RAP® Energy solutions for a changing world

Maryland Energy Workshop

Using Pricing and Demand-Side Management to Reduce Congestion Costs

Annapolis, MD

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Principal

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The Regulatory Assistance Project (RAP)®

RAP – the Regulatory Assistance Project

- RAP is a non-profit organization providing technical and educational assistance to government officials on energy and environmental issues. RAP staff have extensive utility regulatory experience. RAP technical assistance to states is supported by US DOE, US EPA and foundations.
- David is a former PUC and DEP commissioner

What Are the Goals?

Lower prices and bills?

Higher system reliability?

More resiliency?

Dynamic Pricing Can Reduce Cost of Congestion

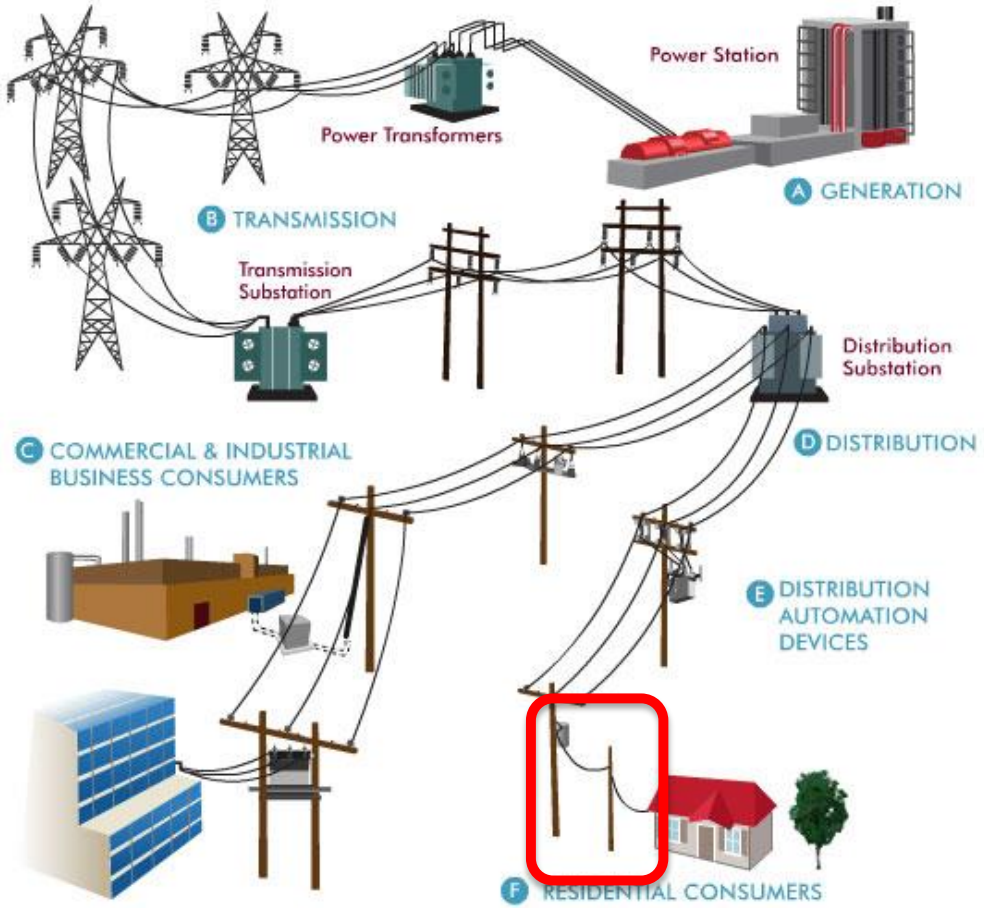
- Predictable reductions in peak demand from dynamic pricing tariffs can impact utility planning by reducing/deferring the need to add peaking capacity
- Dynamic pricing can lower system costs since the bulk of generation costs are incurred during peak hours (congestion costs) and reduce the cost of the transmission upgrades to serve peak load.
- Can eliminate interclass subsidies by pricing power more closely with actual costs

Principles for Modern Rate Design

- **Universal Service:** A customer should be able to connect to the grid for no more than the cost of connecting to the grid.
- **Time-Varying:** Customers should pay for grid services and power supply in proportion to how much they use and when they use it.
- **Fair Compensation:** Customers supplying power to the grid should be compensated fairly for the value of the power they supply.

