

Smart Grid Subcommittee Report

Marilyn Brown

Subcommittee Vice-Chair

U.S. Department of Electricity
Electricity Advisory Committee

February 20, 2018

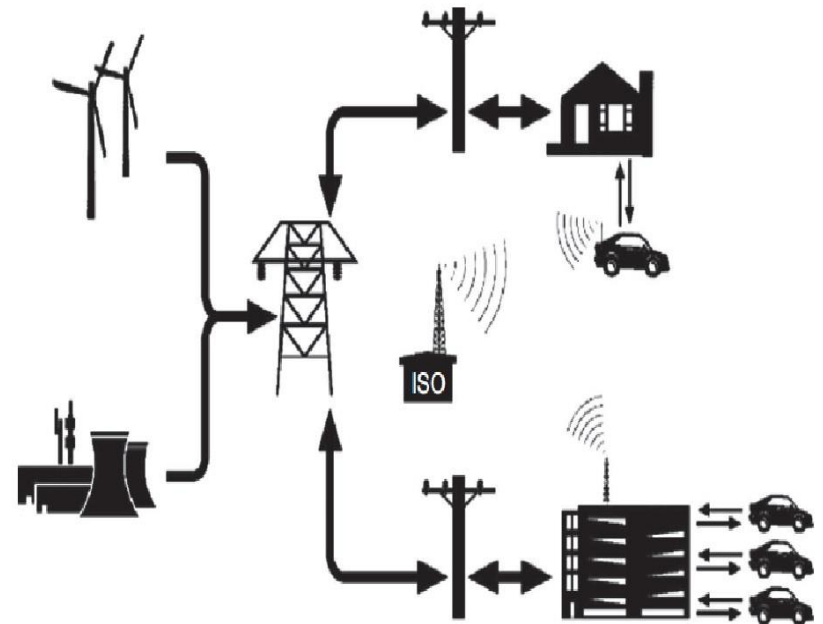
Subcommittee Overview

Statutory basis: The Energy Independence & Security Act of 2007 §1303 advised DOE to establish a smart grid advisory committee covering:

“the development of smart grid technologies, the progress of a national transition to the use of smart-grid technologies and services, the evolution of widely-accepted technical and practical standards and protocols to allow interoperability and inter-communication among smart-grid capable devices, and the optimum means of using Federal incentive authority to encourage such progress.”

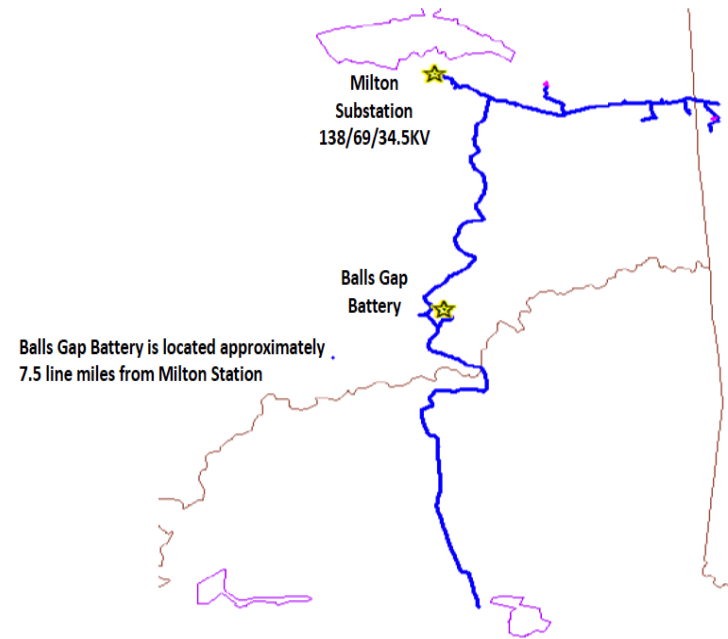
Four Work Product Proposals in Oct. 2017 were Consolidated into Two

1. **Integration of Electric Vehicles into the Smart Grid + Business Models for Non-Utility Participants**
2. **Resiliency and Reliability + Infrastructure Investment in the Grid**

