Document Overview

This document provides examples of NWAs that assist in grid management, including:

- BTM Solar
- Utility-Owned Solar and Storage
- Electric Vehicles
- Residential Demand Response (DR)
- Consumer and Industrial (C&I) DR and Energy Efficiency (EE)
- Aggregated mix of DERs/Micro-Grids
- Batteries

BTM Solar

1. Southern California Edison (SCE)

- What: Partnership with Sunrun, residential solar provider, aggregating residential solar PV installations for grid-management purposes.
    - SCE will send signals to Sunrun during high-demand events such as extreme heat waves when the energy grid is strained. In response, Sunrun will dispatch energy from thousands of its Brightbox solar-powered battery systems installed in the SCE territory, providing five megawatts (MW) of energy capacity to help support the overall energy system. The same solar-powered home batteries will also provide reliable backup power to these households if the power goes out.
- Goal: Increase grid resilience and reduce power costs
    - By bundling the power from these batteries together to create a “virtual power plant”, Sunrun will release stored solar energy to the grid when it’s needed most, lowering the overall cost of power and reducing critical strain on the energy system.
- More information HERE

2. Liberty Utilities, New Hampshire

- What: Utility to provide solar power backup battery in demo to reduce system peak demand with customer-sited batteries
    - In Phase 1, which will last through 2022, Liberty Utilities will offer 200 Tesla Powerwalls. Each participant takes two batteries and controller software at a one-time.
- Goal: Cut peak system demand and deliver a positive net present value (NPV) to customers
    - The battery storage systems' controllers will allow Liberty access when it anticipates system demand will peak. Up to four times per month, the utility can give participants a one-day notice and discharge their stored electricity to avoid high charges from system operators.
- More information HERE and HERE

3. **Green Mountain Power (GMP)**

- What: Tariff, developed in partnership with solar companies
    - Offers up to $10,500 in upfront incentives to customers purchasing their own batteries through local installers.
      At least 500 customers can enroll each year, up to five MW of stored energy annually.
    - Customers enrolled in this program also help to lower costs for all GMP customers by providing access to stored energy during peak demand times.
- Goal: Cost-savings, resiliency
    - *This work to drive down costs for all customers and increase resiliency and safety is always important but is highlighted even more now during this extraordinary time. We are pleased to offer affordable energy storage solutions for more residential customers in a way that saves money for all GMP customers* - Mari McClure, GMP's president and CEO.
- More information HERE

Utility-Owned Solar and Storage

1. **Liberty Utilities**

- What: Replacing high fire-risk distribution lines with solar + storage microgrids
- Goal: Cost-effective alternative to hardening lines
- More information HERE

2. **Ozark's Electric Cooperative, Arizona**

- More information HERE.

3. **Duke Energy (2 Projects)**

- What: Mount Holly micro-grid
    - 100-kW PV solar system with smart inverter capabilities
    - 250-kW battery energy storage system
    - 10kW solar carport with EV charging capabilities
    - 500-kW automated resistive load-bank
    - Instrumented and automated distribution grid equipment, such as reclosers, smart meters, sensors and PMUs
    - Wireless devices, supporting Wi-Fi, 4G LTE, 900 MHz RF and AMI Mesh
    - An envision room with appliances and smart breaker monitoring and control capabilities
    - An operations room with commercial application software to monitor and control the microgrid components
- What: Madison County
    - In the town of Hot Springs, the company will proceed with a solar and battery-powered microgrid system that will help improve electric reliability,

provide services to the overall electric system and serve as a backup power supply to the town of more than 500 residents.

- Goal: Meet power demand by balancing public input, environmental impacts and the need to provide customers with safe, reliable and affordable energy
- More information HERE and HERE.

