NREL
NATIONAL RENEWABLE ENERGY LABORATORY

NREL's Workplace Charging Program

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Department of Energy Laboratories

Office of Science Laboratories

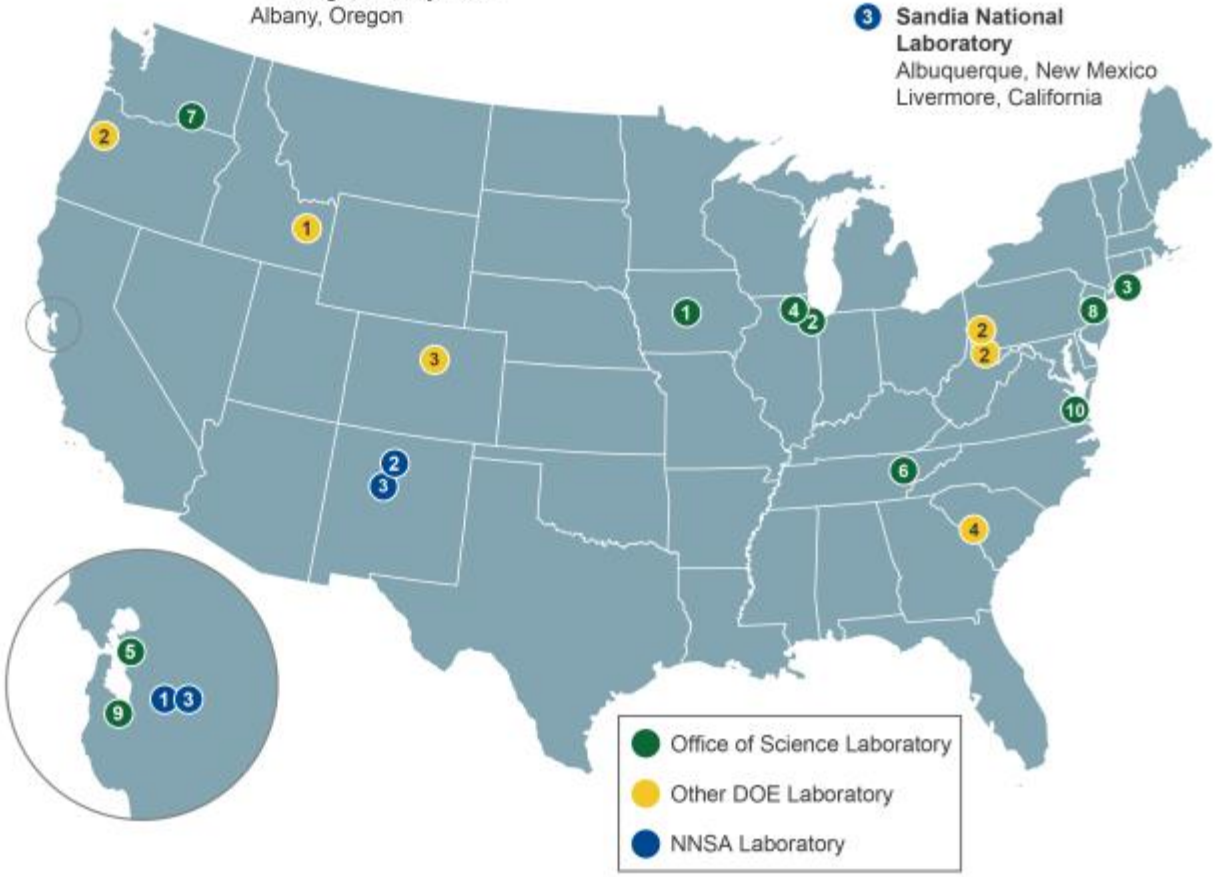
1. **Ames Laboratory**
   Ames, Iowa
2. **Argonne National Laboratory**
   Argonne, Illinois
3. **Brookhaven National Laboratory**
   Upton, New York
4. **Fermi National Accelerator Laboratory**
   Batavia, Illinois
5. **Lawrence Berkeley National Laboratory**
   Berkeley, California
6. **Oak Ridge National Laboratory**
   Oak Ridge, Tennessee
7. **Pacific Northwest National Laboratory**
   Richland, Washington
8. **Princeton Plasma Physics Laboratory**
   Princeton, New Jersey
9. **SLAC National Accelerator Laboratory**
   Menlo Park, California
10. **Thomas Jefferson National Accelerator Facility**
    Newport News, Virginia

