



Acadia Center

Advancing the Clean Energy Future

Using Residential Load Control To Reduce Peak Load and Integrate Renewables

Efficiency Maine Annual Symposium

January 27, 2017

Freeport, ME

Jamie Howland, Director, Climate and Energy Analysis
Center



Overview

- Examine the potential of intra-day load shifting to reduce loads on the grid
- Explore policy considerations associated with using energy efficiency programs to deploy Active Load Management (ALM)
- Provide recommendations for policy makers and efficiency program administrators.

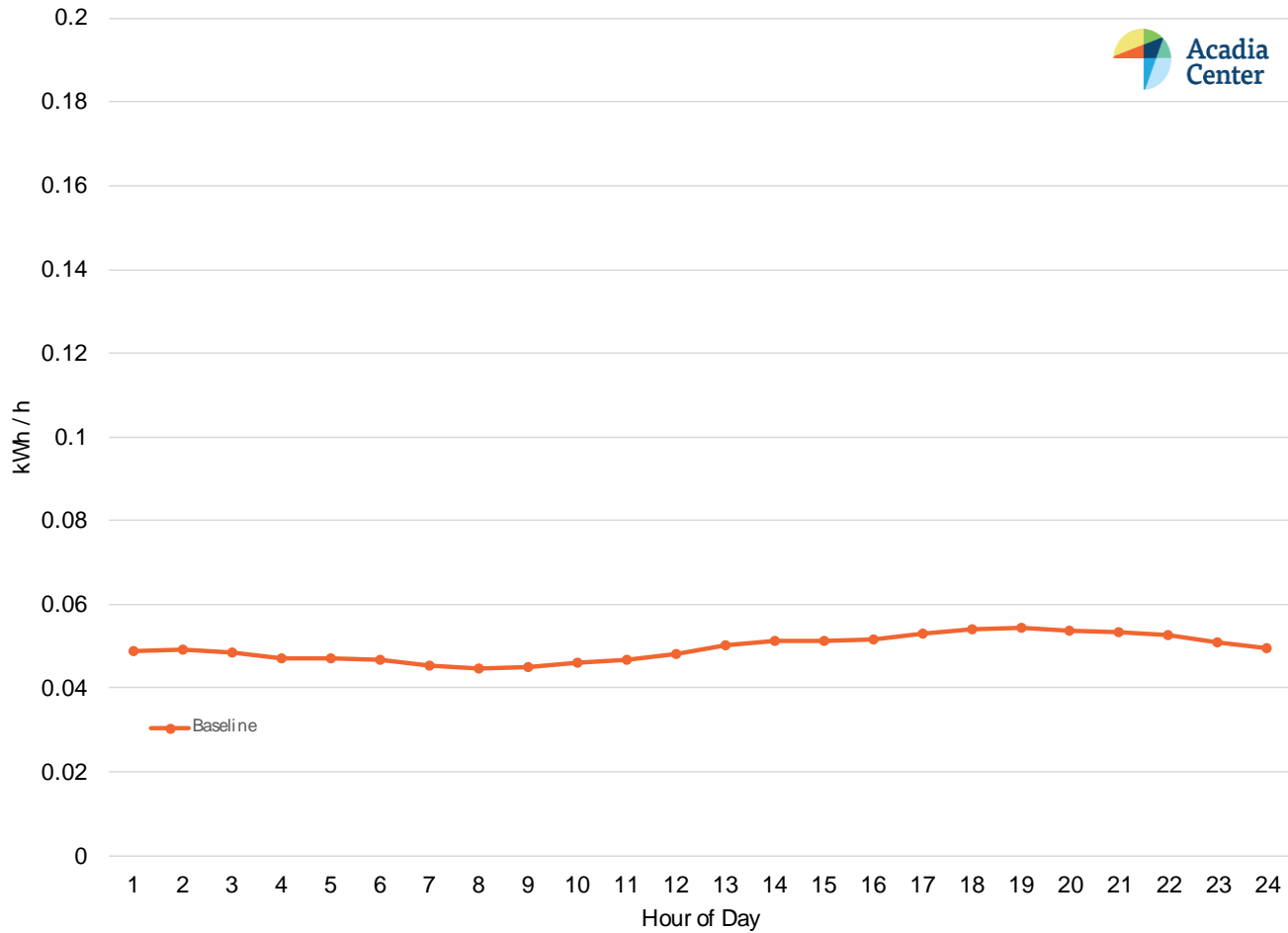
Background

- The grid is changing!
 - Efficiency programs have led to declining energy use and flattened peak demand
 - Lots of PV in ISO-New England, and much more on the way
 - Electric Vehicles
 - Heat Pumps
- New and emerging technologies have lowered the cost of equipment controls, increasing the potential to harness the power of many small things