Electric Vehicles (EV)

1. National Grid

- What: Off-peak rebate program
- Goal: "Given that EVs are a uniquely high-powered and, in many cases, flexible load, the Off-Peak Charging Rebate program will help inform time-varying rate designs (e.g., defining off-peak time-period windows) … [which can enhance] technical potential and effectiveness of load management technique."
- More Information HERE

2. Southern California Edison Company

- What: Automated Load Management (ALM), Type I
    - In Type I ALM, Energy Management System (EMS) is used to manage energy costs or respond to grid conditions.
    - All EV Supply Equipment (EVSE or charging stations) installed in SCE's Charge Ready programs are Type I ALM capable, with network connection and EV Service Provider (EVSP) operator in place. Type I capable systems can be configured by the customer to reduce electricity costs, for example, by changing price or capability according to time and utility tariff.
    - SCE has 140 sites and 2,667 ports participating in Type I ALM within our territory. The current list of sites is funneled through the Charge Ready Pilot & Bridge program
- Goal: Connect with DR system for T&D assistance
    - When also configured to connect to SCE's DR system, as demonstrated in the Charge Ready DR Pilot, the systems can be signaled to perform a grid support function when such action is needed based on grid conditions. In this manner, generation, transmission, and distribution impacts are reduced.
- More information HERE.

3. PG&E

- What: EPIC 2.03B - Smart Meter - Vehicle to Home – Technology demonstration (completed)
- Goal**:** The goal of this project was to complement EPIC 2.03 solar photovoltaics (PV) smart inverter assessment project by including electric vehicle related technology. The Vehicle to Home demonstration focused on charging and discharging of the EVs in response to a demand respond event (providing load drop by islanding the house) or hard islanding events in different configurations.
- More information HERE.

4. **PG&E**

- What: EV Charge Network Program – Infrastructure (active)
    - Make-ready and utility-owned charging infrastructure for workplaces and multi-family dwellings. Includes incentives for charger purchase in some customer segments.
    - Up to 4,500 level 2 chargers deployed over 3 years.
    - The program offers Automated Load Management (ALM) services to interested hosts. It is currently fully subscribed.
- More information HERE.

Residential Demand Response

1. **O&R**

- What: Demo approved by DPS Staff on September 20, 2021
    - Utilizes Nimble – a cloud-based, grid-edge flexibility platform from Packetized Energy – to transform smart devices into resources that respond in real time to the grid's rapidly changing conditions.
    - Load can be shifted away from high-price periods towards low-price periods, resulting in significant savings and providing additional grid services.
- Goal: Integrate renewable energy onto the electric grid by providing increased stability and management of load.
- More information HERE

2. **Central Hudson**

- What: Alleviate demand constraint through incentive-based model
- Goal: Defer new infrastructure in three targeted zones for five to 10 years, reduce future bill pressure for customers, create additional earnings opportunities for Central Hudson
- Outcomes:
    - Exceeded the total, first-year MW target for all three zones, achieving 5.9 MW of load reduction compared to the target of 5.3 MW.
    - Achieved its 50% load reduction milestone of 8.0 MW in October of 2017 with approximately 3,000 active devices deployed, nine large C&I customers enrolled, and a 40% adoption rate within the Fishkill area.
- More information HERE

3. **OPower**

- What: Measures customer energy use and then applies behavioral science tactics in digital reports to customers – such as providing tips and normative comparisons and shareable badges and accolades – to incentivize energy saving and shape demand trends favorable to the utilities.
    - Behavioral demand response
    - Behavioral load shaping

  - Peak time rebates
  - Home energy reports
- More information HERE

4. PG&E

- What: Behind the meter storage
- Goal: Evaluate the technical ability of BTM energy storage to reduce peak loading or absorb distributed generation on utility distribution feeder(s), with sufficient reliability for distribution grid operations
- More information HERE