Other DOE Laboratories

1. **Idaho National Laboratory**
   Idaho Falls, Idaho
2. **National Energy Technology Laboratory**
   Morgantown, West Virginia
   Pittsburgh, Pennsylvania
   Albany, Oregon
3. **National Renewable Energy Laboratory**
   Golden, Colorado
4. **Savannah River National Laboratory**
   Aiken, South Carolina

NNSA Laboratories

1. **Lawrence Livermore National Laboratory**
   Livermore, California
2. **Los Alamos National Laboratory**
   Los Alamos, New Mexico
3. **Sandia National Laboratory**
   Albuquerque, New Mexico
   Livermore, California



NREL Program Portfolio

Broad Range of Clean Energy Solutions






Energy Efficiency
Vehicle Technologies
Building Technologies

Renewable Resources
Wind and Water
Solar
Biomass
Hydrogen
Geothermal

Systems Integration
Grid Infrastructure
– SmartGrid and RE Grid
Battery and
Thermal Storage

International, Tribal, Federal Agencies, States, Local Communities, Private Sector

Foundational Science

Sustainable Campus Initiatives

- Meet or exceed federal sustainability goals
- Attract a world-class workforce
- Model a sustainable campus and living laboratory
- Maximize the effects of our research while minimizing impacts of doing business