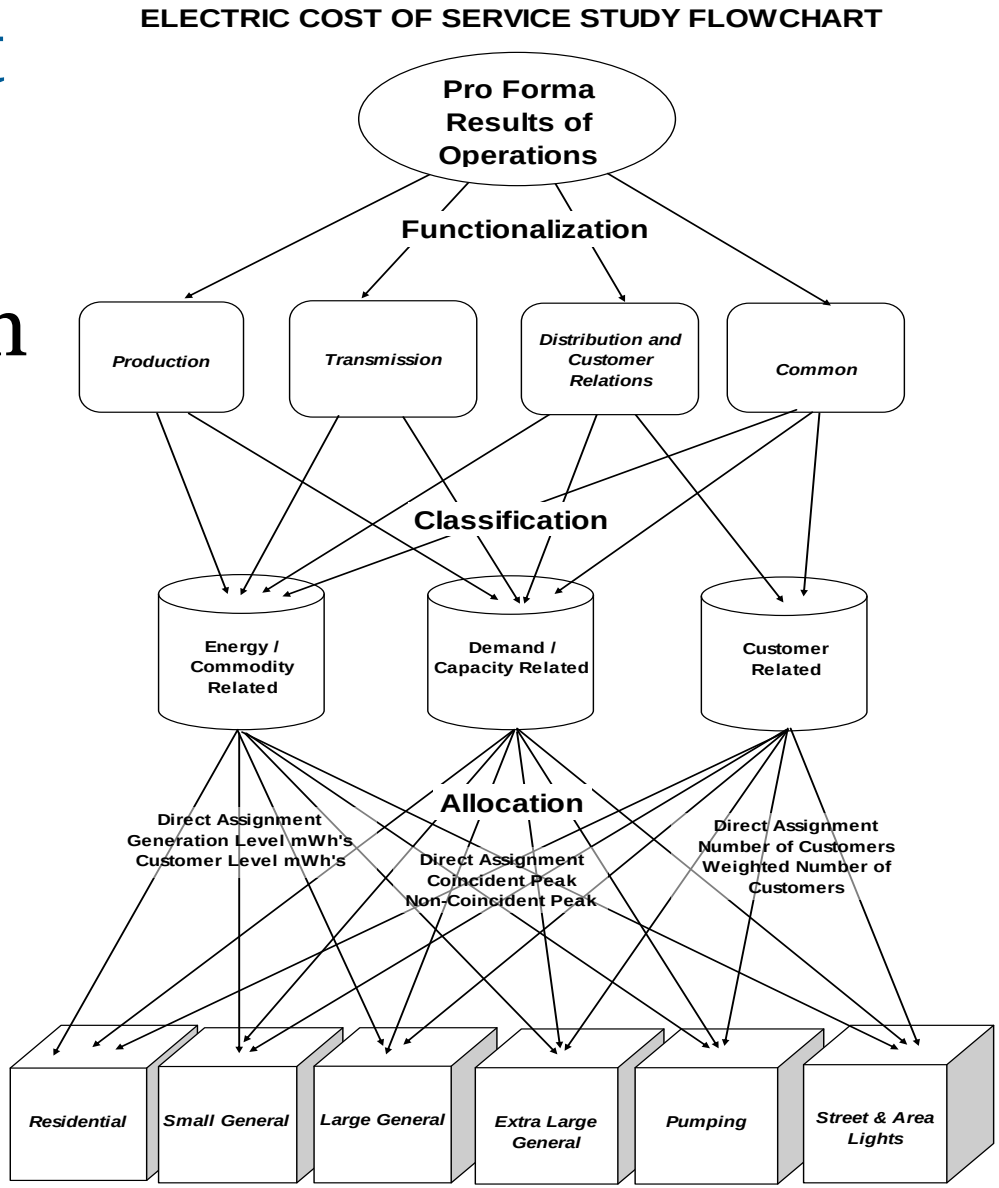
Customer-Specific Costs Appropriate for the Monthly Customer Charge