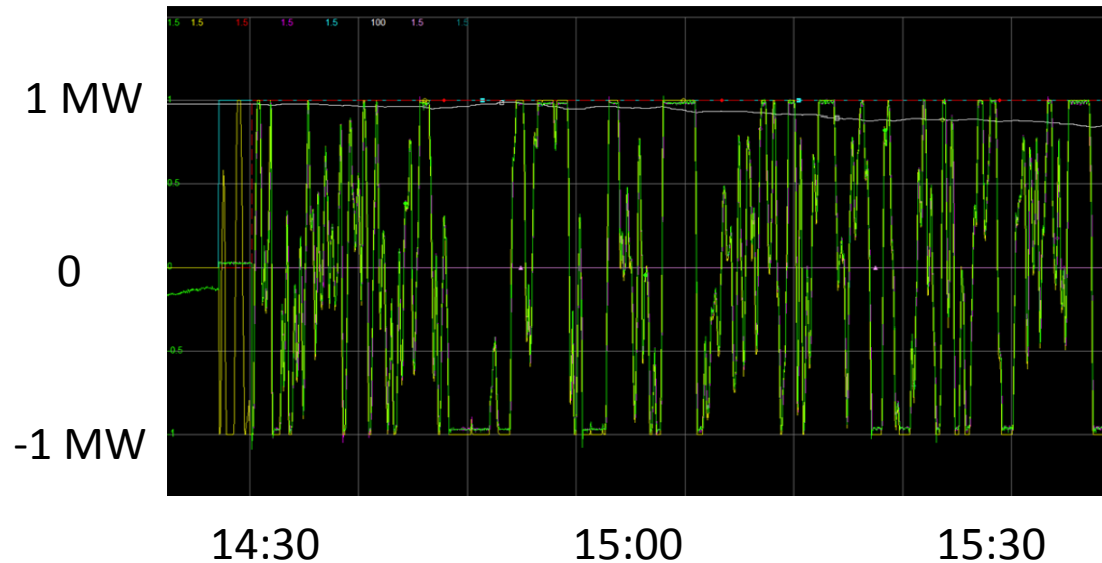


Subcommittee Work

- Presentation by Tom Weaver (AEP) on “Applying DER for Resiliency on Distribution Circuits” on 11/16/17
- The Balls Gap project: 2 MW NAS Battery
- Constructed in 2008 and placed in service in January, 2009
 - ✓ **Peak Shaving** – Reduced load on the Milton 2, 138-34.5 KV transformer
 - ✓ **Islanding** – Ability to separate from the Milton and serve up to 800 customers for 6 hours

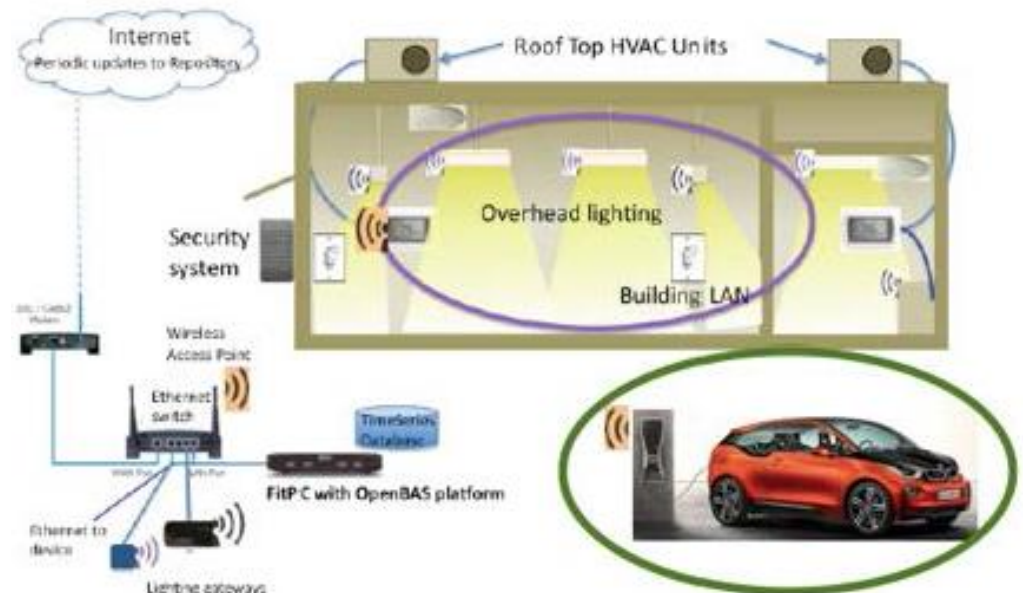


Battery output in PJM market



Subcommittee Work

- Presentation by Timothy Lipman (UC-Berkeley) on “Open Source Platform for Plug-in EV Smart Charging in California” on 1/18/18
 - ✓ Develop open-source software code to interface with EV chargers for load control
 - ✓ Develop algorithms for congestion relief and voltage regulation through smart charging