NREL's Campus Transportation Approach

Avoid

- Teleworking
- Web conferencing
- Compressed work weeks

Shift

- Non-motorized
- Public transit
- Rideshare

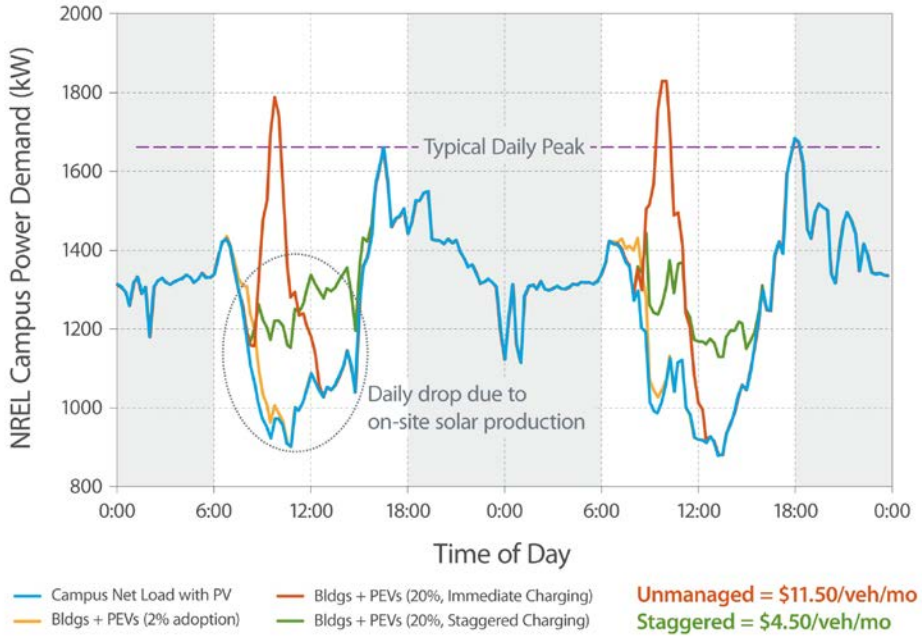
Improve

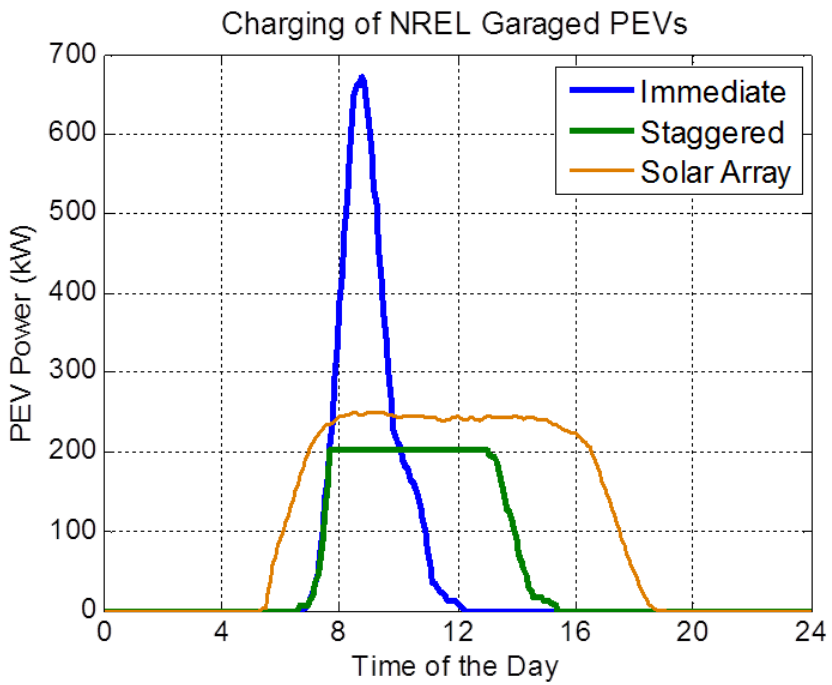
- Alternative fuels
- More efficient vehicles
- Driver training

Background: Incorporated EVSE's into New Parking Garage

- 1,700 car parking garage – consolidated parking for campus
- Design-build, performance based contract
- Design criteria included capabilities for EV charging at 2% of parking spaces and "EV ready" conduit for expansion up to 20%
- 36, L-2 charging ports installed (18 dual port charging pedestals)

