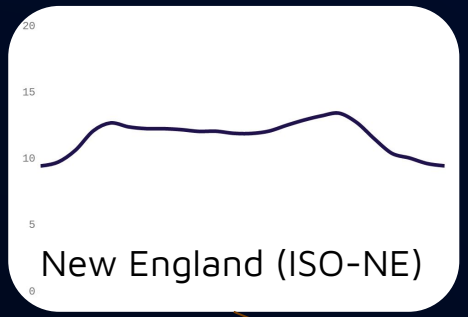
RECURVE
SHAPE THE FUTURE OF ENERGY

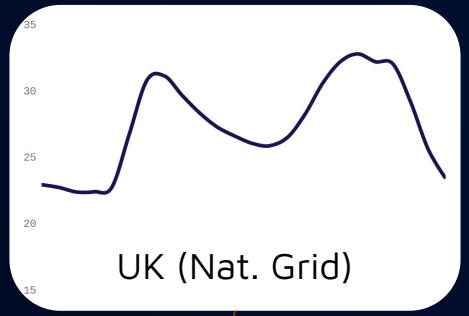
Demand Flexibility as a Resource

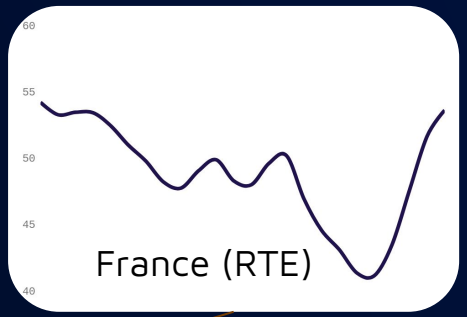
Efficiency, Demand Response, Storage and Electrification

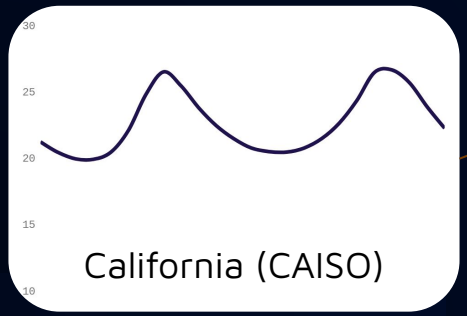
Carmen Best
Director of Policy & Emerging Markets
carmen@recurve.com

