Committee on Energy Resources and the Environment

This session will begin at 1:45 p.m.
Demand Flexibility: Let's Figure it Out Now

**Panel I: The Utility Experience**
*July 17, 2023 | 1:45-2:45pm (CT)*

**Moderator** - Hon. Lillian Mateo-Santos, Puerto Rico

**Introduction** – Elliott Nethercutt, NARUC Center for Partnerships & Innovation

**Panelists**
Amadou Fall, Chief Operating Officer, North Carolina Electric Membership Corporation (NCEMC)
Tom Hines, DSM Strategy Consultant, Arizona Public Service
Michael Hubbard, Manager Energy Conservation, Dominion Energy
Yoh Kawanami, Director, Customer Energy Resources Operations, Hawaiian Electric Company, Inc.
What is Demand Flexibility?

- **Efficiency**: Ongoing total electricity use
- **Load Shed**: Curtailing customer use during periods of high demand
- **Load Shift**: Shifting electricity use from periods of high to low system demand
- **Modulate**: Short-term usage adjustments to maintain power quality needs on the distribution system

Source: DOE/LBNL, modified by NARUC staff
Managing More Complex Demand-Side Resources

- **Virtual Power Plants (VPPs):** an aggregation of small-scale, distributed energy resources, including PVs, Non-utility storage, EV chargers, and smart/responsive devices (water heaters, thermostats, etc.)

- **Distributed Energy Resources Management System (DERMS):** platforms to aid distribution system operators in the management of grids with high levels of distributed energy resources

- **Advanced Metering Infrastructure (AMI):** a two-way communication system to collect detailed metering information throughout a utility's service territory. AMI can be used to provide more advanced measurement and verification (M&V) of data
Demand Flexibility Considerations for Utilities

- Financial incentives, rate of return (fixed charge vs. alternative rate design)
- Refining rate structures so that customer prices reflect shifting utility investments
- How will DF compliment the changing generation mix?
- Interplay with integrated resource plans (IRP)
- Alignment with distribution system plans and other grid modernization initiatives
- Consideration for rapid electrification (EV charging)
- Leveraging measurement & verification tools; improved data granularity and visibility
- Coordination with regional grid operators; involvement with market design
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Demand Flexibility: Let's Figure it Out Now

The Utility Experience

NARUC Summer Policy Summit - July 17, 2023

Amadou Fall – NCEMC COO
1M
Households and businesses served by NC Electric Cooperatives

93
Counties we work in around the state of North Carolina

26
Distinct member-owned, not-for-profit cooperatives

- Flexible Demand Response Programs
- Microgrids
- Battery Energy Storage Sites / Planned
- Solar: Community / Utility Scale / with Storage
<table>
<thead>
<tr>
<th>Program Name</th>
<th>Connect to Save</th>
<th>Customer-owned Generation</th>
<th>Substation Batteries (BESS 1.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eligible Customers and # Enrolled</td>
<td>Residential customers with central electric HVAC</td>
<td>Residential and C&amp;I</td>
<td>Member co-op substations</td>
</tr>
<tr>
<td>End Use Equipment</td>
<td>Direct installed smart thermostat (Ecobee, Nest, or Honeywell)</td>
<td>Existing fossil-fired whole home or C&amp;I scale generators</td>
<td>2 hour duration lithium-ion batteries: 2.5 MW/5 MWh and 5MW/10MWh</td>
</tr>
<tr>
<td>Dispatch Type</td>
<td>Utility</td>
<td>Utility</td>
<td>Utility</td>
</tr>
<tr>
<td>Grid Services Provided</td>
<td>Peak management, resource adequacy</td>
<td>Peak management, resource adequacy</td>
<td>Peak management, resource adequacy</td>
</tr>
<tr>
<td>Timing/Duration of Operation</td>
<td>Any day/time; two hour notice; +/- 3 degrees for 3 hours; pre-cooling / pre-heating used if available; max 6 events in a month; max 48 events per year</td>
<td>Any day/time; 1 hour notice; min duration 1 hour; max duration 8 hours; annual limit of 60 hours</td>
<td>~8 events per month. Nov to Mar 2 hour duration due to shorter system peak window. Apr to Oct 3 hour duration due to longer system peak window</td>
</tr>
<tr>
<td>Compensation and Penalties</td>
<td>$50 annual gift card to customer if they opt out &lt;=5 times</td>
<td>$/kW-mo capacity payment to member co-op who then passes a portion to customer. Non-performance subject to claw back.</td>
<td>$/kW-mo credit to member co-op host Additional credit paid based on MW reduction at time of monthly billing peak (aka performance credit).</td>
</tr>
<tr>
<td>Est Annual Results (kW, kWh, $)</td>
<td>13,000 devices installed, avg load reduction 18 MW</td>
<td>64 MW load reduction</td>
<td>40 MW load reduction for 2 hours</td>
</tr>
</tbody>
</table>
Demand Flexibility: Let's Figure it Out Now: The Utility Experience (Panel I of II)