5. National Grid

- What: Rhode Island's Tiverton/Little Compton Pilot
- Goals: The electric load in Little Compton and southern Tiverton, Rhode Island is served by two feeders from a substation in Tiverton which is part of the Providence Power Supply Area (PSA). It was projected that the peak demand would grow by approximately 2.6 percent annually on a weather-adjusted basis (RI PUC 2012b). As a result, one of the two feeders was projected to be over capacity by 2014 and the second by 2021.
  - To address this issue, construction of a third feeder at the Tiverton substation was planned for 2014. At the time of the initial analysis, the upgrade was estimated to cost $2.93 million in that year (RI PUC 2013b). The load reduction necessary to defer the construction of the third feeder would gradually increase from 150 kW in 2014 to 1 MW in 2018.
  - To be successful, any NWA would need to deliver this amount of sustained load relief on the two existing feeders. Load shape curves showed that the days in which the load peaked were primarily weekday afternoons and evening during the summer. The cumulative net present value of deferring construction of the new substation feeder for four years is $653,273 (RI PUC 2013b).
  - National Grid designed a pilot project using a combination of targeted energy efficiency measures and demand response to reduce peak energy consumption; the pilot is estimated to cost $3.4 million over its 6 year life and generate $6.3 million in benefits to Rhode Island customers from lower energy and capacity costs and savings from the deferred substation feeder.
- Outcome: Snapshot of first few years

Year	Unique accounts	Central AC thermostats installed	Window AC plug load devices installed	% of 2014 savings goal achieved	% of total savings goal achieved
2012	158	35	0	31%	5%
2013	437	132	145	201%	30%
Total	595	167	145	233%	35%

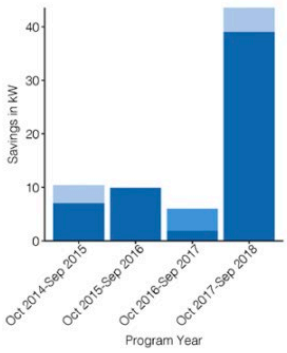
More Information HERE.

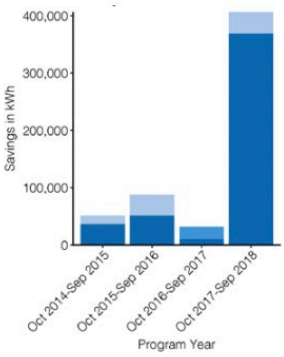
Commercial and Industrial (C&I) Demand Response (DR) and Energy Efficiency (EE)

1. **RG&E**

- What: Commercial System Relief Program (CSRP)
    - Participants are paid to save energy in alignment with the grid operation goals of the utility.
- More information HERE.

2. **Consumers Energy**

- What: Swartz Creek Energy Savers Club
- Goal: Demonstrate feasibility of using targeted Residential and C&I EE and DR to reduce peak load on Swartz Creek substation to defer future capacity upgrade
    - Reduce peak load by 1.4 MW in 2018
    - Defer $1.1M in future capital spending
- Outcome: Total demand reductions due to EE programs was ~795 kW in City of Swartz Creek, ~363 kW on Swartz Creek substation
    - Residential demand reductions were due to EE and DR programs at key times of the year
    - C&I customers saw reductions in both demand and total usage as shown in the graphs below. However, the demo failed to attract enough C&I for DR and only utilized EE.
        - The utility found that direct outreach by company is helpful, particularly with C&I customers; Company representatives can guide through options and process.
        - 

        - 

    - More information HERE and HERE.

3. **Consumers Energy**

- What: Four Mile Substation, Pilot
    - Involves 750 C&I participants comprising 82% of load share
- Goal: Leverage targeted EE an DR to address distribution capacity needs, building on lessons learned from Swartz Creek
    - Reduce peak load by 0.5 MW

    - Defer $2.5M-$3M in future capital spending
        - Primary Selection Criteria:
        - Estimated Load Relief Needed 5-20%
        - Upgrade Cost $1M-$3M
        - Project need date 3-5 years out
- More Information HERE

Aggregated Mix /Micro-grid

1. **Central Maine Power**

- What: Mix of NWA solutions to address forecasted load concerns.
    - 500 kW
    - 3 MWh Convergent supplied battery energy storage system (BESS)
    - 250 kW of Ice Energy's thermal storage units
    - 500 kW, diesel-fueled back-up generator
    - EE commercial lighting
    - Rooftop solar PV systems
- Goal: Address sub-transmission constraint and reliability without requiring the traditional option of a $1 billion transmission line project, due to environmental concerns.
- Outcomes:
    - Project demonstrated reliability benefits comparable to a transmission line
    - Project ended in 2018 because electric load growth did not materialize as originally forecasted. Boothbay region load never reached forecasted levels, so full NWA deployment was not required.
    - Maine ratepayers saved over $12 million compared to a stranded transmission asset that turned out was not needed.
- More information HERE