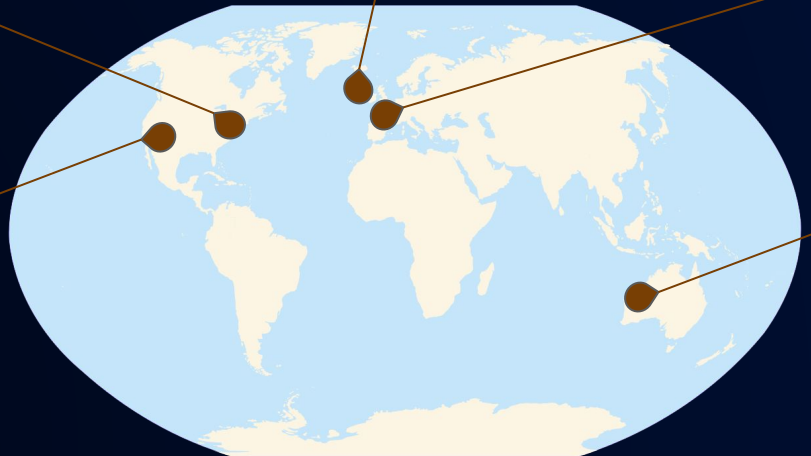
All Load Shapes Need Management

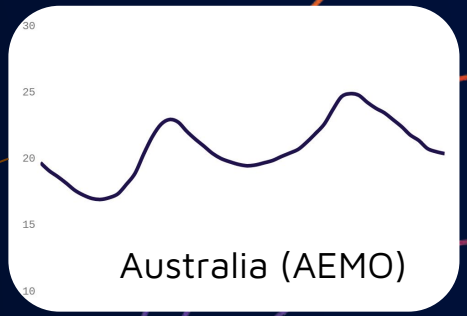




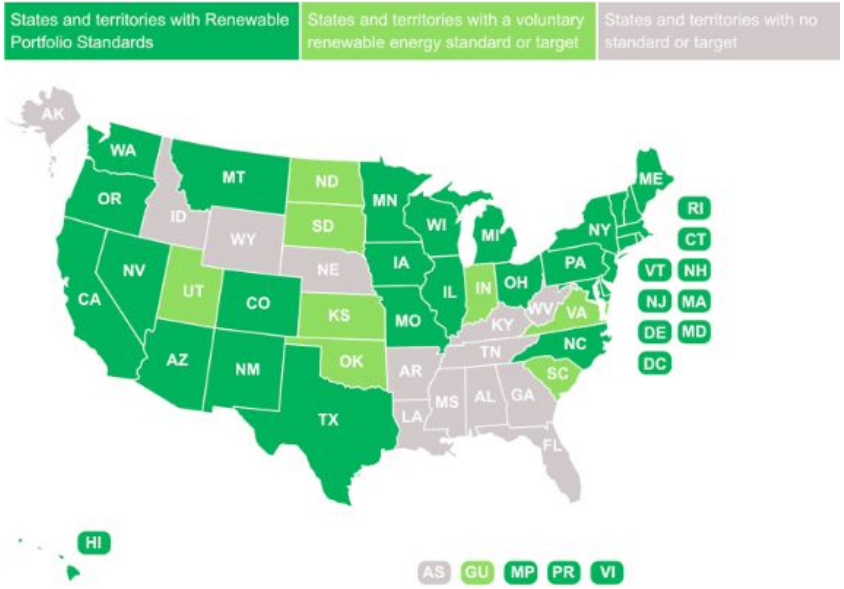




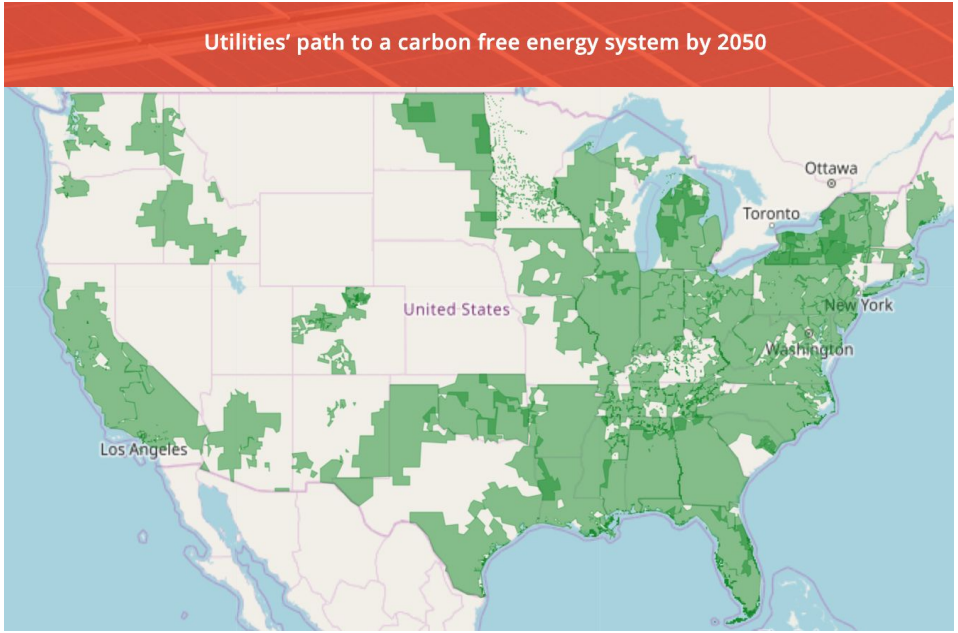




Strong New Requirements for Renewables and Decarbonization

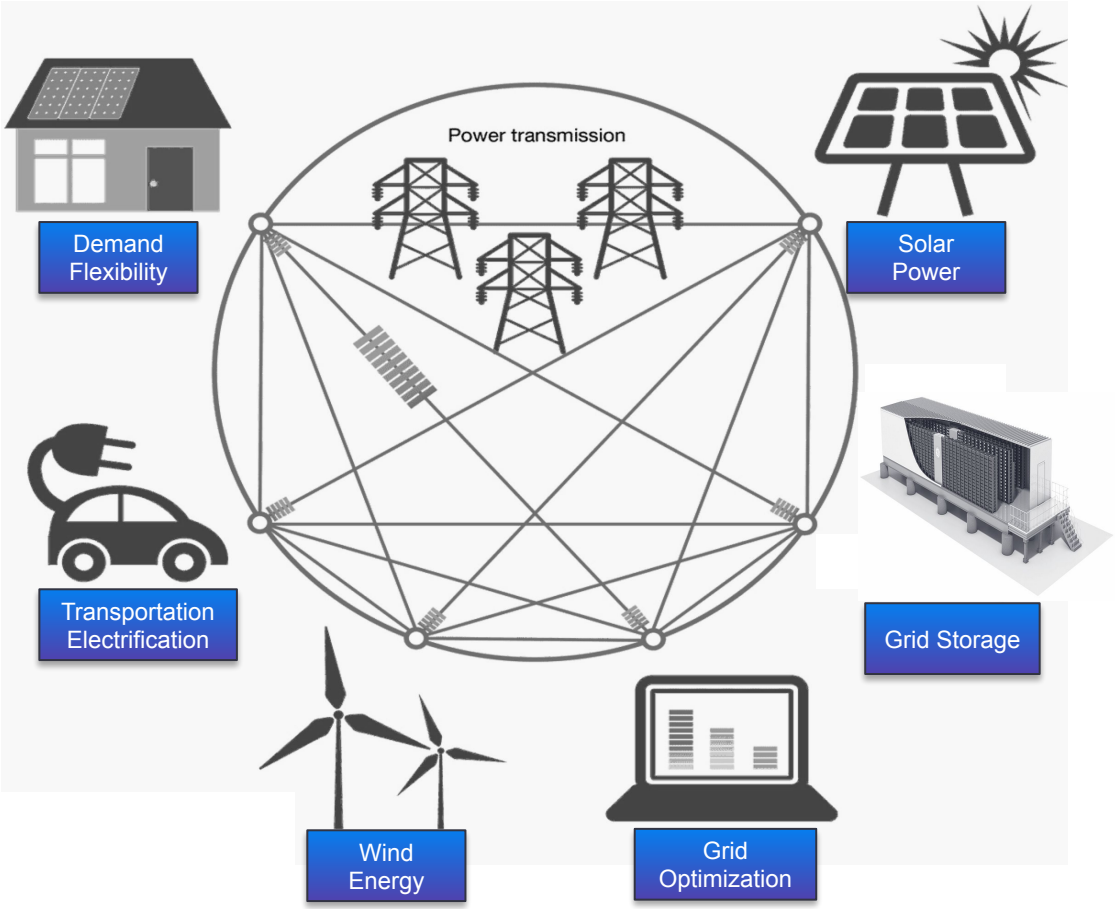


States and Territories with Renewable Portfolio Standards



Utilities' path to carbon free energy system by 2050

Demand Flexibility Enables Grid Integration of Behind the Meter DR, EE, E+, RE, and Storage