Planning for PEVs on a Renewable Campus





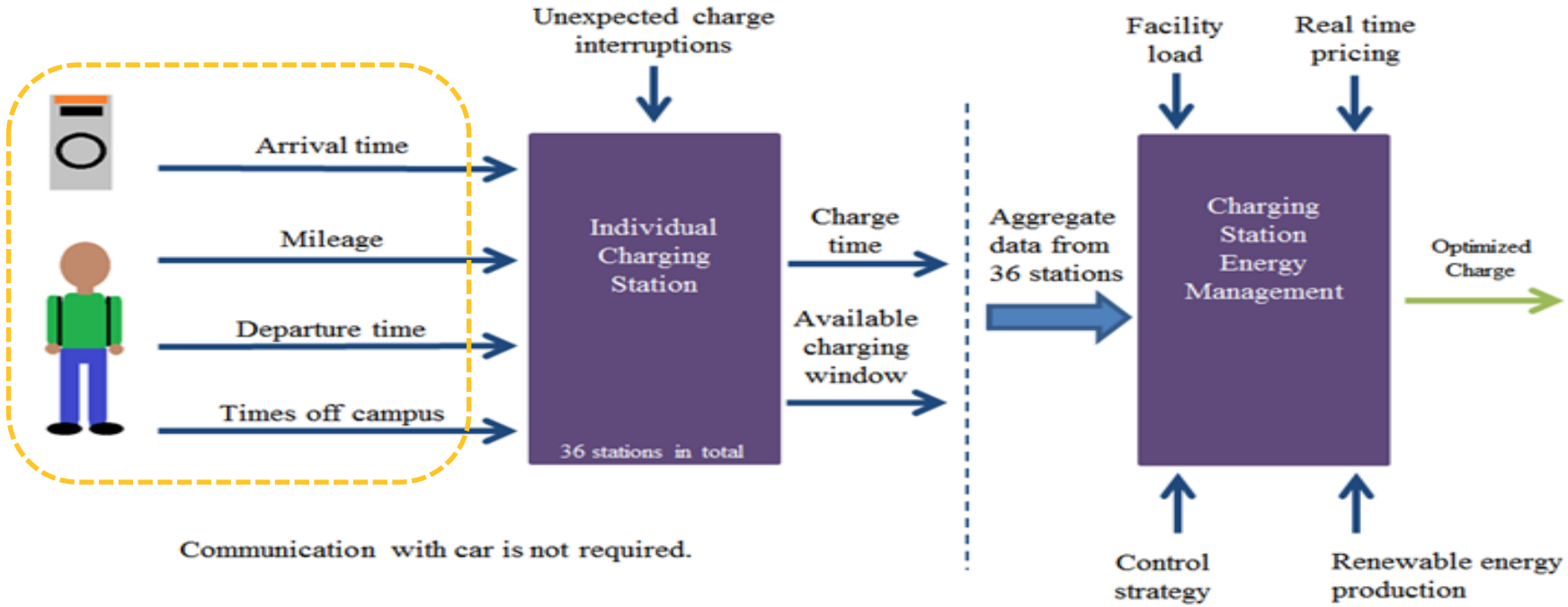
Phase 1: **Pilot Program** (6-mo)

- Alliance advanced estimated electricity costs to DOE for pilot program
- Monitored use and developed long-term funding plan
- Reconciled costs based on actual metering
- 5 registered users (2012)

Phase 2: **Research program**

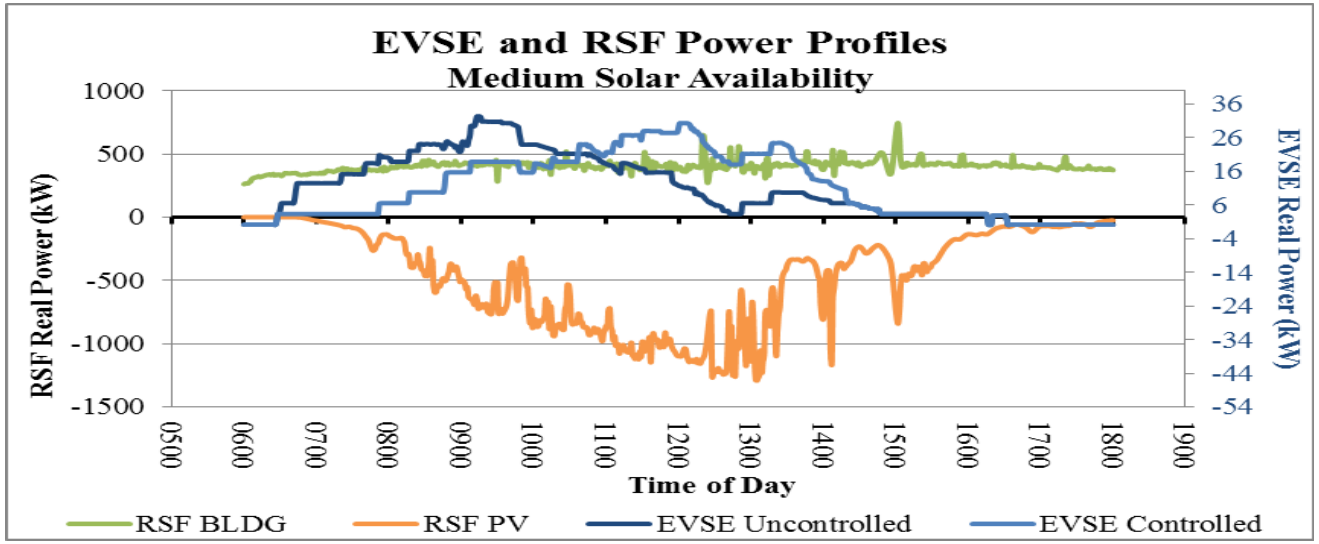
- Employees sign agreement and permit NREL researchers to collect data from EVSEs in exchange for electricity
- 78 registered users (2016)

