Flexibility as a Resource

Efficiency, Demand Response, and Electrification

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

• Python CalTRACK Engine
• Open Source Apache 2.0
• How It Works: https://goo.gl/mhny2s
• Code Repo: https://goo.gl/qFdW4P
The Grid Has Changed
New Problems Require New Solutions
IESO Load Profile - February 18, 2017
The CA Duck is Four Years Ahead of CAISO Projections
Load Balancing Renewable Energy

Supply and Demand
Current System Demand: 24139 MW
Forecast Peak Demand: 25287 MW

Legend
- Under -$50
- -$50 to $0
- $0 to $50
- $50 to $55
- $55 to $60
- $60 to $65
- $65 to $70
- $70 to $75
- $75 to $80
- $80 to $85
- $85 to $90
- $90 to $95
- $95 to $100
- $100 to $125
- $125 to $150

Day-Ahead
03/27/2017
Hour: 15-16, Interval: 0
Marginal Energy Cost: $4.77
Non-Wires
Alternatives

Oakland Clean Energy Initiative

OCEI Peak Day Hourly Resource Need
Beneficial Electrification
Decarbonization

Electricity CO$_2$ Intensity

Monthly Emissions Intensity, 2019 & 2030
Turning Demand Flexibility into a Grid Resource
Turning Demand Flexibility into a Grid Resource

IESO Installed DERs (4,168 MW)
Not All Energy Efficiency is of Equal Grid Value
Not All Energy Efficiency is of Equal Carbon Value
AHUP Delivers 59% More Avoided CO₂ Per MWH
Pay-for-Performance Markets for Grid Value
AGGREGATORS

Business Models

Savings  Comfort  Health
Sending the Right Price Signal

resource Curve

duck Curve

Resource Curve by Season and Weekend/Weekday

Duck Curve

Hour of Day

kWh

Summer, Weekday
Summer, Weekend
Winter, Weekday
Winter, Weekend

2011
2012
2013
2014
2015
2016
Competitive Markets Drive Innovation

Home Energy Rewards

Franklin Energy

- 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 $1,000 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)
Paying for Performance When it Matters Most

- Savings Purchase Agreement (SPA)
- 3x Kicker for summer savings from 4pm to 8pm
- Payments based on CalTRACK / OpenEEmeter
Scalable Structures and Private Capital
Portfolios Delivers Manageable Risk

Savings Performance Insurance

Munich RE

HSB Engineering Insurance
Project Finance: The long-term financing of projects based upon projected cash flows rather than the balance sheets of its sponsors.
You Can’t Manage
What You Don’t Measure
Near Real-Time Telemetry

- Projects Enrolled Per Month:
  - 8,570 Total Projects
  - Monthly and Cumulative chart

- Electricity Savings per Month:
  - 2.19M Total kWh Savings
  - Monthly and Cumulative kWh chart

- Natural Gas Savings per Month:
  - 595k Total Therm Savings
  - Monthly and Cumulative Therm chart

- Resource Curve (hourly savings):
  - Portfolio and System Lead chart

- Electricity Use vs. Baseline:
  - kWh chart

- Gas Use vs. Baseline:
  - Therm chart

- Electric End-Uses:
  - Heating, Cooling, Heat/Cool, Base Load chart

- Gas End-Uses:
  - Heating chart

- Energy Conservation Measure Distribution:
  - Bar charts for different measures

- Electricity Savings Distribution:
  - 78% Electric Realization Rate

- Natural Gas Savings Distribution:
  - 80% Gas Realization Rate
Target the Most Valuable Customers

![Chart showing the distribution of percent savings for projects, with 'Avoid' and 'Target' categories.]
Track Hourly Resource Curves

Resource Curve Over A Typical Day (Day Type(s): All, Month(s): All)

- Portfolio
- System Load

KWh

System Load [MW]

Hour Of Day

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Valuing Margin
Avoided Cost

$50.8k
Portfolio Normal Year Avoided Costs

$101.55
Normal Year Avoided Costs Per Participant

Resource Curve - Normal Weather Year (Drag to zoom)