One of These Things is Not Like the Other…

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CALTRACK

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

LF ENERGY OPENEEMETER

- Python CalTRACK Engine
- Open Source Apache 2.0
- How It Works: https://goo.gl/mhny2s
- Code Repo: https://goo.gl/qFdW4P

LF ENERGY

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ieso
Independent Electricity System Operator
EnergyTrust of Oregon
nyserda
Energy. Innovation. Solutions.
DOER
Massachusetts Department of Energy Resources
nationalgrid
BAY AREA Regional Energy Network
MCE
SMUD
CONNECTICUT GREEN BANK
conEdison
CONNECTICUT ENERGY ENVIRONMENT
NREL
PG&E
EAST BAY COMMUNITY ENERGY
EVERSOURCE ENERGY
UI
CALIFORNIA ENERGY COMMISSION
SOUTHERN CALIFORNIA EDISON
SoCalGas
NSW GOVERNMENT
Office of Environment & Heritage

Pathways to Meter-Based Pay-for-Performance

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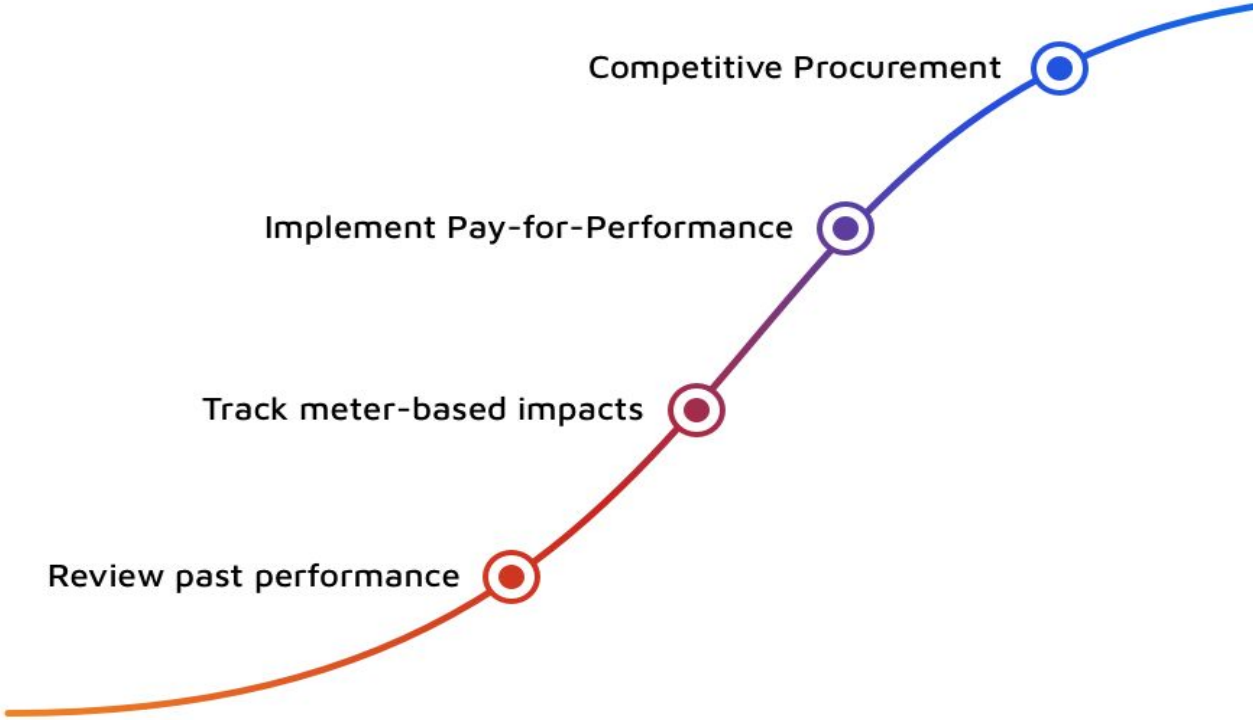
A Path to Scaling Efficiency