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- Michael Hubbard, Manager Energy Conservation, Dominion Energy
APS Overview

*Arizona’s largest and longest serving utility, serving 1.3 million customers in 11 of Arizona’s 15 counties*

- **Balanced Resource Mix**
  - High penetration of rooftop and utility scale solar
  - Member of regional Energy Imbalance Market (EIM)
  - Customer sited resources provide up to 25% of total resource needs by 2035 (2020 IRP)

- **Successful Customer Adoption of TOU Rates**
  - >60% of residential customers have opted for TOU or TOU+Demand rates

- **Clean Energy Commitment**
  - Deliver 100% clean and carbon free energy by 2050 (currently >50% clean)
  - Clean, affordable, reliable and customer focused

- **Award Winning Portfolio of Customer DSM Programs**
  - Use multiple tools to drive demand flex (behavioral, rate responsive, direct dispatch DR)
  - Reduce peak, lower emissions, integrate renewables, load shift, pilot ancillary services
  - Customer centric delivery approach – drive value and ease of participation

- **DSM Portfolio Accomplishments**
  - Reported 322 MWs/354,000 MWhs savings, $42 million in net benefits in 2022
  - National awards – AESP, ENERGY STAR, ESIG, PLMA, SEPA
### APS Demand Flexibility Customer Programs

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Cool Rewards</th>
<th>Peak Solutions</th>
<th>Battery Pilot</th>
<th>Water Heater Controls</th>
<th>Energy Saving Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eligible Customers and # Enrolled</td>
<td>Residential 78,000 T-stats</td>
<td>C&amp;I ~80 customer sites</td>
<td>Residential ~665 homes</td>
<td>SF/MF Residential ~2000 homes/apts</td>
<td>320K Residential voluntary opt out</td>
</tr>
<tr>
<td>End Use Equipment</td>
<td>HVAC/Smart T-stats</td>
<td>HVAC/Process/Misc</td>
<td>Batteries</td>
<td>Elec Water Heaters</td>
<td>Misc/All</td>
</tr>
<tr>
<td>Dispatch Type</td>
<td>DR events, EnergyHub</td>
<td>Customer responds to DR event calls</td>
<td>Rate response, DR events</td>
<td>Rate response, load management</td>
<td>Voluntary calls on peak days</td>
</tr>
<tr>
<td>Grid Services Provided</td>
<td>Peak demand, reliability</td>
<td>Peak demand, reliability</td>
<td>Load shifting, peak demand, solar integration, location, ancillary</td>
<td>Load shifting, peak demand, solar integration</td>
<td>Peak demand, reliability</td>
</tr>
<tr>
<td>Timing/Duration of Operation</td>
<td>Up to 20x/summer, 2-3 hour events</td>
<td>Up to 18x/summer, up to 5 hour events</td>
<td>Up to 100x/year, up to 4 hour events</td>
<td>Daily management around TOU rates</td>
<td>Up to 5x/summer, focused on peak</td>
</tr>
<tr>
<td>Compensation and Penalties</td>
<td>$75 sign up, $35/yr No penalties for opt outs</td>
<td>~$40/kW + $.09/kWh (PFP)</td>
<td>$500/kW up to $3750/home for 3-year commitment</td>
<td>Free device/install for MF properties</td>
<td>None</td>
</tr>
<tr>
<td>Est Annual Results (kW, kWh, $)</td>
<td>123 MWs</td>
<td>52 MWs in 2022</td>
<td>&lt; 1 MW</td>
<td>1 MW</td>
<td>5.5 MWs</td>
</tr>
</tbody>
</table>

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12 Subject to Change – For Discussion Purposes Only
Demand Flexibility: Let's Figure it Out Now: The Utility Experience (Panel I of II)

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2022 Highlights

• ~$1.4 billion spend with veteran, women, and diverse businesses
• Donated $45 million in the communities where we operate
• Our employees volunteered 95,000 hours of their time

About Us

• Headquartered in Richmond, VA
• Operating in 16 states and serving more than 7 million customers with electricity or natural gas
• Committed to Net Zero emissions by 2050
• 2nd largest solar fleet in the U.S.
Residential Demand Response Programs