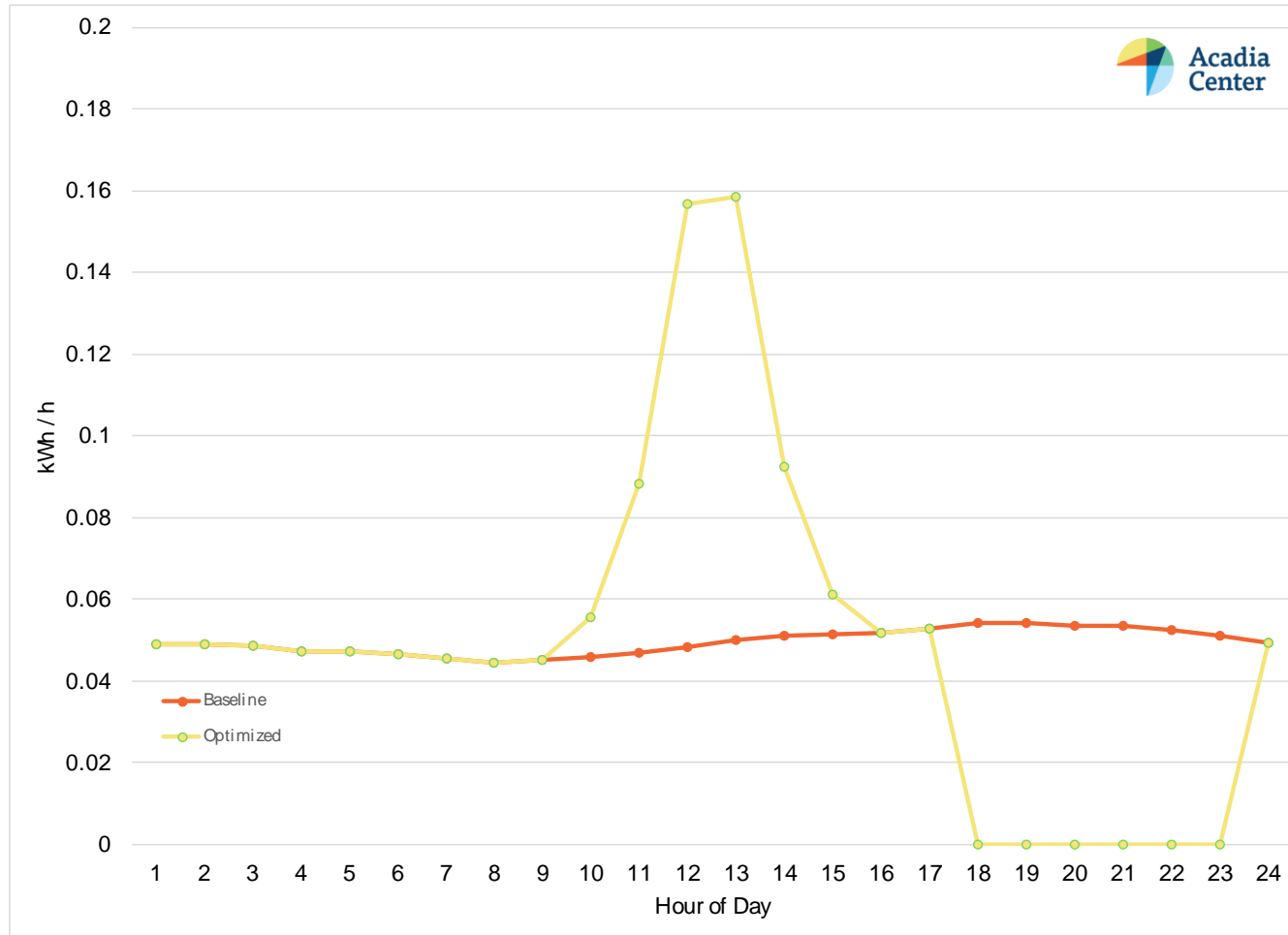
Definition of ALM

- There are several terms that refer to Load Management – generally moving load to a different time period.
- In this context, we use the term Demand Response (DR) to refer to traditional load management – curtailment of load by large customers when called upon to do so, typically with low frequency
- Active Load Management is defined here as including much smaller loads, varying times, more frequent dispatch, and more automated dispatch.