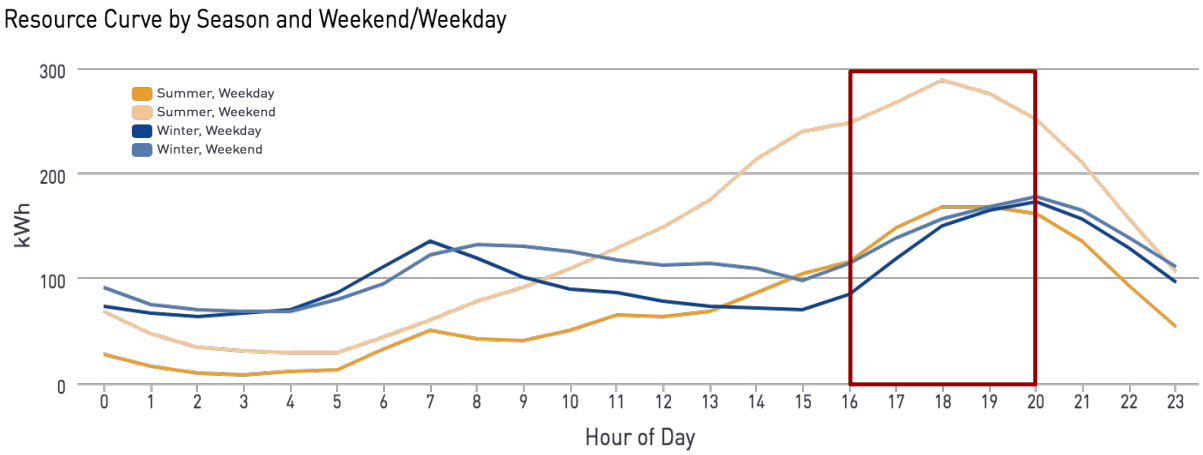


What is Meter-based Pay-for-Performance?

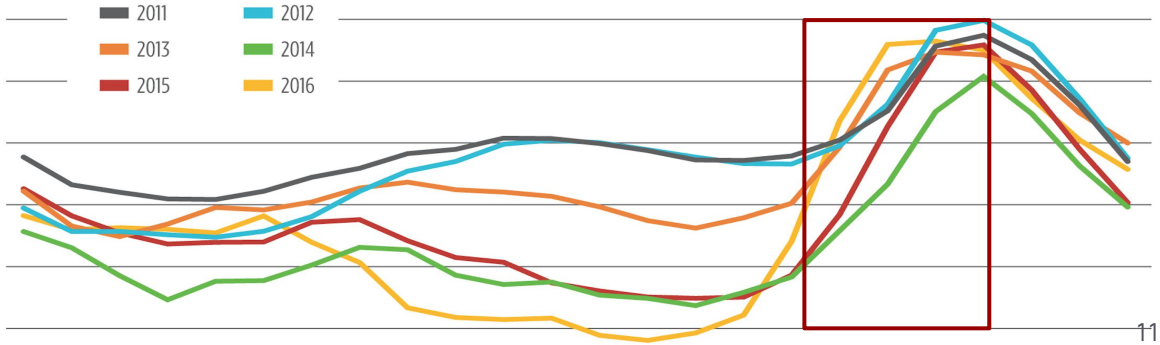
- Whole building analysis at customer meter
- Hourly interval meter data enables time valuation
- Aggregated portfolio savings are the basis of payment not individual buildings
- Performance settlement is between administrators and aggregators not direct settlement with customers

Sending the Right Price Signal

Resource Curve



Duck Curve



Statewide Policies on Performance

- Legislation
- Regulatory Reform
- Executive Order

California Public Utilities Commission

nyserda
Energy. Innovation. Solutions.

...the core of the P4P model is the design and alignment of the performance-based requirements between the program administrator and the service provider as well as the corresponding services/requirements between the service provider and the customer. (New Efficiency: New York)

EnergyTrust of Oregon

...expand meter-based savings pilot programs, including pay for performance pilot programs by January 1, 2019. (Executive Order No 17-20, Accelerating Energy Efficiency in Oregon's Built Environment)

Early Lessons Learned

Market Focus

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- Coordination required
- Data standards
- Limits of tools and models
- Input from market actors is critical
- Test to create broad learnings to enable utility adoption at scale

Scaled Pilots & 3P

California Public Utilities Commission

- Diversity and creativity
- Implementer business models are shifting
- Impact analysis enables adaptation
- Embedded M&V adopted w/ or w/o P4P
- Savings claims still pending guidance

Contractor Focus

EnergyTrust of Oregon

- Familiarity with M&V tools is the focus
- Incremental adjustment allows for discrete questions
- Reconciliation of methods
- Stress points to applying meter-based methods at scale

Market-Based Behind the Meter Demand Flexibility

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Improve Cost Effectiveness and Customer Experience

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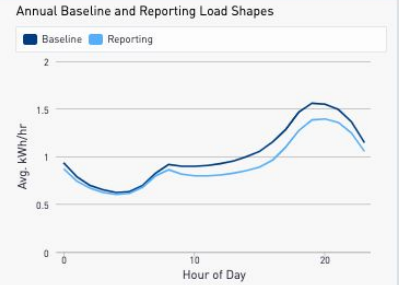
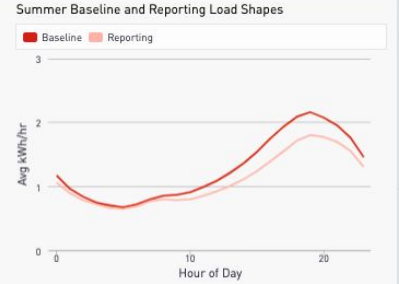
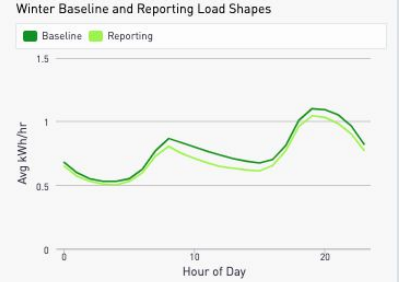
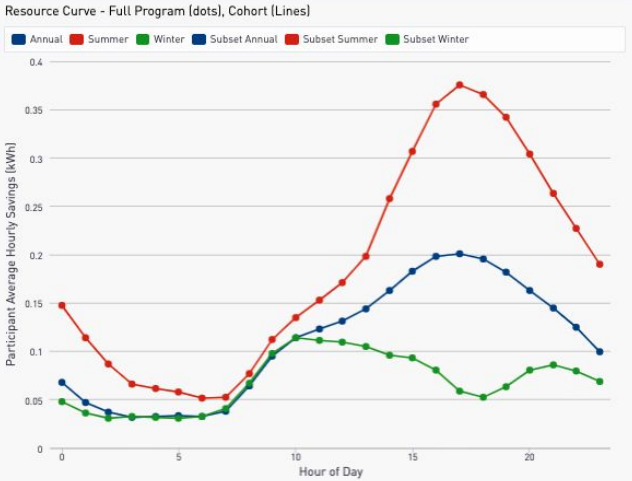
Metering | Analytics | Data | Upload | API

