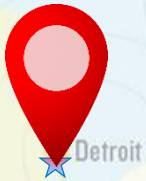
NEXTENERGY

ask us what's next

Business of Plugging In to the Clean Grid Management Briefing Seminar

July 31, 2018

Who we are



NEXTENERGY works with innovators to accelerate solutions which create smarter, cleaner, and more accessible communities and cities.

What we do

accelerate innovative solutions via public-private partnerships

private

DENSO
FCA FIAT CHRYSLER AUTOMOBILES
GM
bp
DAIMLER
QUALCOMM
Ford
WELLS FARGO
BOSCH Invented for life
BEDROCK — DETROIT —
DTE Energy Know Your Own Power
Consumers Energy Count on Us

public

Pacific Northwest National Laboratory
OAK RIDGE National Laboratory
MEDC
U.S. DEPARTMENT OF ENERGY
WAYNE STATE
MICHIGAN STATE UNIVERSITY
NREL NATIONAL RENEWABLE ENERGY LABORATORY
planetM Michigan. Where big ideas in mobility are born.
TARDEC
UNIVERSITY OF MICHIGAN
NETL
Argonne NATIONAL LABORATORY
MI Energy Michigan Agency for Energy
SBA U.S. Small Business Administration
MichiganTech

What we do
build the pipeline to commercialize technology

- NextChallenge: Smart Cities
  - In partnership with Wells Fargo, DTE Energy, and DENSO, NextEnergy crowd-sourced smart cities solutions within Mobility and Smart Buildings, Homes, and Infrastructure which could be demonstrated in Detroit.
  - *Awardees: Callida Energy, Smart Cone, Switch Source*
- EV Infrastructure
  - In partnership with FCA and Mercedes Benz, NextEnergy tested, validated and demonstrated EV's to determine technology feasibility and economic viability for grid applications.
  - *Partners: Coritech Services, Mojio, Oxygen Network, Iotecha,*
- Venture Services
  - With support from the BP Ventures, DENSO Ventures, and the Michigan Economic Development Corporation, NextEnergy provides venture support services to over 50 clients per year.

Demonstration and Test Platforms

EV Infrastructure

The campus' EV infrastructure includes 10 electric vehicle charging stations (bi-directional, wireless, fast, etc.), and supports RD&D of next generation infrastructure, including vehicle-to-grid, vehicle-to-home, vehicle-to-building and wireless charging.

Connected Home

NextHome is a 400 square foot "living lab" that is part smart home, part distributed generation and part direct current and is accessed by many different industry partners to test and demonstrate IoT technologies.

Microgrid

The microgrid Pavilion is one of the first microgrid research pavilions in the nation, capable of mimicking any grid scenario in the world for testing and validating advanced energy and mobility technology solutions.

Simplifying Charging Capacity and Infrastructure

Understand use and ownership models

- How EV's are or will be used (examples)
  - Personal vehicles and Ownership
  - Fleets
    - Mobility as a service
  - Long range EV travel
  - Autonomous

Personal Vehicles and Ownership

Charging Experience and Usage Model

- Generally the most economical charging for personal EV's is at overnight at a single family home or with a dedicated charger
  - Level 1 charging typically adds 3-5 miles of range per hour
  - Level 2 charging typically adds 10-25 miles of range per hour

- If you are a typical commuter, you can satisfy most of your charging needs at home
  - Typical daily commuting can be satisfied via charging at home overnight

Personal Vehicles and Ownership

Charging Experience and Usage Model

- What if you live in a multi-family unit without your own dedicated charger?
  - Can charging stations be provided at your residence?
  - Can workplace charging be sufficient?
  - Can you access charging at curbside or in public parking facilities?

- Level 2 charging can satisfy significant demand
  - Level 2 charging can be integrated into and operated at a lower cost for workplace and public parking applications

Fleet Applications

- Significant opportunities exist for EV's in fleet applications such as local delivery, campus shuttles, municipal use, taxis, etc.
  - Defined routes, central station charging/refueling, etc.
  - L2 and some form of DC Fast Charging can provide significant benefit
  - DC Fast Charging can minimize dwell time as current chargers can provide up to 100 miles of range per hour and technology to fully charge vehicles in 10-15 minutes is in development
  - DC fast charging requires higher integration costs and operational strategies may be required to minimize demand charges and peak energy pricing

Mobility as a Service

- In a mobility as a service model, vehicle range, dwell time, and charging location are all important factors.
  - Some car share deployments require a charging session to be initiated to end a trip
  - Location of charging stations can be a big factor in success of deployments
  - Is DC Fast Charging required to minimize dwell time and ensure enough range for the next trip?
  - Stations should be networked to provide additional information to operators and users

Long Range EV Travel

Can fast charging support long range and interstate travel?

- Is a 10 minute charge time sufficient for long range travel?
- What are the required infrastructure and grid distribution upgrades to support 350-400kW charging? How many plugs will be needed at each site?
  - A typical fueling station has 6-12 dispensers (2.1 to 4.8 MW for EV fast charging)
  - Where are the best places to site these stations (grid upgrades, travel patterns, economic development opportunities)?
  - Who owns and operates them?

DC Fast Charging
Fueling Station of the Future?

- Can we have electric fuel stations similar to petroleum stations today?
  - If you have a 200 mile + range vehicle in a city, can you conveniently charge at a station once or twice a week?
  - Upgrading stations in a city can be a challenge (Cost of the electrical service upgrades)
  - Do Microgrid based stations with integrated storage create greater operational flexibility?
  - Petroleum stations make more margin off of sales inside the store than they do in fuel
    - What happens to their business model if we see a significant penetration of EV's?