Freezers



Freezers

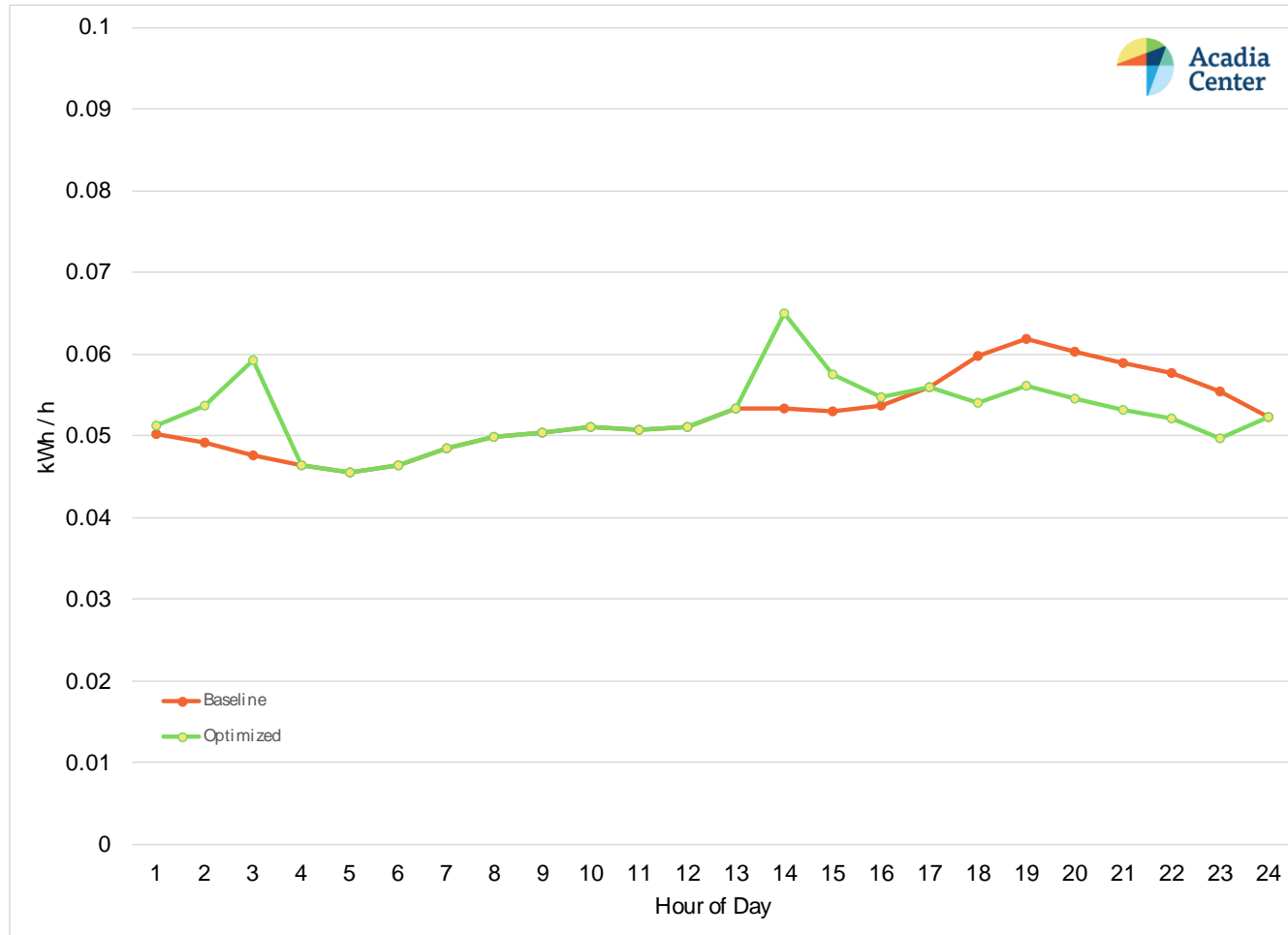


Product Classification

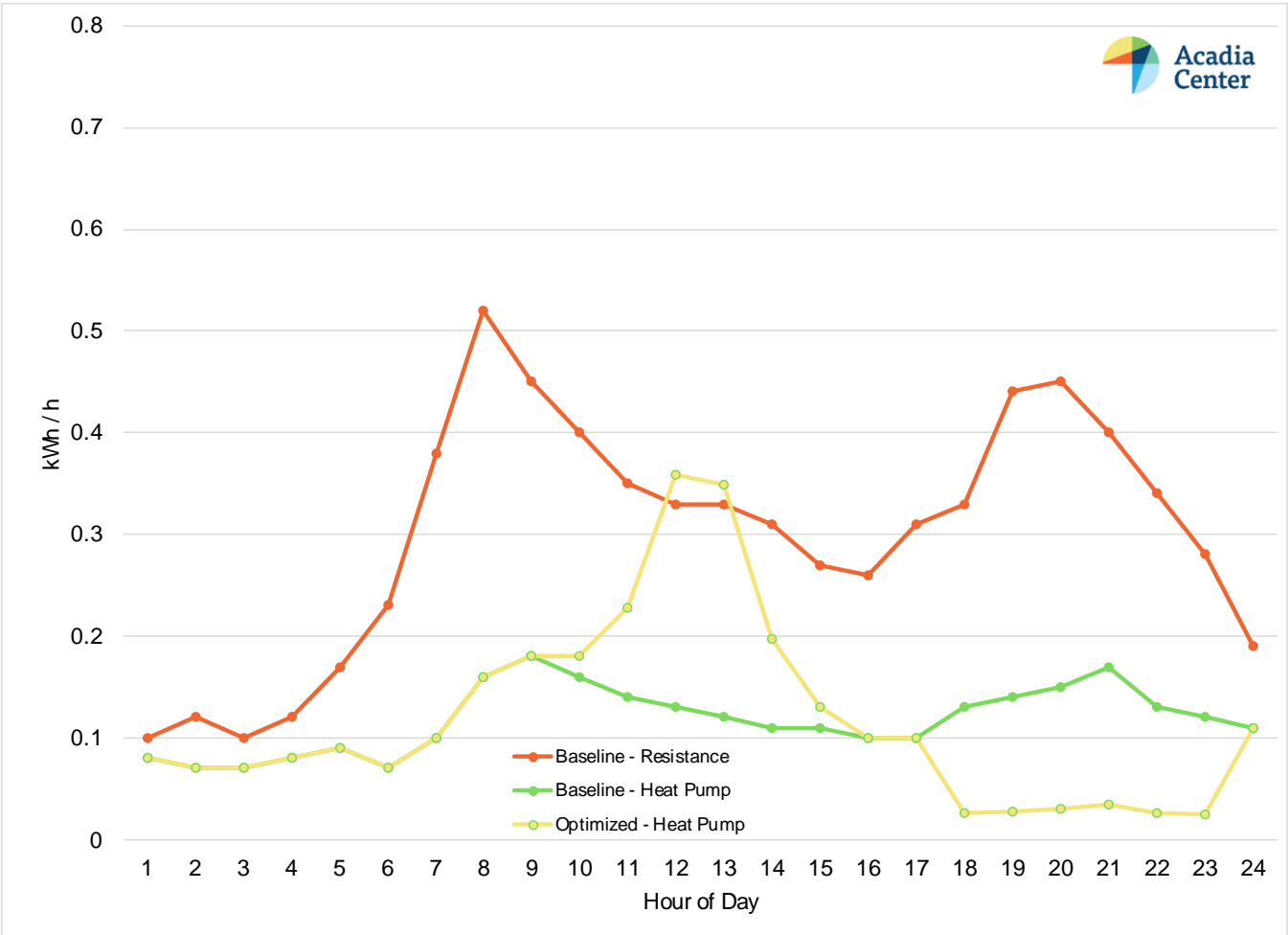
Category	Degree of Impact to Customer	Description of Application
1	Minimal	Not readily apparent to customers and have no loss of services provided
2	Low	Customer might see changes, but no loss of service
3	Medium	More visible to customers and moderate change or loss of service
4	High	Visible to customers and loss of service