FILTERS (3) ▾ Climate_Zone 4 Year 2020 zProgram Home Energy Savings

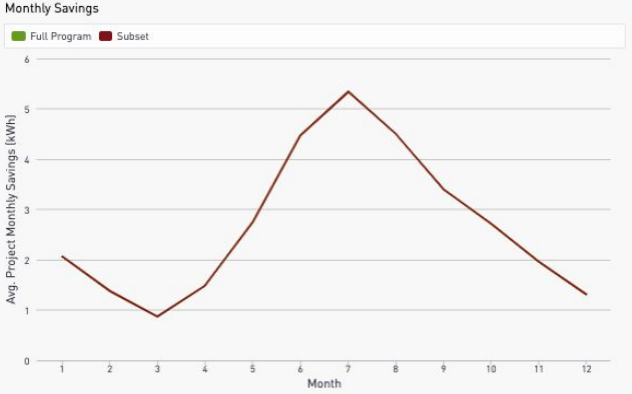


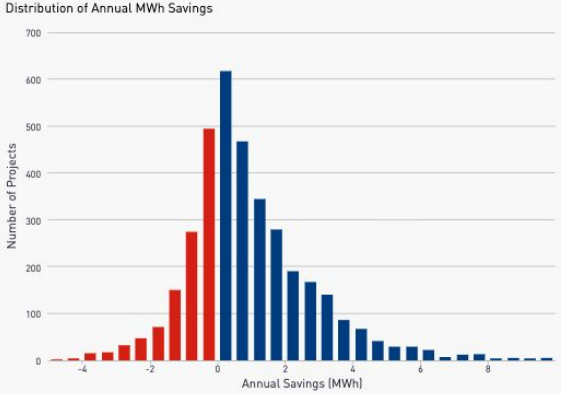






Program Average	Subset	
965 kWh Annual Participant Savings	965 kWh Annual Participant Savings	100% Percent of All Projects
11 % Annual kWh Savings	11 % Annual kWh Savings	17 % Summer Peak kWh Savings
213 kWh Summer Peak Participant Savings	213 kWh Summer Peak Participant Savings	30 % % Negative Savers



