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Deepening Solar Investment through Beneficial Electrification

SolSmart Webinar

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Outline

• Barriers as Solar Adoption Deepens
• Beneficial Electrification can Help
• Case Studies
  • MN Coop – Water Heating
  • VT GMP – The ehome Initiative
• SMUD
  • SMUD’s Plan to Achieve Zero Net Carbon
  • Why Beneficial Electrification is Essential
  • Examples of What We are Doing
Problem: Barriers May Arise as Solar Adoption Deepens
Ratemaking Basics – Investor Owned Utilities

• “Cost of Service” approach:
  • Total costs for providing service are recovered, plus reasonable return on investment

• Regulators concerned with ‘just and reasonable’ rates
  • Sufficient but no more than necessary to cover costs and return on investment
Barrier #1: Utility Profit is Affected by DER Adoption

Increased sales $\rightarrow$ increased utility profit

When load is served with existing facilities, costs are fixed

Creates incentive to resist measures that reduce sales (e.g. DG and EE)
Utility Revenue Requirement: Discourages Distributed Energy Resources

Revenue Requirement (aka Cost-of-Service) = Capital Investments (Cap-ex) + Operating Expenses (Op-ex)

Both reduce kWh sales => raises rates

Distributed Generation = less need for cap-ex = lower earnings

Energy Efficiency = more op-ex & less need for cap-ex

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Energy Efficiency = more op-ex & less need for cap-ex

Revenue Requirement (aka Cost-of-Service) = Capital Investments (Cap-ex) + Operating Expenses (Op-ex)

Distributed Generation = less need for cap-ex = lower earnings
Barrier #2: Distribution System Impacts

- At low solar deployment – negligible impact
- At high deployment, may affect power quality, reliability, and safety on the local distribution system.
- Strategies and solutions are available for avoiding & mitigating negative impacts
  - Smart inverters
  - Grid investments
  - Storage
  - Beneficial Electrification (See next section)
Solution: Beneficial Electrification
High-efficiency Heat Pump with Air Exchangers
Grid-Integrated, Heat-pump Water Heater
Smart Charging
Electric Vehicles
What makes electrification beneficial?

Three Criteria: Achieve at Least One Without Adversely Impacting the Others

1. Saves Customers Money Long-Term; New Services
2. Reduces Environmental Impacts
3. Enables Better Grid Management
Flexible Load helps Grid Operations
Value of Flexibility for Integrating Renewable Energy

California Independent System Operator Duck Curve

Net load - March 31

Ramp need ~13,000 MW in three hours

Overgeneration risk
Well-designed Rates Encourage Beneficial Use of Electrification
3 Case Studies
The Sunna Project

- Steele-Waseca Cooperative Electric
- Owatonna, Minnesota
- Built community solar garden on headquarters, encourages controllable electric water heating

Photo credit of Steele-Waseca Cooperative Electric
https://swce.coop/swce-field-services/renewables/
The Sunna Project

- $1,225 for one panel
- OR
- $170 for one panel + a free electric water heater if the customer subscribes to the grid-integrated water heater program
The eHome Initiative

- Green Mountain Power
- Rutland, Vermont
- Comprehensive home energy makeover
- May install solar, cold-climate heat pumps, heat pump water heaters, etc.

*Photo credit of Green Mountain Power, https://greenmountainpower.com/initiatives/ehomes-a-total-energy-makeover/
Resources from RAP

- Beneficial Electrification: Ensuring Electrification in the Public Interest
- Beneficial Electrification of Transportation
- Beneficial Electrification of Water Heating
- Beneficial Electrification of Space Heating
- Beneficial Electrification: A Key to Better Grid Management
- Environmentally Beneficial Electrification: The Dawn of Emissions Efficiency (Electricity Journal)
About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

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Building Electrification and Energy Efficiency

Strategic Business planner at SMUD

Scott received a BS in Mechanical Engineering from Purdue University in 1992 and MBA from Marquette University in 2000. Scott has worked in the energy efficiency field for 15 years as a general contractor, energy consultant, new construction residential program administrator, existing multifamily program administrator, mechanical engineer, rater and trainer.
Sacramento Municipal Utility District (SMUD)

- 5th Largest CA utility
- Electric only utility
- Population 1.5 million
- 2,219 employees
- 50% carbon free electricity
- 626,460 accounts
- 10,930 GWh load in 2017
SMUD’s Integrated Resource Plan

- Integrated Resource Plan (IRP): long-term strategic analysis of plausible futures at a moment in time
  - Focus to serve customers while balancing key objectives (GHG reduction, costs/rates, reliability)
  - Scenarios represent plausible future outcomes
  - Helpful in determining near term resource needs and informing long term policy goals
  - IRP will be updated periodically
2018 IRP Focus

• SMUD’s IRP focused on achieving very significant carbon reductions in the greater Sacramento region and in SMUD’s energy supply
  – Maximize local benefit for our customers
• IRP identified 4 key strategies to achieve deep carbon reductions across Sacramento:
  - Energy Efficiency
  - Electrification
  - Low-carbon energy/fuels
  - Mitigation of Other GHG Sources
Approved IRP GHG Goals

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<tr>
<th>Year</th>
<th>Net Greenhouse Gas Emissions (metric tons)</th>
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<tbody>
<tr>
<td>2030</td>
<td>1,350,000</td>
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<tr>
<td>2040</td>
<td>Net Zero</td>
</tr>
<tr>
<td>2050</td>
<td>Net Zero</td>
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</tbody>
</table>

Net Zero is achieved through vehicle and building electrification, energy efficiency, clean distributed resources, RPS eligible renewables, large hydro, and biogas.

2020 Emissions ≈ 3,200,000 metric tons
IRP – Electrification Focus

- Now 60% RPS (SB100)
- 50%+ RPS, 74% zero-carbon electricity
- 100% EV sales in light-duty
- Nearly zero-carbon electricity
- 15% renewables
- 25% renewables
- 33% renewables
- 30% EV sales in light-duty

- Begin installing electric heat pumps
- Doubling EE savings* + 50% heat pumps sales
- 100% heat pump sales
- 100% of truck sales are electric, hybrid or CNG
- Nearly half of remaining fossil fuels = advanced biofuels

Emissions (MMTCO2e)
Electrification Impact on SMUD Demand

DER Budget includes an additional $1.7 BILLION between 2019 and 2040.
Electrification at SMUD

• EB vs BE
  – Beneficial Electrification vs Electrification of Buildings

• At SMUD all electrification is beneficial

• ZEV ≈ ZEB
  – Zero Emission Buildings is the goal
Benefits of Building Electrification

- Reduce Customer’s Energy Bills
- Create Local Jobs
- Improve Regional Air Quality
- Improve Indoor Air Quality
- Future Prepping of Buildings
- Downward Pressure on Electricity Rates
- Fewer Green House Gas Emissions
Collaboration with Agencies

• Local Governments
  – Influence Climate Action Plans
    • All-electric ready new construction
    • Permit compliance ideation
    • Demonstration of acceptance

• California Energy Commission
  – Influence all-electric energy code
    • Goal: 2022 for new construction, 2028 retrofit code
<table>
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<th>Program</th>
<th>Launch Date</th>
<th>Total Possible Incentive</th>
<th>Base Incentive</th>
<th>HP-HVAC</th>
<th>HPWH</th>
<th>Induction</th>
<th>Bonus</th>
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<td>March 2018</td>
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<td>HP-HVAC Equipment Efficiency</td>
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Thank you.