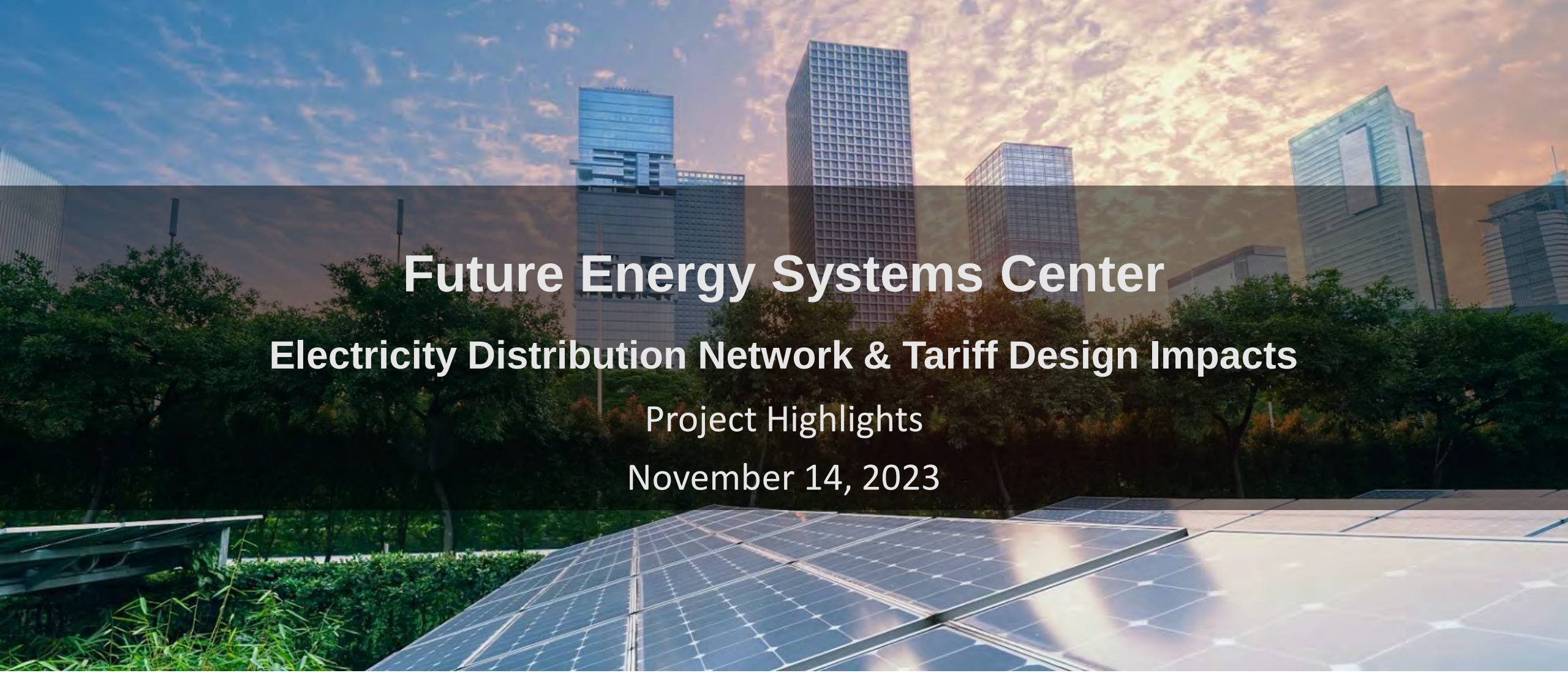


Future Energy Systems Center

Electricity Distribution Network & Tariff Design Impacts

Project Highlights

November 14, 2023



Project Team

Principal Investigators



Tim Schittekatte
Research Scientist,
MIT Energy Initiative



Pablo Dueñas Martínez
Research Scientist,
MIT Energy Initiative



Dharik Mallapragada
Principal Research Scientist,
MIT Energy Initiative

Graduate Students



Graham Turk
Graduate Student
Technology & Policy Program
MIT Energy Initiative



Zachary Schmitz
Graduate Student
Integrated Design & Management
MIT Energy Initiative



Abdelrahman Ayad
Visiting PhD Student
McGill University

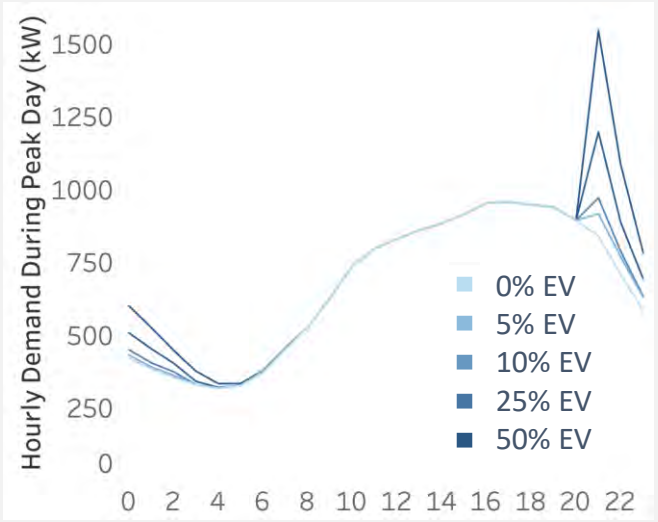
Project motivation and objectives

Motivation

- Electrification of heating and transportation will lead to significant grid investment driven by peak demand growth
- Time-differentiated tariffs are effective at shifting demand and reducing operating costs for electric vehicles and heat pumps
- Yet the leading states are adopting simple time-of-use tariffs that will create new peaks due to bunched flexible demand, especially from EV charging



Source: US DOE

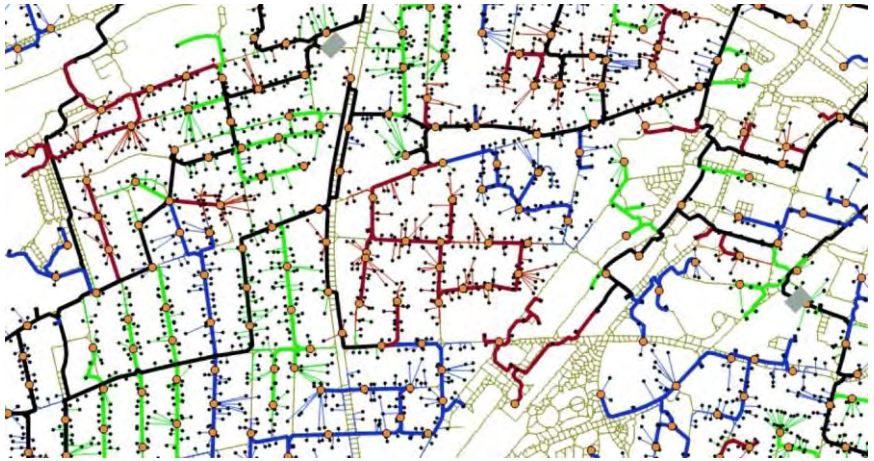


Objectives

1. **Model household responses to alternative tariff designs**
2. **Compute network investments required to support electrification**
3. **Simulate wholesale electricity market prices using flexible demand profiles**
4. **Provide menu of rate design alternatives for state PUCs**

Results and Takeaways

- While any rate reform will create short term winners and losers, in the long term all grid users benefit from lower network costs
- Subscription charges offer implementation advantages & reduce electrification costs without shifting burden to non-electrified households
- This study will be the first to compute distribution network investment costs under alternative tariff designs with flexible demand



Source: NREL SMART-DS