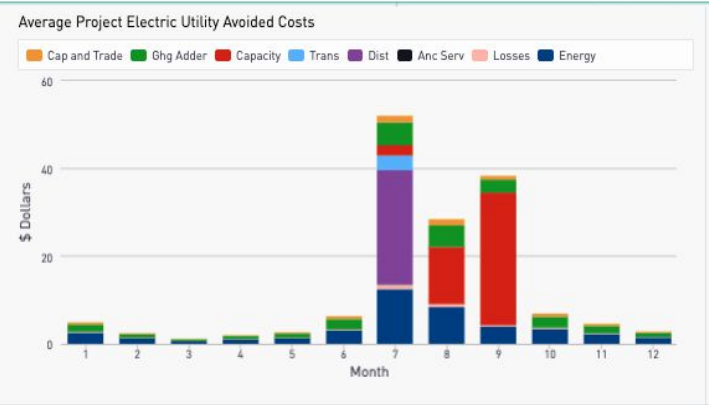


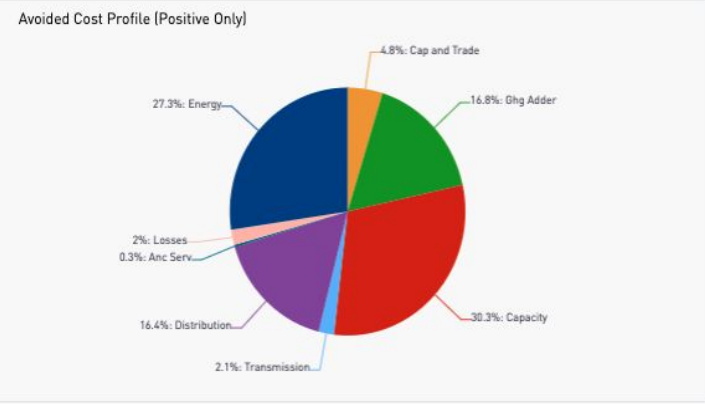
Electric Flexiwatts

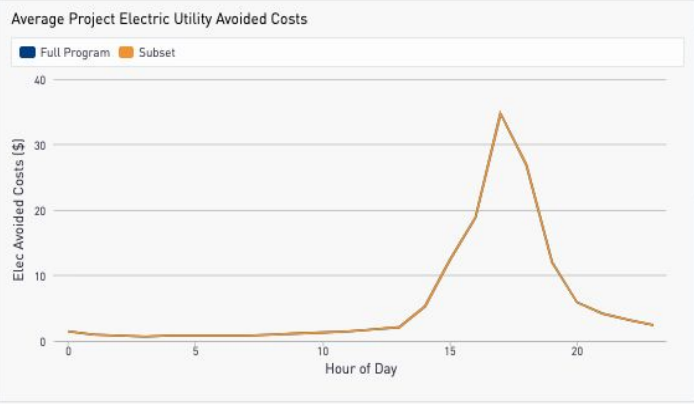
Residential HVAC and Shell

Metering | Analytics | Data | Upload | API

FILTERS (3) ▾ Climate_Zone 4 Year 2020 zProgram Home Energy Savings







Program Average

.397 Tons
Project Annual GHG Savings From Electricity

.41 Tons/MWh
Avoided GHG per MWh Savings

$146.97
Project Annual Electric Utility Avoided Costs

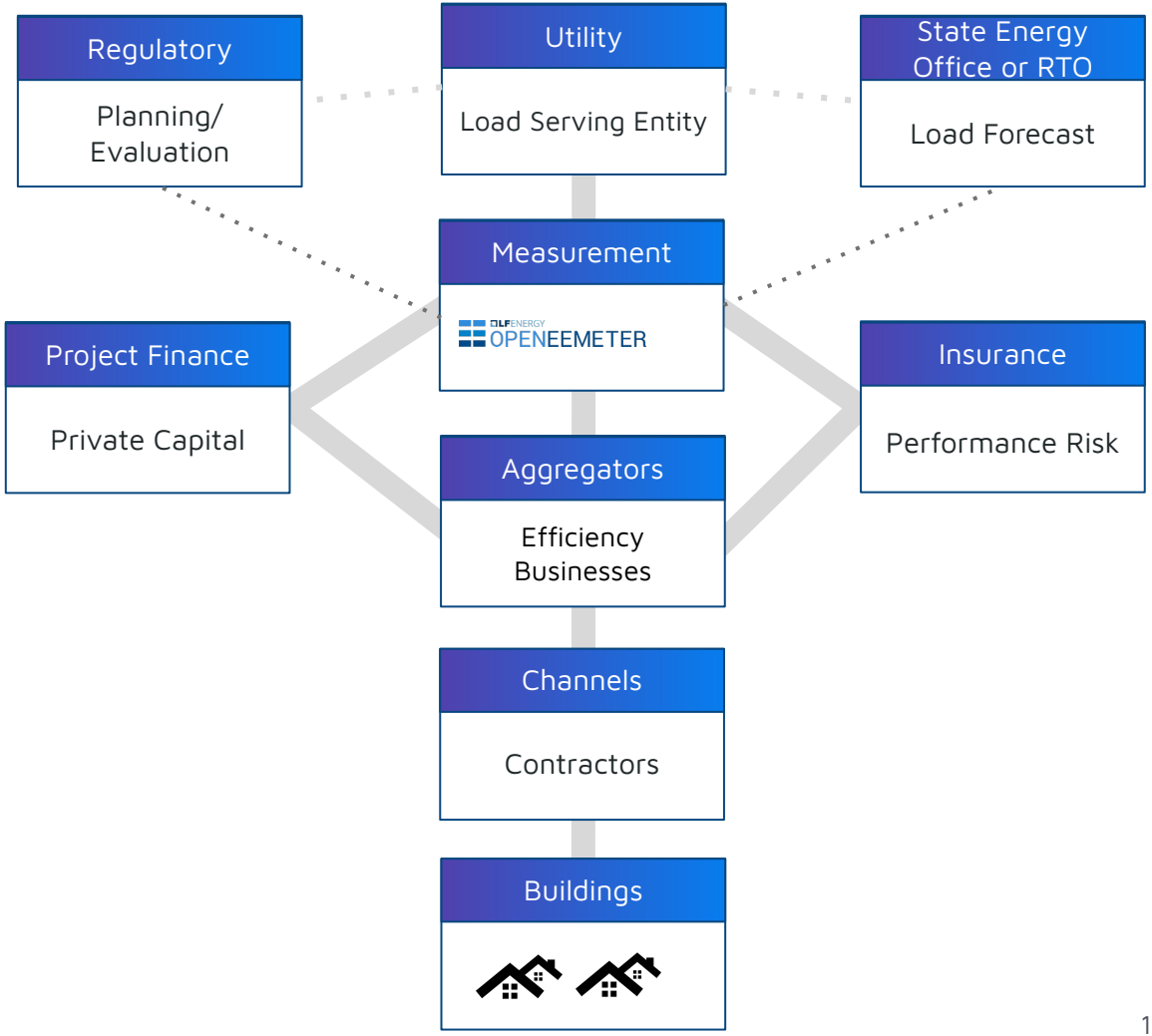
$ .152/kWh
$ Avoided Cost per kWh Savings