2. **PG&E**

- What: Micro-Grid
- Goal: Avoid fire hazard
    - Quote from VP of engineering: "*PG&E is eager to deliver the benefits of remote grids to our customers, and we intend to expand the use of stand-alone power systems as an alternative to certain existing distribution lines, providing enhanced reliability with a lower risk profile and at a lower total cost*"
- More information can be found HERE, and I think we can contact Maureen/Torrey on the ICF team as well.

6. **Con Edison → could fall under aggregation as well.**

- What**:** The Brooklyn Queens Demand Management (BQDM) program resulted from a settlement in Con Edison's 2013 rate case. Rising electricity demand in BK and Queens → capacity constraint on a portion of its grid that could overload existing infrastructure and lead to reliability concerns.

  - **"***The BQDM Program, as described in the Company's petition for approval, was designed to address a forecasted overload condition of the electric sub-transmission feeders serving the Brownsville No. 1 and 2 substations with 17 MW of demand reduction from traditional utility-side solutions and 52 MW from non-traditional customer-side and utility-side solutions by the Summer of 2018. 2 The impacted area, the BQDM Area, comprises locations served by the Brownsville 1 and 2 Area Substations in Brooklyn and Queens and includes the three electrically independent networks of Ridgewood, Richmond Hill and Crown Heights*."
  - INCLUDES**:**
    - Customer-side solutions programs
    - Small-Medium businesses program
    - Multifamily Energy Efficiency Programs
    - Commercial and Industrial EE Programs
    - Residential EE Programs
    - Combined Heat and Power (CHP)
    - Emerging Technologies
- Outcome SNAPSHOT [ongoing]:
  - 52 MW Peak load reduction for summer 2018 via 22.5 MW from Customer-Sided Solutions and 18 MW from Utility-Sided Solutions.
    - CVO efforts "outperformed based on voltage reduction optimization," from 1.5% to 2.5%-3.0%.
    - ConEd projects that it will achieve customer-side load reductions greater than the 41 MW cumulative level by 2021
- More information HERE, HERE and HERE.
  - The 2021 BQDM Implementation Plan HERE is a good source for updated data if requested.

Battery Projects

1. **O&R**

- What: Part of Pomona NWA Project, battery storage project in Rockland County.
- Goal: Help O&R maintain reliable service for customers, reduce costs and incorporate new tech to maintain efficient, resilient, reliable and sustainable electric operations.
- More information HERE.

2. **Con Edison**

- What: Con Edison has dispatched two lithium-ion battery systems dispatching on their queue in Staten Island and the Bronx.
- Goal: Reliability via shaving peak demand.
- More information HERE

3. **Arizona Public Service**

- What: Battery Energy Storage System (BESS)
- Goal: Address load growth and consequent thermal constraint as an alternative to rebuilding 17 miles of distribution lines of rough terrain.
- Outcomes:
    - Reliable peak shaving service on the thermally constrained feeder during the summer of 2018.
    - Cost-effective solution for APS to serve the rural community, compared to reconductoring of the line.
    - Battery project designed with the capability to add energy capacity as the need arises over the next five to 10 years.
- More information HERE.

Appendix – Additional Links

Joint Utilities of NY EV Make-Ready Pilot HERE
National Grid NWA Pilot Proposal Write-Up, 2016 HERE
Summary of Lessons Learns from APS's utility-owned solar project HERE
Initial Report on New York Power Grid Study HERE
DER Aggregation Pilot Program, Maine, HERE
DER Aggregation Pilot Program, Arizona Public Service and Energy Hub, HERE and HERE
Central Hudson Peak Perks, DER Aggregation, HERE