1. **AC Cycling (Smart Cooling Rewards) **RECENTLY CLOSED
   - Cycling of HVAC units: 4-hour events, up to 30 events or 120 hours during summer months (June – Sept.)
   - Enrollment: ~100,000+ customers. Final year ~54,500 participants.
   - Incentive: $40. Reduced to $35 to maintain cost effectiveness.
   - Operated: 2010-2022
   - Results: Initial 1kW+/participant; final year diminished to 0.49kW

2. **Wi-Fi Thermostat Demand Response**
   - Cycling of thermostat: 4-hour events, up to 45 events, must participate in 75% of hours called; focus summer months
   - Enrollment: ~5300 (increasing dramatically with recent product additions)
   - Incentive: $35 first year; $10 each year thereafter
   - Results: 0.94 kW/participant (recent EM&V)
Residential Demand Response Programs

3 EV Demand Response
- Cycle qualifying EV Chargers (Internet connected and activated by manufacturer); 4-hour events; 45 max per year; 15 max per month
- Enrollment: 686 first year. Target of ~3600 over 15 years
- Incentive: $40 annually
- Anticipated Results: 0.165MW to 1.67MW over 15 years

4 Water Savings (heat pump water heater)
- Cycling of water heater: 4-hour events, up to 45 events, must participate in 75% of hours called; focus summer months
- Enrollment: ~237 (recently launched). Range of 2,600 to 48,000 over 15 years
- Incentive: $40 first year; $10 each year thereafter
- Anticipated Results: 0.894MW to 23.6MW over 15 years
Commercial Demand Response Programs

1. **Commercial Distributed Generation**
   - Curtailment load by operating backup generation; 4-hour events up to 120 hours
   - Enrollment: ~21 customers
   - Eligibility: minimum demand of 200kW with on-site backup generation
   - Incentive: monthly customer payment ($5.12/kW-month + fuel payment + variable O&M adder)
   - Operated: 2012-present
   - Results: 6.6MW
Programs Filed with Commission

1. **Peak Time Rebate** *(pending approval; final order by Aug. 13)*
   - Enable residential customers to reduce energy consumption during peak periods. Alerts via text, email, voicemail, web notices. Post communications as well.
   - Enrollment: 500,000 over 5 years
   - Incentive: $1.25/kWh saved; assumes 50% participation of customers per event; estimated $28 per year for 10 events.
   - Anticipated Results: ~2.5% energy reduction; estimated 195.6MW coincidental summer reduction by year 5

2. **EV Telematics Pilot** *(pending approval; final order by Aug. 13)*
   - Cycle EV via car’s telematics (only while home)
   - Enrollment: Target of 1,000 customers
   - Similar savings anticipated as EV Charger DR program
Demand Flexibility: Let's Figure it Out Now:
The Utility Experience
(Panel I of II)

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Hawaiian Electric – Past, Present and Future

- Traditional Demand Response Programs
- Aggregators
- Battery Bonus
- TOU
- Bring Your Own Device Programs
### Traditional Demand Response Programs

<table>
<thead>
<tr>
<th></th>
<th>RDLC</th>
<th>SBDLC</th>
<th>CIDLC</th>
<th>Fast DR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Island</td>
<td>Oahu</td>
<td>Oahu</td>
<td>Oahu</td>
<td>Oahu / Maui</td>
</tr>
<tr>
<td>Customer Type</td>
<td>Residential</td>
<td>Small &amp; Med Business</td>
<td>Commercial &amp; Industrial (C&amp;I)</td>
<td>C&amp;I</td>
</tr>
<tr>
<td># enrolled</td>
<td>33,000</td>
<td>160</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Equipment Type</td>
<td>Water Heater, A/C</td>
<td>Water Heater, A/C</td>
<td>Industrial loads, generators</td>
<td>HVAC, pumps, batteries, generators</td>
</tr>
<tr>
<td>Dispatch</td>
<td>Utility – immediate</td>
<td>Utility – 1hr notification</td>
<td>Utility – 1hr notification</td>
<td>Utility – 10 min</td>
</tr>
<tr>
<td>Services Provided</td>
<td>Peak load reduction, Fast Frequency Response (FFR)</td>
<td>Peak load reduction, FFR</td>
<td>Peak load reduction, FFR</td>
<td>Peak load reduction</td>
</tr>
<tr>
<td>Duration</td>
<td>1 hour</td>
<td>1 hour</td>
<td>1 – 4 hours</td>
<td>1 hour</td>
</tr>
<tr>
<td>Compensation</td>
<td>$3/mo – water heater $5/mo – A/C</td>
<td>$3/mo – water heater $5/tonnage – A/C</td>
<td>$5/kW - $10/kW $0.50/kWh</td>
<td>$5/kW - $10/kW $0.50/kWh</td>
</tr>
<tr>
<td>Current status</td>
<td>13 MW</td>
<td>1 MW</td>
<td>11 MW</td>
<td>9 MW</td>
</tr>
</tbody>
</table>