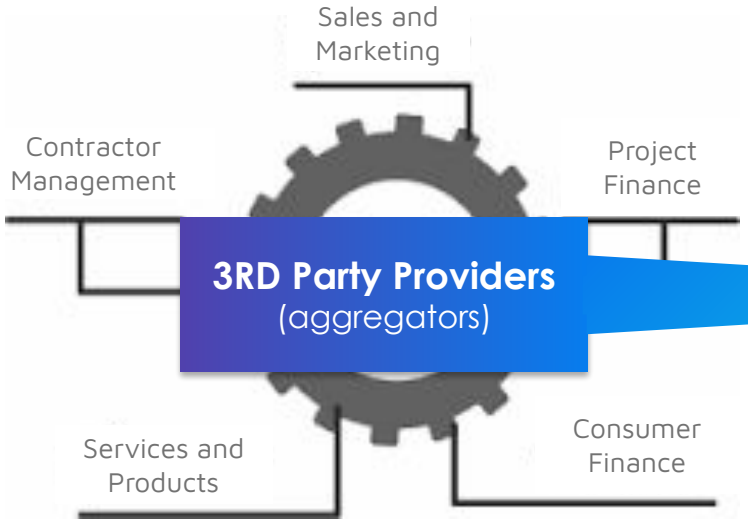
Electric Avoided Cost

Residential HVAC and Shell

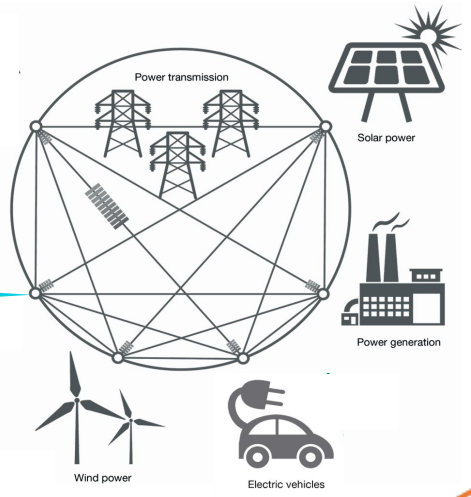
Cap and Trade | Ghg Adder | Capacity | Transmission | Distribution | Ancillary Services | Losses | Energy