Analysis of Potential

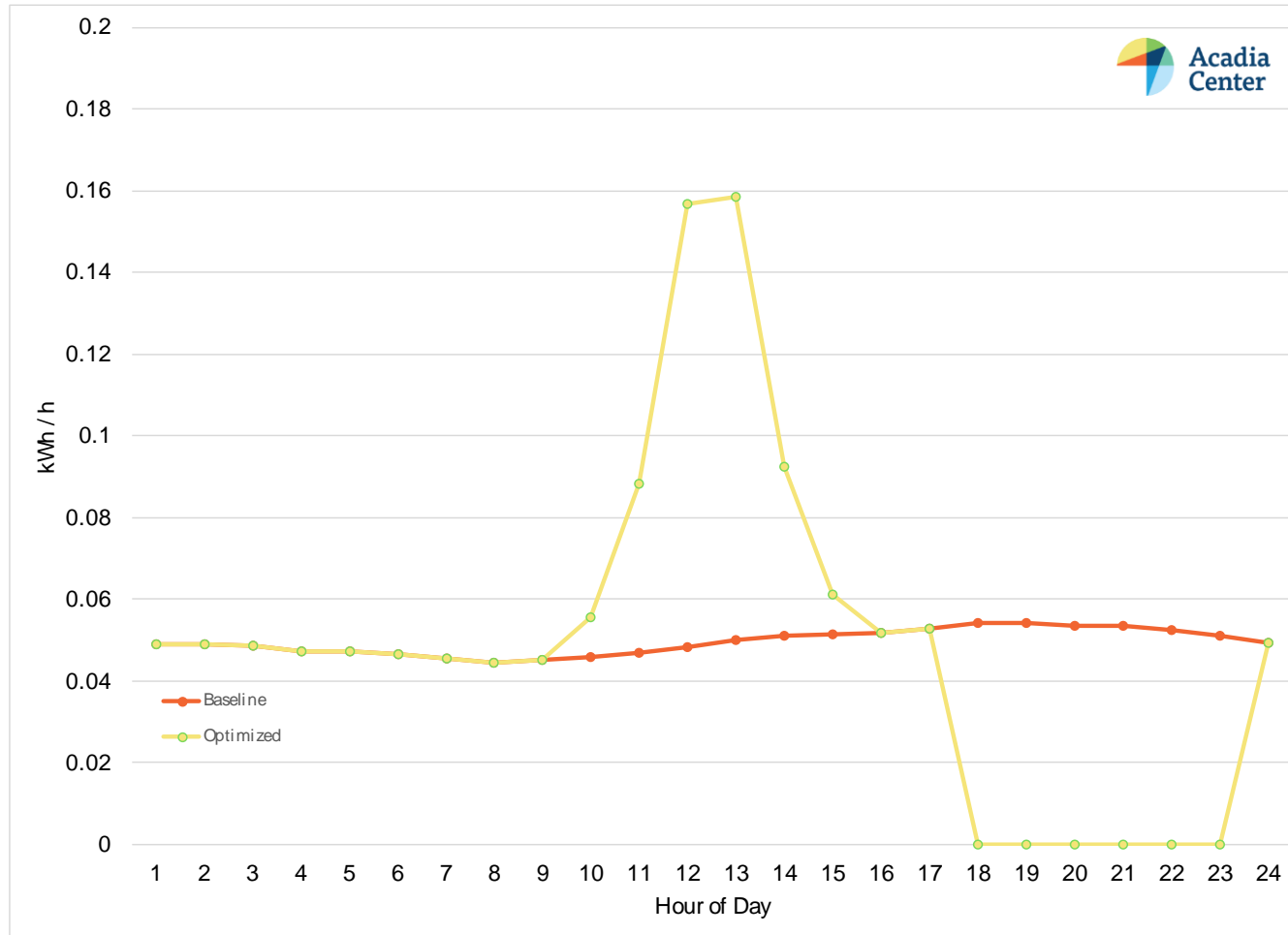
Refrigerators



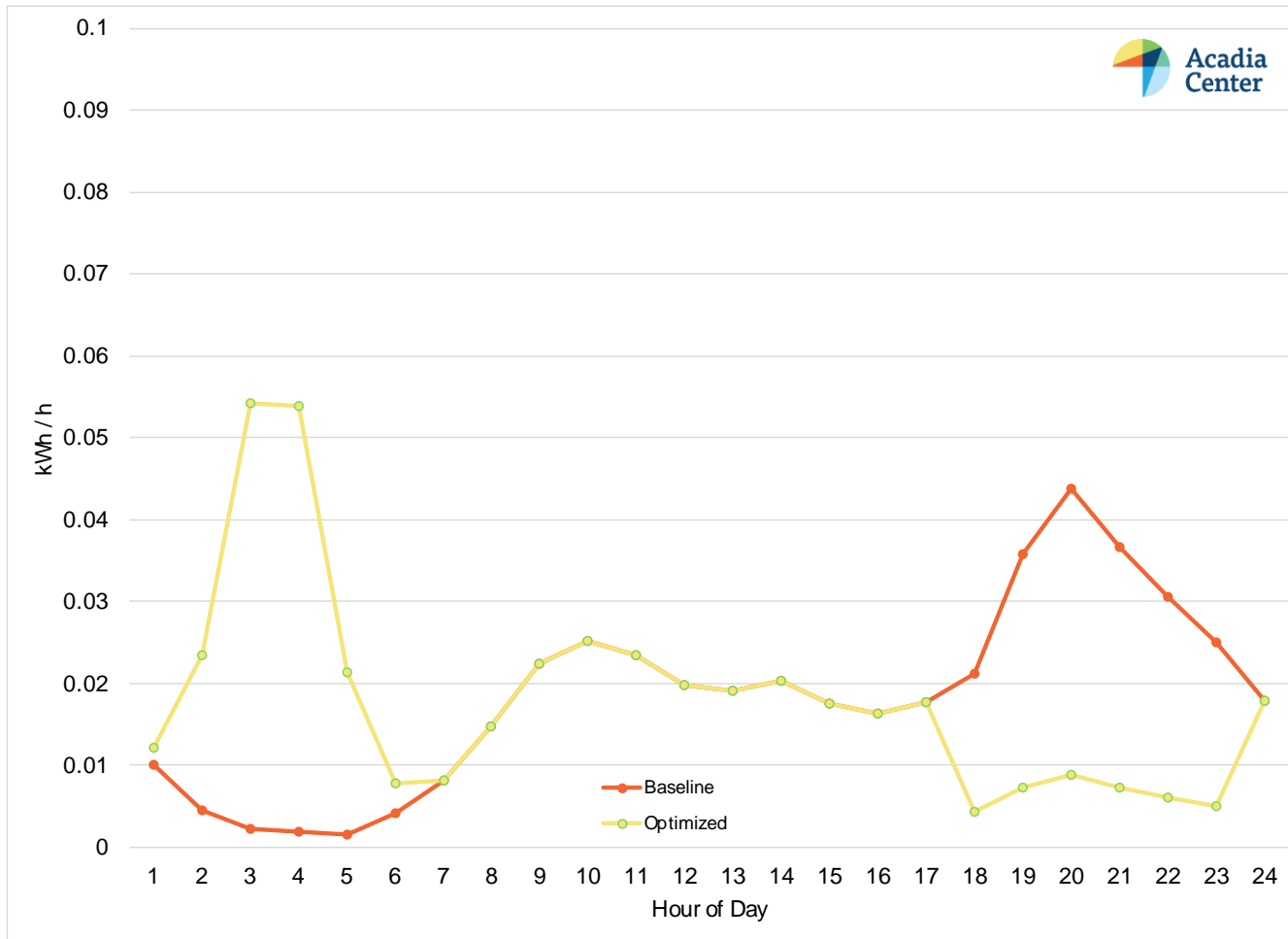
Hot Water Heaters



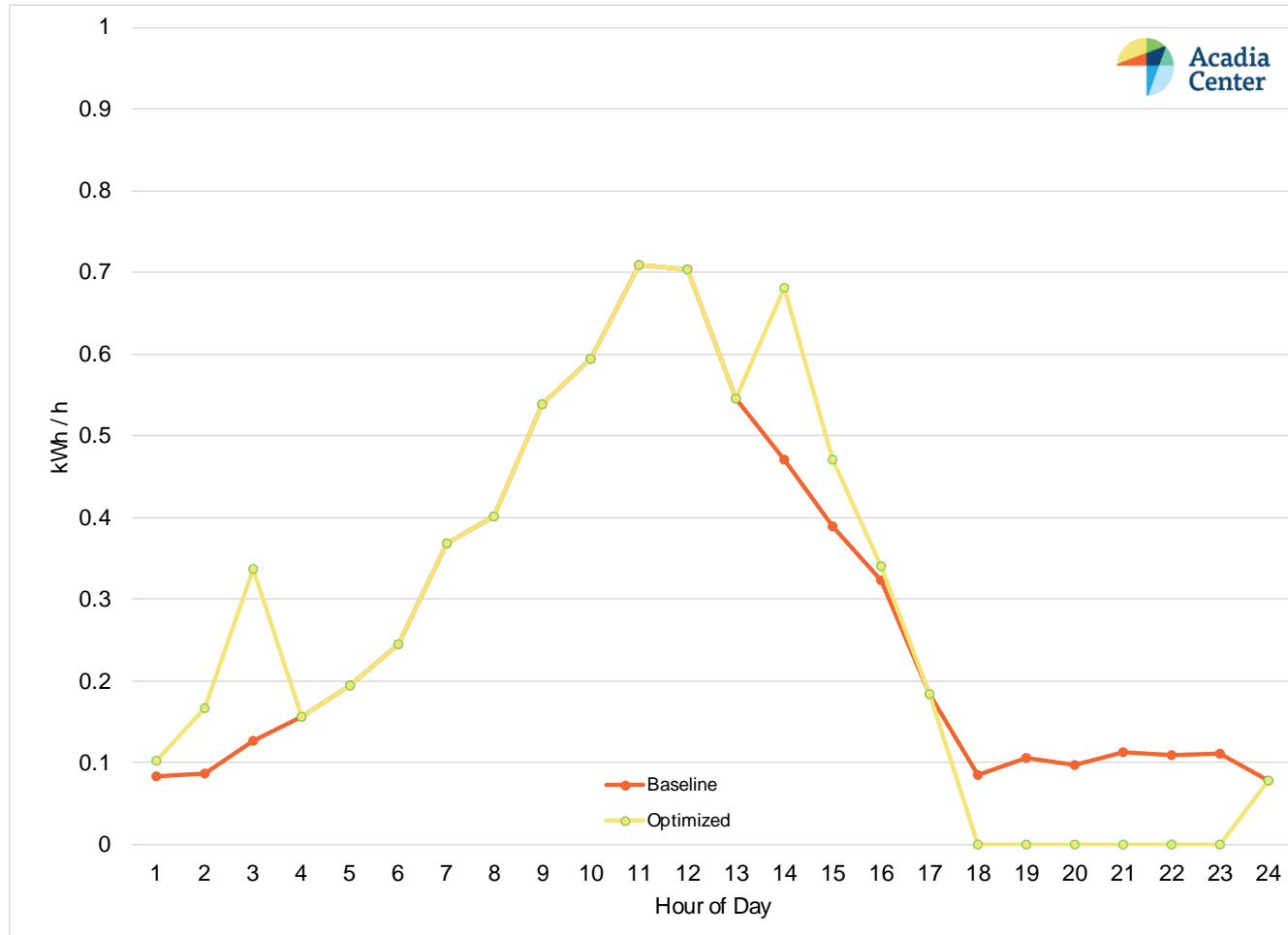
Freezers



Dishwashers

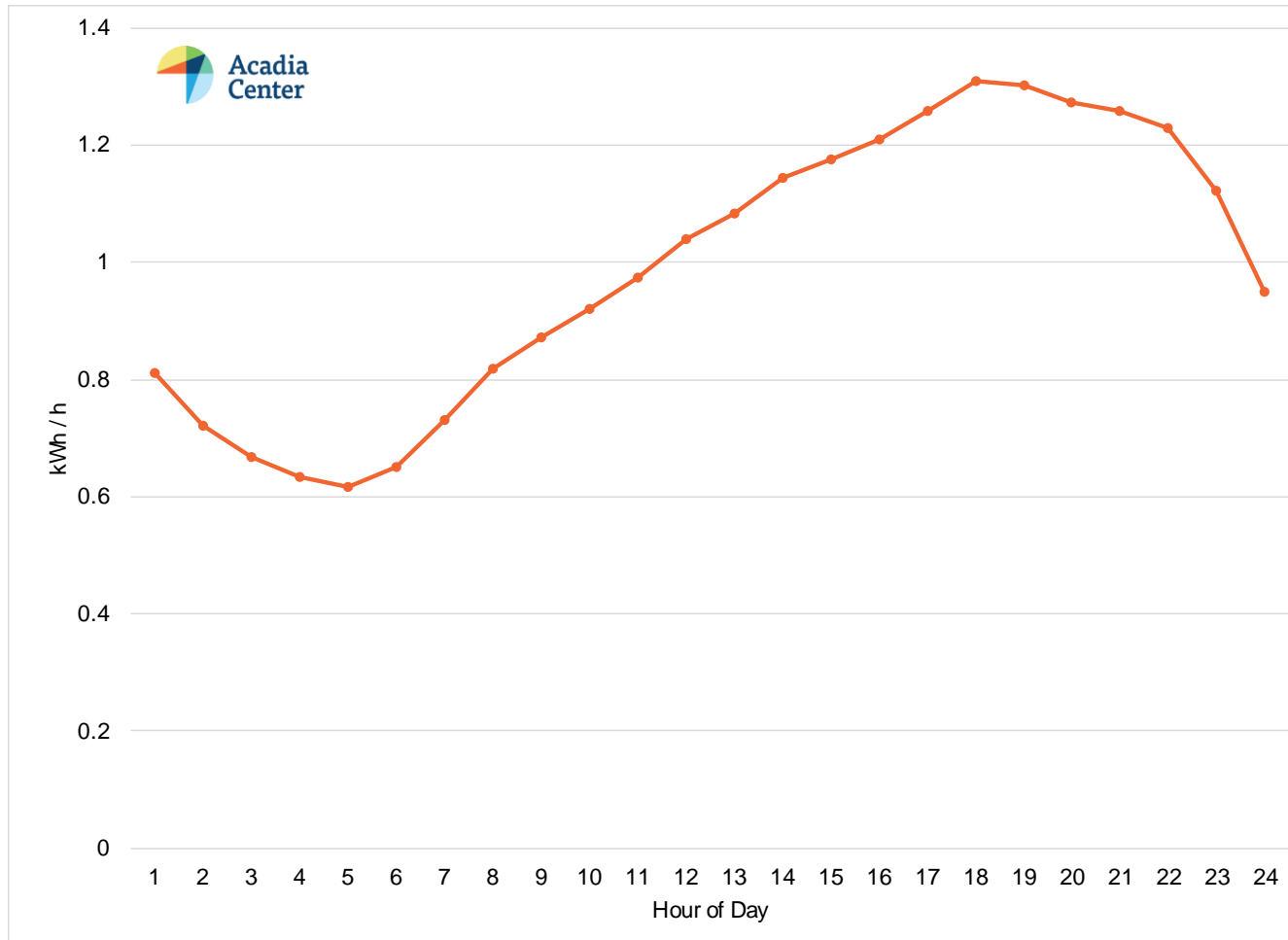


Pool Pumps

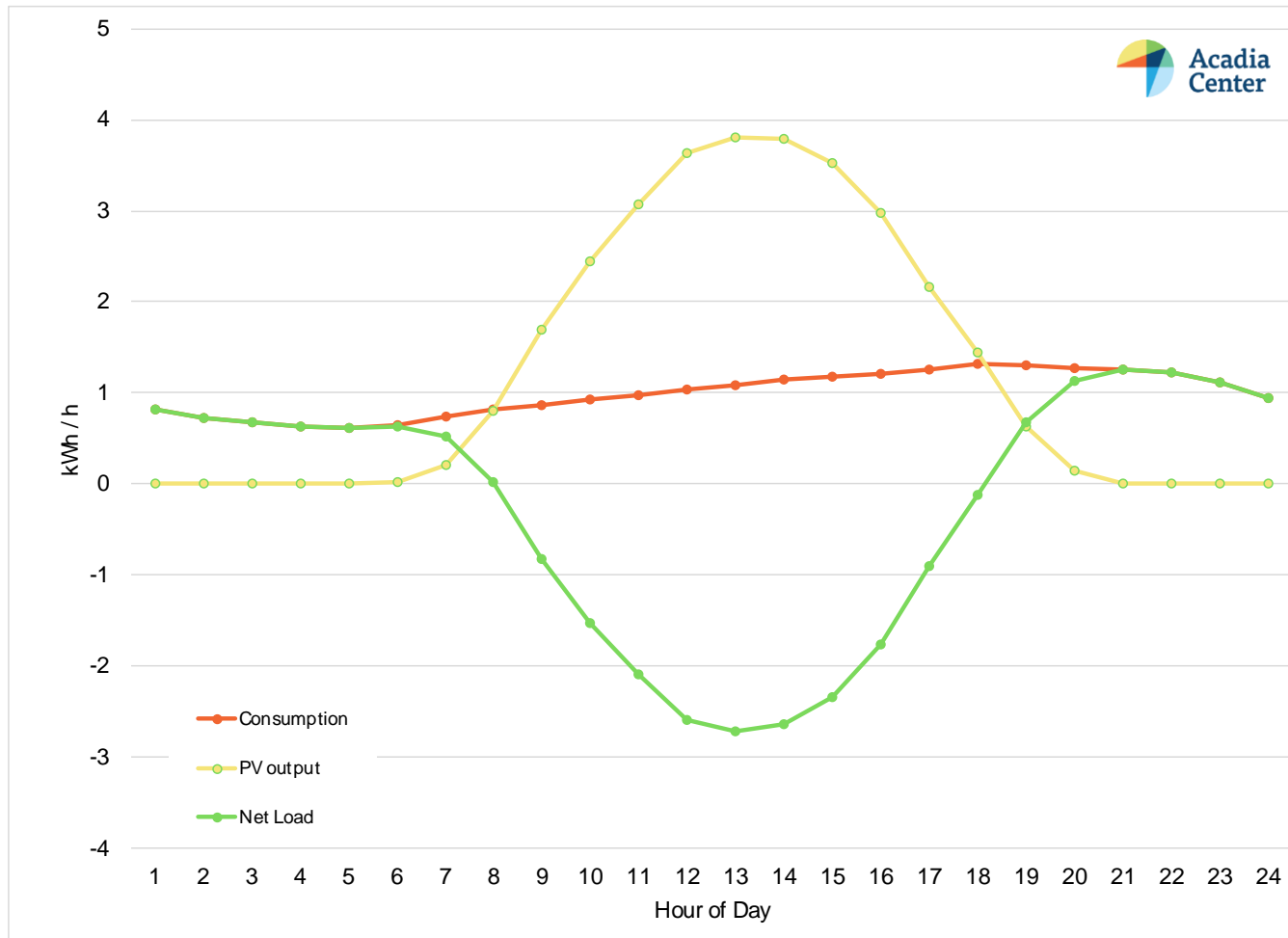


Results

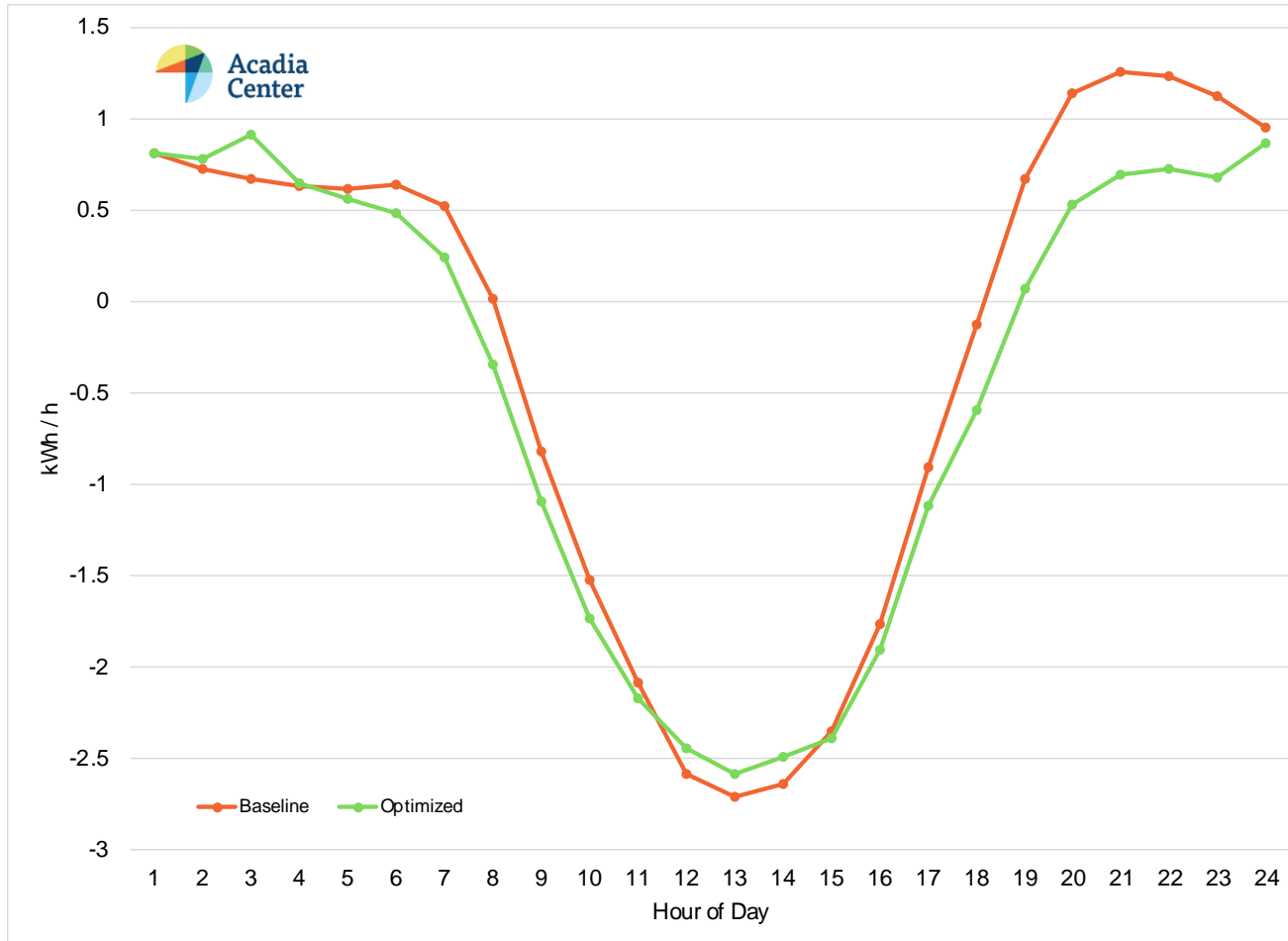
Load Profile for Average Home



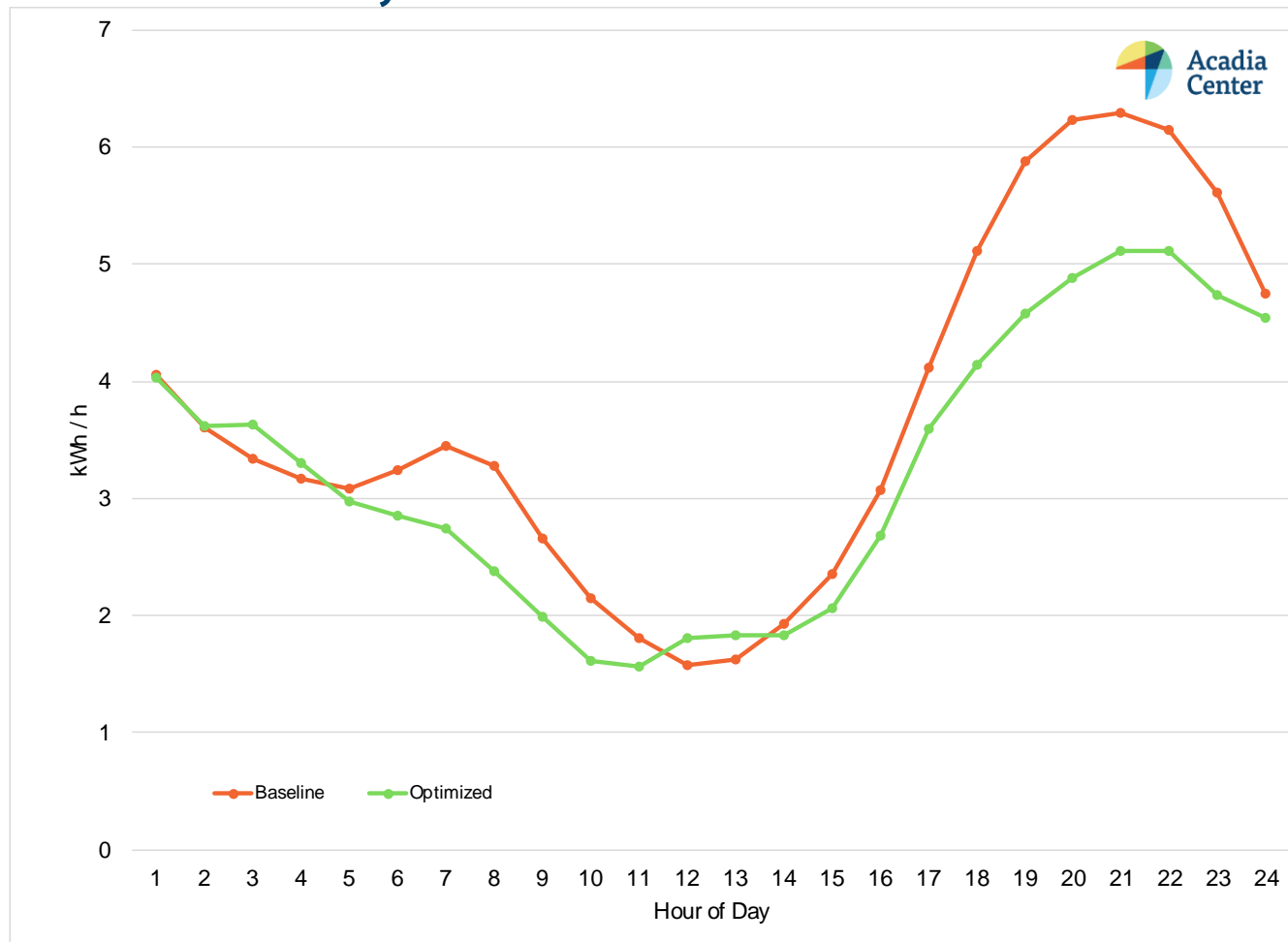
Load Profile for a Single Home with Solar PV



Combined Impact of Optimizing Use of All Five Products – Single Home w/ALM



