plan Stakeholder Group ¹	9/29/2021
Environmental Justice Coalition ² , Energy Outreach Colorado, Natural Resources Defense Council, Southwest Energy Efficiency Project, and Western Resource Advocates	10/12/2021
Commission Staff	10/14/2021

Stakeholders were receptive to the project.

¹ The TEP Stakeholder Group includes dozens of organizations spanning Colorado state government agencies, Colorado municipalities, environmental advocates, energy efficiency and electrification groups, other utilities, EV charging hardware and software providers, automobile manufacturers and dealerships, community groups, and many others. Nearly 100 people participated in the TEP Stakeholder Group meeting on September 29, 2021.

² The Environmental Justice Coalition includes representatives from the Colorado Latino Forum, GreenLatinos, GRID Alternatives, and Vote Solar.