Performance Accountability For Scale and Private Capital



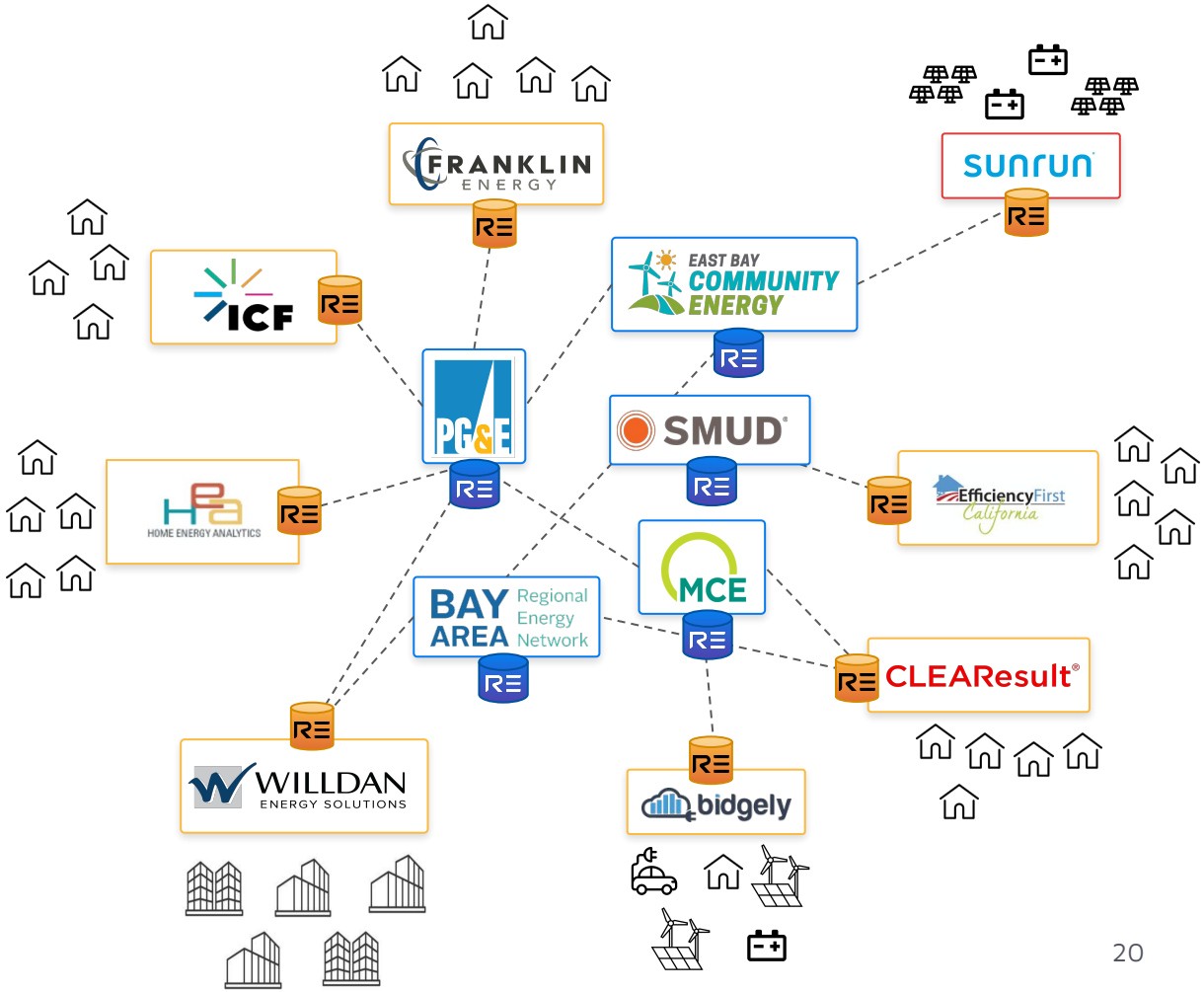


DEMAND FLEXIBILITY

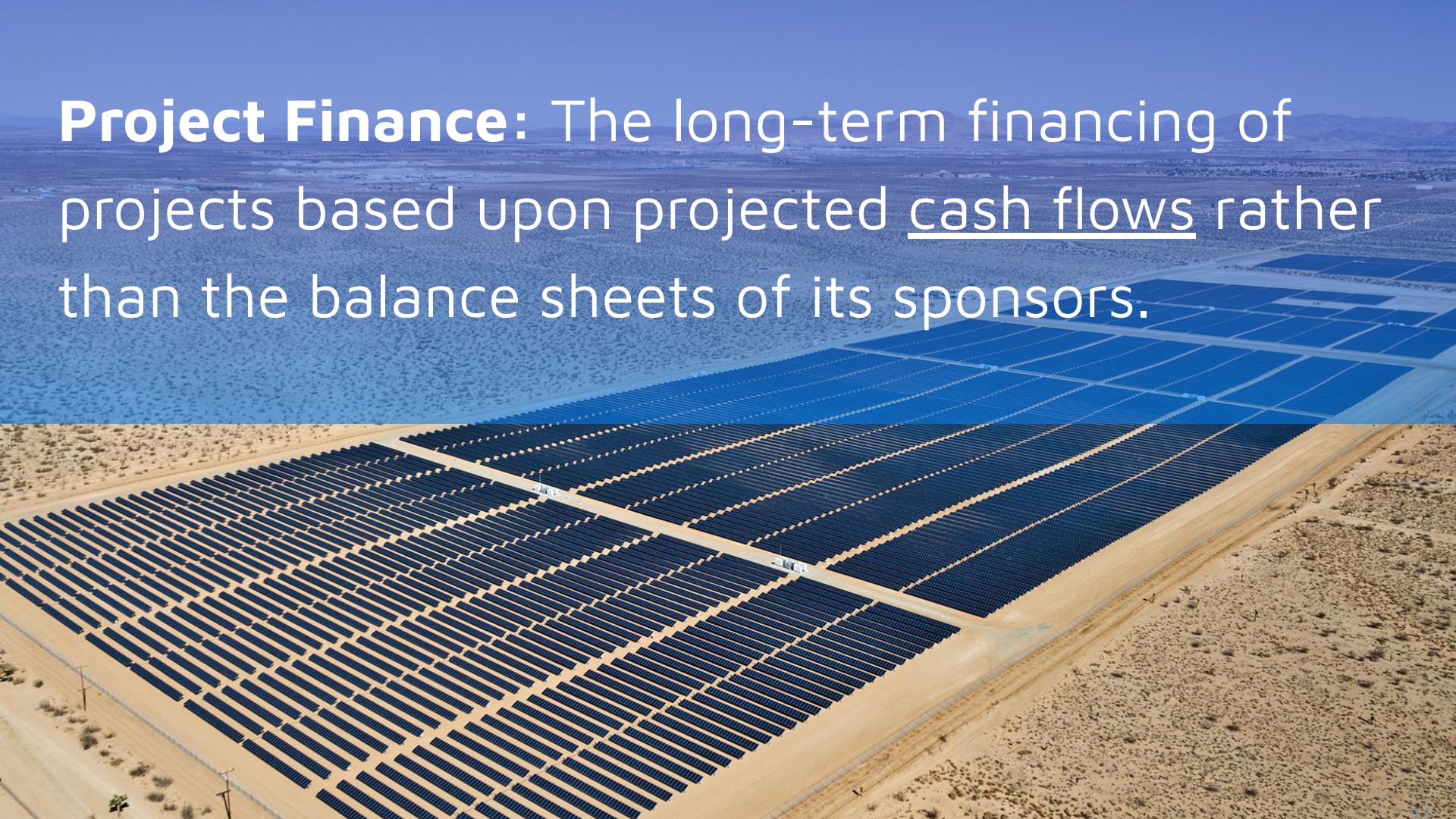


BUSINESS MODELS

Enable Grid Investments for Demand Flexibility



Project Finance: The long-term financing of projects based upon projected cash flows rather than the balance sheets of its sponsors.



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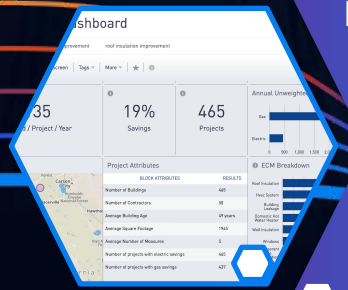


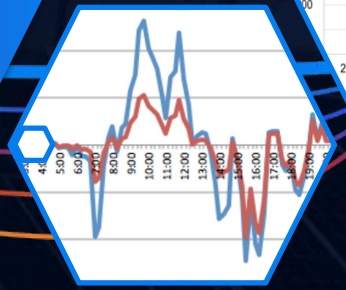
Pay for Performance

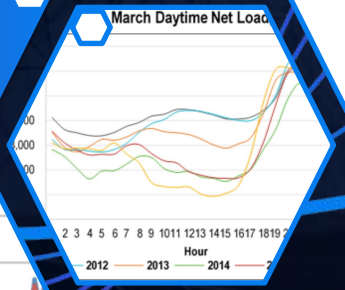
Resource Curve

Demand Flexibility

Procurement

Metered Flexiwatt





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