Combined Impact – Five Homes with ALM; one with Solar PV



Creating a Policy Framework

Delivery Mechanism

- There are many possibilities for getting ALM products to customers and connecting them in a way that can respond to grid needs.
- **Transaction costs for the products included in this study need to be low for the economics to work.**
- All of the products included in this study are part of some energy efficiency programs around the country.

Compensating Participants

- Need to first consider revenue sources:
 - Energy and capacity markets
 - Value of avoided generation infrastructure and/or fuel
 - Value to the grid (both T&D) as a non-wires alternative
- Range of compensation options:
 - Paid full value of participation by a program administrator
 - Amount paid determined by market, similar to how EE rebates are set
 - Condition of an EE product rebate

Aggregator

- **Utility or third-party efficiency program administrator** seems like the most obvious choice for the role
 - Combines role of both delivering products and providing the compensation to customers
 - Existing relationship with customers
- Other options that could be considered include:
 - **For-profit third party;**
 - **Non-profit third-party** – e.g. a “Sustainable Energy Utility” tasked with providing non-infrastructure solutions; and,
 - **No aggregator** – customers instead respond to more granular rate structures.

Recommendations

- ALM can play a role in integrating renewables and optimizing the use of grid infrastructure.
- More work is needed to better understand value of peak load reductions to generation, transmission, and distribution costs.
- **Avoid lost opportunities.** We should no longer be incentivizing products that are not ALM capable when communicating / controllable versions are available at reasonable cost.
- Just like many small EE purchasing decisions have dramatically changed energy consumption, many small load shifting activities have the potential to lower grid costs.

Contact Information

Jamie Howland
Director, Climate & Energy Analysis Center
860-246-7121 x201
jhowland@acadiacenter.org



**Acadia
Center**

Boston, MA • Hartford, CT • New York, NY • Providence, RI •
Rockport, ME • Ottawa, ON, Canada

www.acadiacenter.org





www.acadiacenter.org