OAK RIDGE National Laboratory | BUILDING TECHNOLOGIES RESEARCH AND INTEGRATION CENTER

Vehicle-to-Home Integration to Improve Grid Interactivity and Resilience

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Power Electronics Systems Integration

- As the number of EVs increases, higher levels of stress will occur on residential-level and distribution-level electric circuits
- Currently, almost all EVs are one-directional charging and are simply seen as a load to the grid
- EV chargers, especially fast chargers, can increase the daily energy consumption of houses significantly

Approach

- Enable bidirectional flow between the EV and the home to serve as a load, storage, and power provider to enable optimization of residential load profiles, provide resilience during outages, reduce peak demand, and high photovoltaic (PV) integration and utilization

Impact

- This research is timely and impactful toward next-generation home load optimization and transportation electrification
- ORNL has developed HEMS that can integrate EV, PV, and thermal loads and optimize their operation for specific use cases
- Benefits homeowners with increased resilience during outages, higher utilization of PV resources, and optimized demand profiles by using EVs as a source of power
- Demonstration will show how to reduce stress on local electric grids with increased penetration of higher power requirements for charging EVs without utility capital upgrades
- Co-optimization of residential loads with EVs and integrated PV + energy storage system to reduce the carbon footprint of operating large loads at scale
- Technology, including integration (energy management system), and hardware (charger, inverter, electrical) will be directly transferrable to other buildings