PEV Charge Management with Renewable Sources at NREL



NREL PIX21661

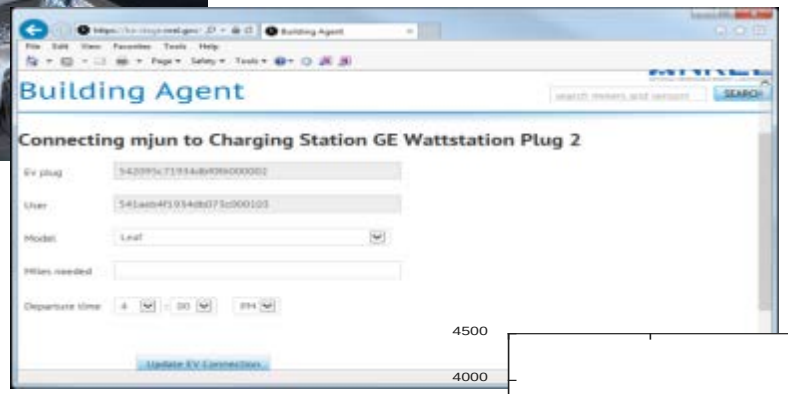
Provide simple interface with least information necessary to create managed individual and aggregate scenarios with status display

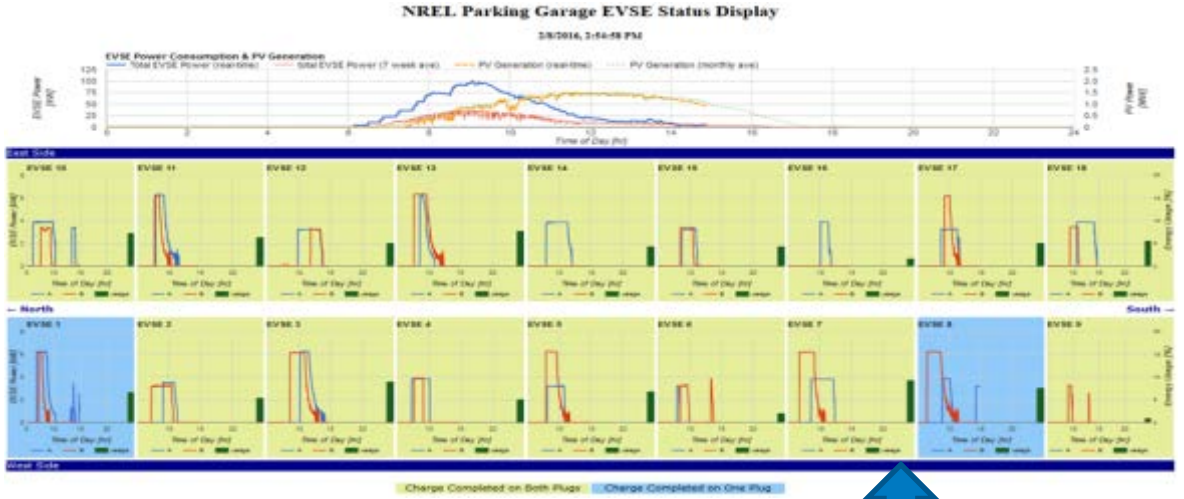


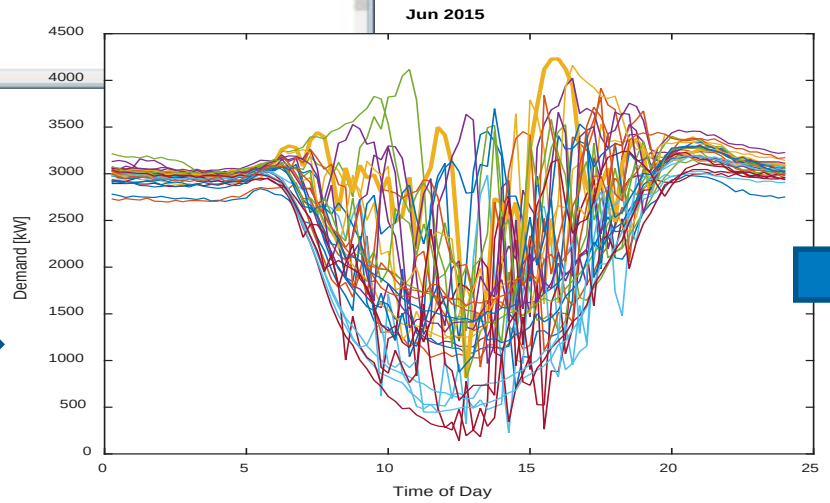
RSF = Research Support Facility

NREL Parking Garage Managed EVSE Experience

- Each station monitored, ~3yrs of data
- Wifi comms to pilot line control
- Manage with respect to campus net load, solar dynamics, demand response, and driver requests