Automation

- Who plugs in if no one is driving the vehicle?
- L2 wireless charging can be ideal for residential, workplace, and public charging applications
  - Automated valet parking can be added value for users
  - Can create a charging que for vehicles at workplace and public lots
  - Optimize charging for fleets in off peak hours

Integrating charging capacity into the grid

- Many options to consider in planning for the future
  - L2, DC, DC Fast Charging, Wireless
- Integrating charging into densely populated cities can be more challenging
  - Dedicated space for charging stations
  - Distribution system and site upgrades
- Ownership and operating models need to be considered
  - Private sector, Public sector, Utility
  - Role of Smart Charging and Networks

Smart Charging

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Phase 1 - ISO-15118 | Phase 2 | Contact

Scenario:3 | Part:5 | Back | Reset | Next

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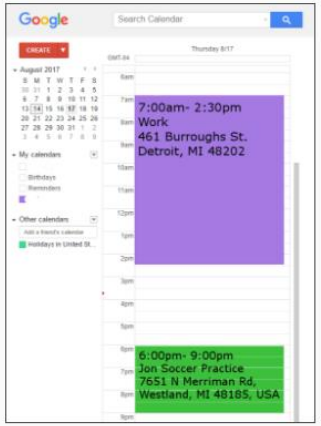
Opt-In Negotiated Demand Response (DR)



DTE Demand Response	
DR Status:	Disabled
Start Time:	3:00 PM
End Time:	5:30 PM
Incentive:	12 Credit/kWh
Power Limit:	2 kW

Home User	
Name:	Debra
Billing ID:	0000 555 2514 8
Power Usage (kW):	4.6kW
Daily Incentive:	0 Credit

Electric Vehicle Charging Station	
Location:	NextHome
EVSEID:	BB-3675-1
Status:	Charging
Power (kW):	3.1kW

Vehicle	
Vehicle Type:	ISO 15118
Contract ID:	US-OXY-002023-5
Required Energy (kWh):	14kWh
State of Charge (%):	30%

ISO-15118 Partners

CONNECTED DETROIT INNOVATES | smart | Mercedes-Benz | oxygen INITIATIVE | DTE Energy | CORITECH SERVICES

Smart Charging

Project Trends Alarms Settings Help

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Campus Power Overview

Outside Temp: 79.2 °F
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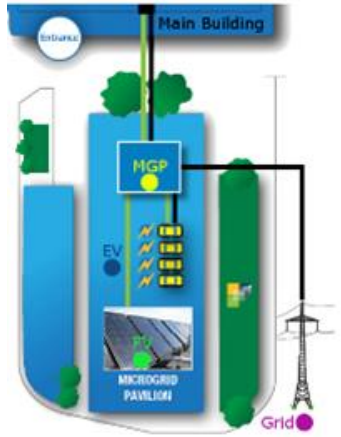


ELECTRIC VEHICLES

Total Power -77.5 kW Load Power Generation

Vehicle	Charging / Discharging	Power (kW)/ Status	SOC (%)
EV #1		-18.7	25
EV #2		-19.4	23
EV #3		-20.4	26
EV #4		-18.7	64

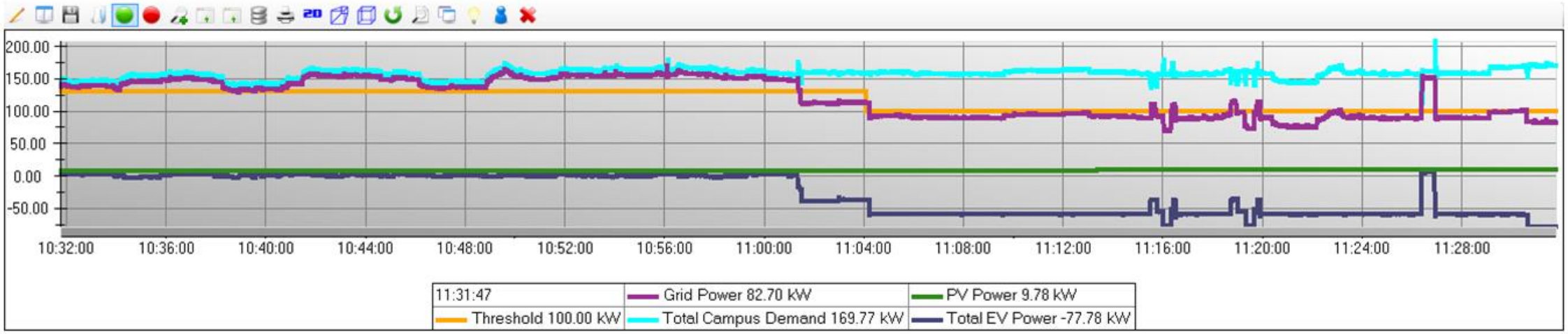
MicroGrid Pavilion

Power:

Grid	84.1 kW
Solar Output	9.8 kW
Electric Vehicles	-77.5 kW
Total Campus Demand	171.4 kW

Test Parameters:

Threshold (kW)	100.0 kW
Scenario Name	Demand Mitigation_EVs with 70% SOC (#4)



Optimizing Smart Charging

- Standardized communication protocols and packages which work for multiple industries
  - Utilities, Building and Home Automation, OEM's, Network Operators
  - Policies which allow for more value to be created for all of the above
    - $, cyber security, personal choice and preference, etc. .

Impact on Vehicles

- Integration with other communication protocols and applications
- How many charging options are included by the OEM
  - L1/L2, DC, DC Fast Charging, and Wireless
  - Weight, Volume, and Cost are all factors

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