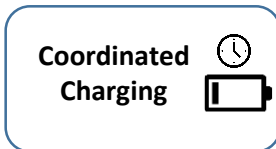
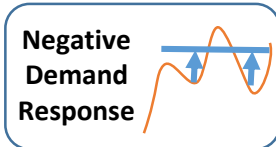
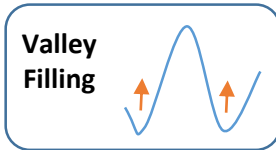
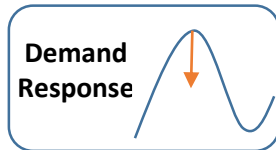


Decentralized and Open-Source Architecture Platform

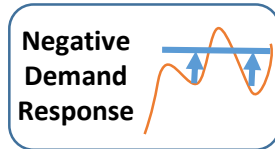
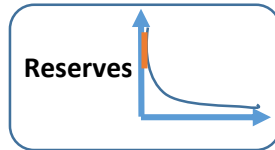
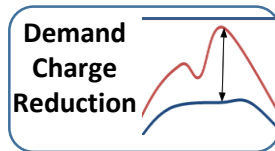
Subcommittee Work: Foundations for White Paper on EV Integration*

Mode of EV Integration Defines Resiliency Impacts & Services

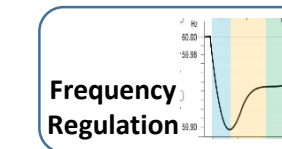
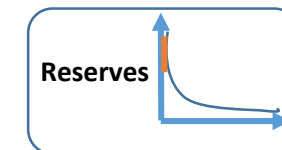
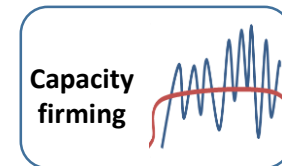
Grid to vehicle (G2V)



Vehicle to building (V2B)



Vehicle to grid (V2G)



*Support for this research was provided by Georgia Tech's Energy Policy and Innovation Center and Brook Byers Institute for Sustainable Systems: <https://cepl.gatech.edu/projects/sgp/GIV>.

Types of Barriers and Challenges to Grid-Integrated Vehicles

Technological Factors

Degradation of batteries

Surge in demand with DC fast charging

DC compatibility with bidirectional flows

Latency following signal inputs from aggregators

Socioeconomic/Financial factors

Transaction costs with EV owners

Warranties provided by EV manufacturers

Payments to charging station owners for ancillary services

Unclear conformance with cost-recovery utility financing

Range anxiety

Access to charging infrastructure

Policy/Regulatory Factors

Tariff or rate design policies

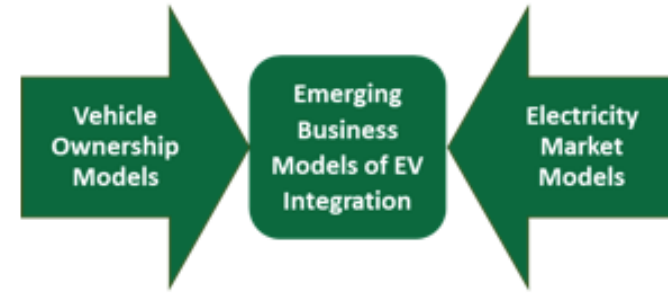
Valuing ancillary services in a vertically integrated market

Open source architecture platform

Creating resiliency service products in wholesale markets

Certification of charging infrastructure

Business Models for Grid-Integrated Vehicles



Asset Ownership

- Owning vehicles
- Owning charging equipment
- Leasing the vehicles and charging equipment
- Managing and coordinating charging

Interaction with Utilities

- Contracts with utilities for retail services
- Contracts with grid operators
- Resiliency services marketed as ancillary products in wholesale markets

Mobility Services

- Leasing cars to customers
- Contracting with fleet owners
- Contracting with ride share services
- Contracting with car rental services
- Providing subscription services for recharging

Battery Management

- Battery Swapping
- Aggregator Coverage
- Manufacturer warranty
- Fleet owner warranty

Timeline and Next Steps

1. A Google survey has been drafted and field-tested; finalize it and initiate the survey of EAC members
2. EERE speaker at March subcommittee phone call
3. Analyze survey results and discuss them during April call
4. Complete white paper for review at July 2018 EAC meeting

For more information:

Dr. Marilyn A. Brown
Regents Professor of Sustainable Systems
Georgia Institute of Technology

Email: mbrown9@gatech.edu

Phone: [404-385-0303](tel:404-385-0303) (O) 404-275-0482 (C)

<http://marilynbrown.gatech.edu/>