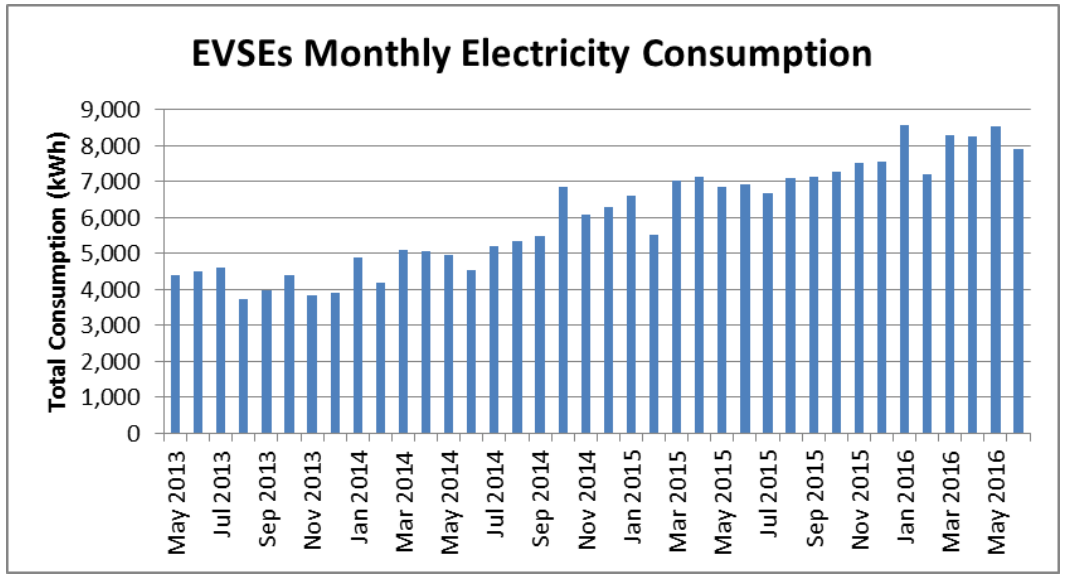






Impacts

- $6,500 annual electricity costs
- 94,692 annual kWh use
- 33.1 $MTCO_2e$ annual GHG savings
- 78 registered users (continued steady growth in EV ownership)



Planning for Future

National Wind Technology Center (NWTC)

- Leveraging existing resources
  - Reuse of solar tree
  - Converting temporary construction outlets
- Planning infrastructure for future EV fleet

Lessons Learned

- Engineering
- Education
- Enforcement

Thank you!

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