Case Study 1: PG&E Residential Pay-for-Performance
Case Study 1: Enabling Competitive Markets Drives Innovation

Home Energy Rewards

- Launched August, 2018
- As of 11/30/18
- 593 projects enrolled in our pool
- Savings
  - 4627 MMBtu
  - 9% electric, 15% gas

ICF – Home Energy Optimization

- $199 for $2,000 in Products and Services ($59 for DAC customers)
- Home Energy Report, Home Energy Advisor
- Smart T-Stat plus optimization (all)
- Advanced Power Strips (half)
- LEDS (4 per home)
- AC Tune Up (most)
  - Air Flow Adjustment
  - Refrigerant Charge
  - Condenser Coil Cleaning
  - Evaporator Coil Cleaning
- Comfort Guard for HVAC Equipment Performance Optimization
- SWH Controller for Electric and Gas Water Heaters (all)
- Temperature Control Valves (TCVs) (half)
- Faucet aerators
- Pipe insulation (half)
23% of Projects

<table>
<thead>
<tr>
<th>FILTERS</th>
<th>Climate Zone</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>3_Summer_Peak_kWh Top Quartile 5_Summer_Shoulder_Ratio Top Half</td>
<td>4</td>
<td>2020</td>
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</table>

<table>
<thead>
<tr>
<th>Program Average</th>
<th>Subset</th>
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<tbody>
<tr>
<td>965 kWh</td>
<td>2,435 kWh</td>
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<tr>
<td>Annual Participant Savings</td>
<td>Annual Participant Savings</td>
</tr>
<tr>
<td>11 %</td>
<td>18 %</td>
</tr>
<tr>
<td>Annual kWh Savings</td>
<td>Annual kWh Savings</td>
</tr>
<tr>
<td>213 kWh</td>
<td>721 kWh</td>
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<tr>
<td>Summer Peak Participant Savings</td>
<td>Summer Peak Participant Savings</td>
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</tbody>
</table>

- **2.5x Greater Savings**
- **70% Fewer Negatives**
23% of Projects

Average Project Electric Utility Avoided Costs

- Cost Breakdown
  - Cap and Trade
  - Ghg Adder
  - Capacity
  - Transmission
  - Distribution
  - Ancillary Services
  - Losses
  - Energy

Average Project Marginal GHG Savings

- Avoided GHG (Tons)
- Avoided Cost ($/kWh)

Program Average
- .397 Tons
- .41 Tons/MWh
- $146.97
- $.152/kWh

Subset
- 1.057 Tons
- .43 Tons/MWh
- $446.73
- $.183/kWh

Climate Zone: 4
Year: 2020

2.7x Avoided GhGs
3x Avoided Cost
Case Study 2:

New York Pay-for-Performance Programs

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>Aug-19</td>
<td>Con Edison RFP launched</td>
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<tr>
<td>Sep-19</td>
<td>National Grid stakeholder meeting</td>
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<tr>
<td>Oct-19</td>
<td>Con Edison Portfolio Manager awards made</td>
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<tr>
<td>Nov-19</td>
<td>National Grid RFP launch</td>
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<tr>
<td>Jan-20</td>
<td>Con Edison Portfolio Managers in market</td>
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<tr>
<td>Jan-20</td>
<td>National Grid Portfolio Manager awards made</td>
</tr>
<tr>
<td>Q1 2020</td>
<td>PSEG LI RFP launch</td>
</tr>
<tr>
<td>Q2 2020</td>
<td>National Grid Portfolio Managers in market</td>
</tr>
</tbody>
</table>

End-Use Customers

- Increased confidence in savings
- Access to a broader set of solutions and services, including finance solutions with little or no upfront contributions
- Longer and more comprehensive relationships with solution providers

Portfolio Managers

- Flexibility to design services around what customers want
- Minimized transaction costs and administrative burden
- Multi-year cash flows that can support finance solutions and add-on services
- Portfolio level performance to manage risk and achieve scale

Utilities

- Elevate EE as a utility resource, with potential temporal and locational impacts
- Align incentive structure to engage solution providers in the management of performance risk
- Longer term visibility into system impacts of EE
- Resource viewed as portfolios, not projects
Case Study 3:
ConEd
EnergyFit
Low Income P4P
NY Rev Demo

Low- and moderate-income residents living in:
- **Group A**: 1-4 unit, attached buildings built before 1930
- **Group B**: 1-4 unit, semi-attached buildings built before 1930
Case Study 3:
Using Private Capital to Provide Low Income Energy Efficiency

Project Finance: The long-term financing of projects based upon projected cash flows rather than the balance sheets of its sponsors.
Case Study 4: EBCE / Joint CCA Solar+Storage Targeting and Grid Integration

- Storage Customers Targeting
- Integration into EBCE Forecast
- Resource Adequacy for BTM Flexibility

![Graph showing load shape and candidate selection criteria](image)
Grid Integrated Buildings - Data Tells the Story

- **Load Shifting**
  (e.g., Storage, DR)

- **Load Shaping**
  (e.g., EE, Solar)

- **Load Balancing**
  (e.g., EVs, Heat Pumps)
Distributed Grid = Distributed Data = Distributed Flexibility
Demand Flexibility Anchors the Decarbonized Grid

- Efficient Buildings
- Transportation Electrification
- Wind Energy
- Grid Optimization
- Solar Power
- Grid Storage

Demand Flexibility
Recurve Makes the Market for Demand Flexibility
Grid Integrated Buildings are Demand Flexibility Assets
Standard Weights and Measures

- Standard M&V Calculation Methods
- Monthly, Daily, and Hourly
- Public Stakeholders Empirical Process
- www.CalTRACK.org

- Python CalTRACK Engine
- Open Source Apache 2.0
- Contributed to Linux Foundation
- Code Repo: https://goo.gl/qFdW4P
Resource Planning
Population Grid Analytics to Design, Forecast, and Procure Demand Side Resources
Fleet Management
Tools for Behind the Meter Demand Flexibility
Flex Ledger
System of Record for Revenue Grade Demand Flexibility Transactions