Welcome!

RENEWABLES INTEGRATION

https://betterbuildingsinitiative.energy.gov/alliance/technology-solution/renewables-integration

Strategic use of renewables can help businesses reduce energy costs and their environmental footprint. The Renewables Integration Technology Research Team is pleased to provide resources, information and guidance on integrating renewable energy into your building portfolio.

Have Questions on PV and Roofing? View the PV Roofing Guide
Renewables Integration – Team Goals

- Strategic use of renewables
- Building load flexibility
- Grid coordination
- Provide resources, information, and guidance on these topics to building owners and managers
Call Agenda

- Introduction & Quick Announcements
  - Rois Langner, NREL

- Technical Presentation: EVs – Building and Grid Integration
  - Myungsoo Jun, NREL’s Transportation & Hydrogen Systems Center

- Technical Presentation: Offering EV Charging at your Building
  - Tristam Coffin, Whole Foods Market

- Discussion and Q&A
  - Rois Langner, NREL
Renewables Integration – Team Players

Technical Team Lead:

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Renewables Integration – Team Players

Technical Team Support:

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Better Buildings Alliance *Renewables Integration* Team

Buildings-to-Grid Working Group

Kick-Off Meeting in Early August

Looking for participants for two studies:

- Portfolio analysis: understand potential for load flexibility (optimized demand management)
- Field study: implementing building load flexibility solutions

Interested? Email us!

Rois Langner: Rois.Langner@NREL.gov
Selam Haile: Selam.Haile@NREL.gov
Announcements

Better Buildings Alliance *Renewables Integration* Team

Team Calls

New topics every other month

Did you miss the last one?

Find it on the Better Buildings Solution Center:


April 9th Call:
- Building load flexibility and grid coordination
- Speakers:
  - Monica Neukomm, DOE
  - Kinga Hydras, GSA
  - Matt Jungclaus & Cara Carmichael, Rocky Mountain Institute

Have questions? Email us!
Rois Langner: Rois.Langner@NREL.gov
Theo Kassuga: Theo.Kassuga@Navigant.com
Presenters

Myungsoo Jun
Researcher, Electrical Engineer
NREL’s Transportation & Hydrogen Systems Center

Tristam Coffin
Director of Sustainability & Facilities
Whole Foods Market
Technical Presentation:
Myungsoo Jun, NREL
EV Charging Overview

Myungsoo Jun
National Renewable Energy Laboratory
US Sales of Plug-in Vehicles (by Model)
US Sales of Plug-in Vehicles (by Year)
Number of PEV’s and Charging Stations
Gas Prices and Electric Vehicle Sales

Month-Over-Month Changes in Gas Prices and Electric Vehicle Sales

[Bar chart showing the comparison between gas prices and electric vehicle sales over time.]
EVSE Impact on Grid

- Residential charging will contribute to a peak during early evening
- 14% LDV adoption scenario in SMUD
  - Voltage violations in 26% substations
  - 17% transformer might need to be replaced

• Demand charges can contribute to significant portions of a company’s utility bill

• In August 2016, demand charges contributed to $90,892 (53%) of NREL’s total monthly bill
  o 17.55 $/kW (Summer rate)

• Minimizing demand from just one 25 kW charger can therefore save up to $438.75 per month.
  o Higher power or more chargers = more opportunity for cost savings.

• Across the U.S. demand charges can rise even higher.
  o Up to 35 $/kW.
Characteristics of NREL Workplace Charging

- 36 EVSE, 165 registered users as of November, 2018
- Average energy consumption per day
  - 253 kWh
- Total Energy for a year
  - 92.5 MWh
- Average unmanaged daily peak demand
  - 134.5 kW
- Average daily peak time
  - 9:04 AM

- NREL delivered 317,433 EV miles based on an average 291.4 Wh/mile (=92.5 MWh / 291.4 Wh/mile) of energy consumed.
• Monthly energy charge by EVSE is quite consistent
• Monthly demand charge is dependent on monthly peak time → controlling charging stations during peak time can reduce total demand and lower monthly demand charge
• Demand charge rate:
  o $14.11/kW for winter & $17.12/kW for summer
• Turning off all the charging stations during peak time could have saved about $5,600
• If peak happens in the morning, cost savings are very significant
User Interface & User Status Information