DLC = Direct Load Control
## Aggregators

<table>
<thead>
<tr>
<th>Island</th>
<th>OATI, Swell</th>
<th>OATI, Swell</th>
<th>Swell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oahu</td>
<td>Maui</td>
<td>Hawaii</td>
<td></td>
</tr>
<tr>
<td>Customer Type</td>
<td>Residential, C&amp;I</td>
<td>Residential, C&amp;I</td>
<td>Residential</td>
</tr>
<tr>
<td># enrolled</td>
<td>2,400 customers</td>
<td>400 customers</td>
<td>50</td>
</tr>
<tr>
<td>Equipment Type</td>
<td>Water Heaters, batteries</td>
<td>Batteries, water heaters</td>
<td>Batteries</td>
</tr>
<tr>
<td>Dispatch</td>
<td>Utility – immediate</td>
<td>Utility – immediate</td>
<td>Utility – immediate</td>
</tr>
<tr>
<td>Services Provided</td>
<td>Capacity Load Build, Load Reduction, and FFR</td>
<td>Capacity Load Build, Load Reduction, and FFR</td>
<td>Capacity Load Build, Load Reduction, and FFR</td>
</tr>
<tr>
<td>Duration</td>
<td>4 hours</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Compensation</td>
<td>$3 - $13 /kW</td>
<td>$3 - $13 /kW</td>
<td>$3 - $13 /kW</td>
</tr>
<tr>
<td>Current status</td>
<td>3 MW</td>
<td>1 MW</td>
<td>0.2 MW</td>
</tr>
</tbody>
</table>
### Battery Bonus Programs

<table>
<thead>
<tr>
<th>Island</th>
<th>Oahu</th>
<th>Maui</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Type</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td># enrolled</td>
<td>3,900</td>
<td>500</td>
</tr>
<tr>
<td>Equipment Type</td>
<td>Batteries</td>
<td>Batteries</td>
</tr>
<tr>
<td>Dispatch</td>
<td>Scheduled everyday</td>
<td>Scheduled everyday</td>
</tr>
<tr>
<td>Services Provided</td>
<td>Peak load reduction (6-8pm)</td>
<td>Peak load reduction (6-8pm)</td>
</tr>
<tr>
<td>Duration</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Compensation</td>
<td>$850/kW (one-time) + $5/kW + export adj.</td>
<td>$850/kW (one-time) + $5/kW + export adj.</td>
</tr>
<tr>
<td>Current status</td>
<td>12 MW (27 MW)</td>
<td>0.5 MW (4 MW)</td>
</tr>
</tbody>
</table>
## Bring your own device (BYOD) programs

<table>
<thead>
<tr>
<th></th>
<th>Level 1 – Flexible User Dispatch</th>
<th>Level 2 – Utility Dispatch</th>
<th>Level 3 – System Grid Services Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Island</td>
<td>Oahu, Hawaii, Maui, Lanai, and Molokai</td>
<td>Oahu, Hawaii, Maui, Lanai, and Molokai</td>
<td>Oahu, Hawaii, Maui, Lanai, and Molokai</td>
</tr>
<tr>
<td>Customer Type</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td># enrolled</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Equipment Type</td>
<td>Batteries initially</td>
<td>Batteries initially</td>
<td>Batteries initially</td>
</tr>
<tr>
<td>Dispatch</td>
<td>Scheduled everyday</td>
<td>Utility – 24 hr notice</td>
<td>Utility – 24 hr notice</td>
</tr>
<tr>
<td>Services Provided</td>
<td>Capacity Load Reduction</td>
<td>Capacity Load Reduction</td>
<td>Capacity Load Build, Load Reduction</td>
</tr>
<tr>
<td>Duration</td>
<td>2 hours</td>
<td>1 – 2 hours</td>
<td>2 – 4 hours</td>
</tr>
<tr>
<td>Compensation</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Current status</td>
<td>Program to start 11/1</td>
<td>Program to start 11/1</td>
<td>Program to start 11/1</td>
</tr>
</tbody>
</table>
Mahalo
Thanks for attending. The next session begins at 3:15 p.m.