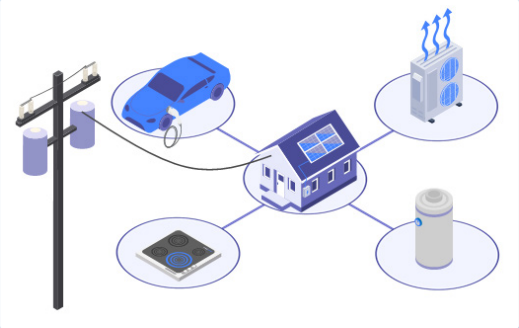
Supplemental Project Notice

RESIDENTIAL SECONDARY DESIGN FOR ELECTRIFICATION

Refined Residential Secondary Design Accounting for Electrification



Electrification of Residential End-Use Technologies

PROJECT HIGHLIGHTS

- Analyze secondary circuit level load profiles and diversity factors for residential electric vehicle charging.
- Characterize future secondary circuit level load profiles of electric vehicles, heat pumps, electric water heaters, and other residential electrification loads.
- Develop logic for modeling residential demand at customer and service transformer level considering both incumbent and electrification loads.
- Guide service transformer sizing and other secondary design to account for electrification.
- Create a proof-of-concept spreadsheet tool for sizing service transformers accounting for electrification.

Background, Objectives, and New Learnings

Electric vehicle (EV) chargers, heat pumps, and other electrified end-use technologies are projected to increase residential end-use loading that may trigger new investments in residential secondary circuits (also referred to as services). Distribution utilities have well-established practices for planning and designing secondaries that are aimed at minimizing total lifetime costs by matching asset capacity with lifetime utilization. There has been limited need to make changes to these practices and their underlying assumptions since the widespread adoption of air conditioning increased residential loads in 1960s and 1970s. Now, electrification is expected to result in further growth in residential loads that existing standards and practices may not fully account for. There is increasing interest in reassessing residential secondary design practices and standards, but it is unclear what changes are needed to properly account for the impacts of electrification.

This project will provide guidance on how to account for electrification loads in residential secondary design. This project will address the following research questions:

- What are the characteristics of different electrification loads and how will they impact the peaks, diversity, profiles, and other key characteristics of aggregated residential loads?
- How to account for electrification in service transformer sizing and other secondary design practices? How to right-size the secondary assets?

While the cost of individual secondary assets can be modest, the sheer number of service transformers and other secondary assets underlines the importance of informed secondary design practices.

Benefits

The potential public benefits of this project include guidance on appropriate secondary investments, increased reliability through right sized secondary assets, and accommodating the residential electrification. The potential funder benefits of this project include increased understanding of electrification impacts on residential load characteristics and the associated secondary impacts, and guidance on integrating electrification impacts in secondary design practices.

Project Approach and Summary

Area-Specific Residential EV Charging Loads Characterization: EPRI plans to perform detailed assessment of EV telematics data acquired by EPRI or participant-provided disaggregated AMI data may also be used at additional cost. EPRI also intends to produce local insights on EV charging load characteristics and project future EV load characteristics.

Area-Specific Heat Pump and Other Electrification Loads Characterization: EPRI plans to also conduct detailed aggregate-level residential end-use load modeling to develop guidance on the characteristics of heat pumps and other electric end-use loads and their impacts to the characteristics of residential customer aggregate loads. EPRI also further intends to estimate area-specific future load characteristics within the participant's service territory based on historically observed trends.

Residential Secondary Design Guidance: EPRI intends to review the project participants' existing secondary design practices and their gaps focusing on the sizing of service transformers and other secondary assets. EPRI also intends to develop guidance for refining secondary design practices. Specifically, EPRI intends to develop a proof-of-concept spreadsheet tool for sizing service transformers to account for electrification loads and consider asset thermal capacity, voltage drop, and other key design constraints.

Deliverables

Level 1 – General Analysis:

- Report documenting the general non-proprietary results on load data analysis, load models, secondary design guidance, and service transformer sizing logic
- Periodic project workshops to gather participant guidance and provide research updates

Level 2 – Utility-Specific Analysis:

- Includes Level 1
- Participant-specific assessment of electric vehicle charging data
- Participant-specific model-based sensitivity assessment of present and future residential load characteristics capturing technology advancement and adoption levels, rates, managed charging strategies, and infrequent events
- Proof-of-concept service transformer sizing tool
- Participant-specific virtual meetings to gather guidance and present results
- Participant-specific report

The non-proprietary results of this work will be incorporated into EPRI's R&D programs and made available to the public, for purchase, or otherwise.

Price of Project

Level 1 – General Analysis: $50,000

Level 2 – Utility-Specific Analysis: $140,000

Optional: Assessment of additional participant-specific AMI or other datasets. Available to Level 2 funders only.

This project qualifies for Tailored Collaboration (TC) or Self-Directed Funding (SDF). Funding can be distributed across two calendar years.

Project Status and Schedule

The project will commence after three Level 1 and one Level 2 member agreements have been completed. The project is planned to be completed within 24 months of commencement.

Who Should Join

Utilities considering modification of their secondary design practices for electrification impacts. Utilities seeking detailed electrification load data specific to their service area for other purposes.

Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

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