NREL Charging Station User Data Input

- Car Model: Chevy Volt
- Miles Needed: 20 miles
- Station Number: 10
- Plug Number: A
- Expected Departure Time: 08:30 AM

Send

NREL Parking Garage EVSE Status Display

2/14/2017, 8:22:48 AM

- Departure Time: 4:00:00 PM
- Miles Requested: 45 miles (about 12.6 kWh)
- Energy Delivered: 1.085 kWh
- Remaining Time: 189.714 minutes
- Charging Status: Charging

NREL Garage EVSE Availability Status

2/14/2017, 8:14:16 AM

- Available
- Charging
- Occupied but Occupying
- Occupied without Information

West Side
- South
- East Side
- North (stair to the shuttle stop) →
Case with Extended Peak

- June 19, 2018 had heavy rain in the afternoon and it caused huge increases of campus load due to reduced PV generation
  - More than 1.8 MW increase in less than 20 minutes (1.86 MW at 11:22 AM and 3.7 MW at 11:40 AM)
  - Charge management was active from 11:55am to 12:45pm
    - 50 kW EVSE demand at 11:54 AM and 21 kW at 11:56 AM
    - Maximum 30.5 kW curtailed → $512 savings in demand charge ($16.79/kW)
  - If we had turned off all the EVSE’s during that period, we would have curtailed 49 kW and saved $823. Or If same event happened during morning, more than 90kW could have been curtailed with more than $1,500 of savings.
Demand Charge Mitigation with DC Fast Charger

**Demand Charge**

- Electricity costs based on average demand in 15-minute time frames of the month
- Reduction of peak demand by distributing the loads can save demand charge
- DC fast chargers are not usually adequate for charge management
  - They are for demand of quick charge
  - They should be integrated with a stationary ESS for demand charge mitigation
An upper and a lower bound of energy that is needed for each flexible load gives range of energy for it at each time frame.

The bound is dependent on type or characteristics of device (PEV, ESS, HVAC, etc.)
• Hierarchical and distributed structure
DC Fast Charger and ESS

- 50 kW DC fast charger by Tritium
  - OCPP 1.6 compatible
  - Dual port with one CHAdeMO and one CCS
- 40 kWh stationary ESS by Sharp
- The battery system is tied with the building meter and controls the battery so that the building load does not exceed a certain threshold value
• Building meter is integrated with PV array → reads net building load
• The stationary battery started to discharge power to the grid once DCFC is used →
  o It alleviates load by the DCFC
  o It tries to maintain the average loads below the clipping level
• Charge management system will give benefits for places with large number of EV chargers such as workplace, MDU, shopping malls, etc.
• Charge management will contribute to reduce demand charge in electricity bill.
• For DCFC, integration with ESS will reduce demand charge
Technical Presentation:
Tristam Coffin, Whole Foods Market
Whole Foods Market: The Evolution of Implementing EV Charger Infrastructure

Better Buildings Alliance Renewables Integration
June 2019 Webinar
The Early Days - Electric Vehicle Charging
Electric Vehicle Charging - Today

Charger Count: >350

Fast Charger Count: >50

Stores with chargers: >150
EV Partnerships

• Three primary partners
• Three separate partner models
• Other potential partners
• Host vs. purchase
  • Question of core competency
• Technology vs. provider choice
EV Charging Implementation - Key Questions & Takeaways

- Level 2 vs. DC Fast Chargers
- System and connector consistency
- Parking space turnover and exclusive designations
- Electric sub-metering vs. separate utility meters
  - Demand charges
  - Planning for increased usage
  - Charger expansion
Comments? Questions?

Please share your thoughts!
Thank you!

Email:
rois.langner@nrel.gov

to be added to our listserv.

Stay tuned for announcements on upcoming BBA Renewables Integration Team calls!