- Billing
- Collections
- Share of transformer and service drop



Embedded Cost of Service

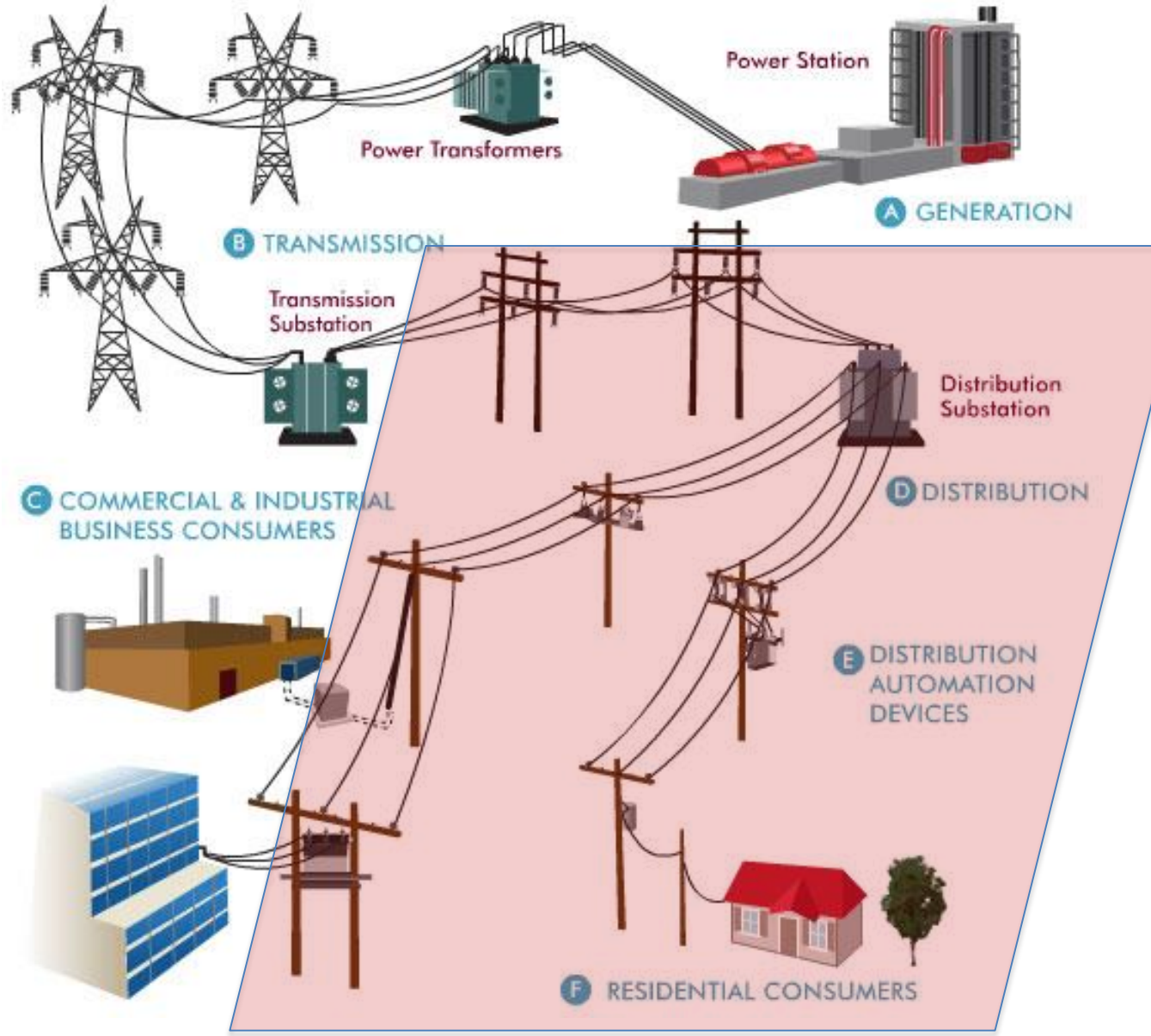
- Functionalization
- Classification
- Allocation



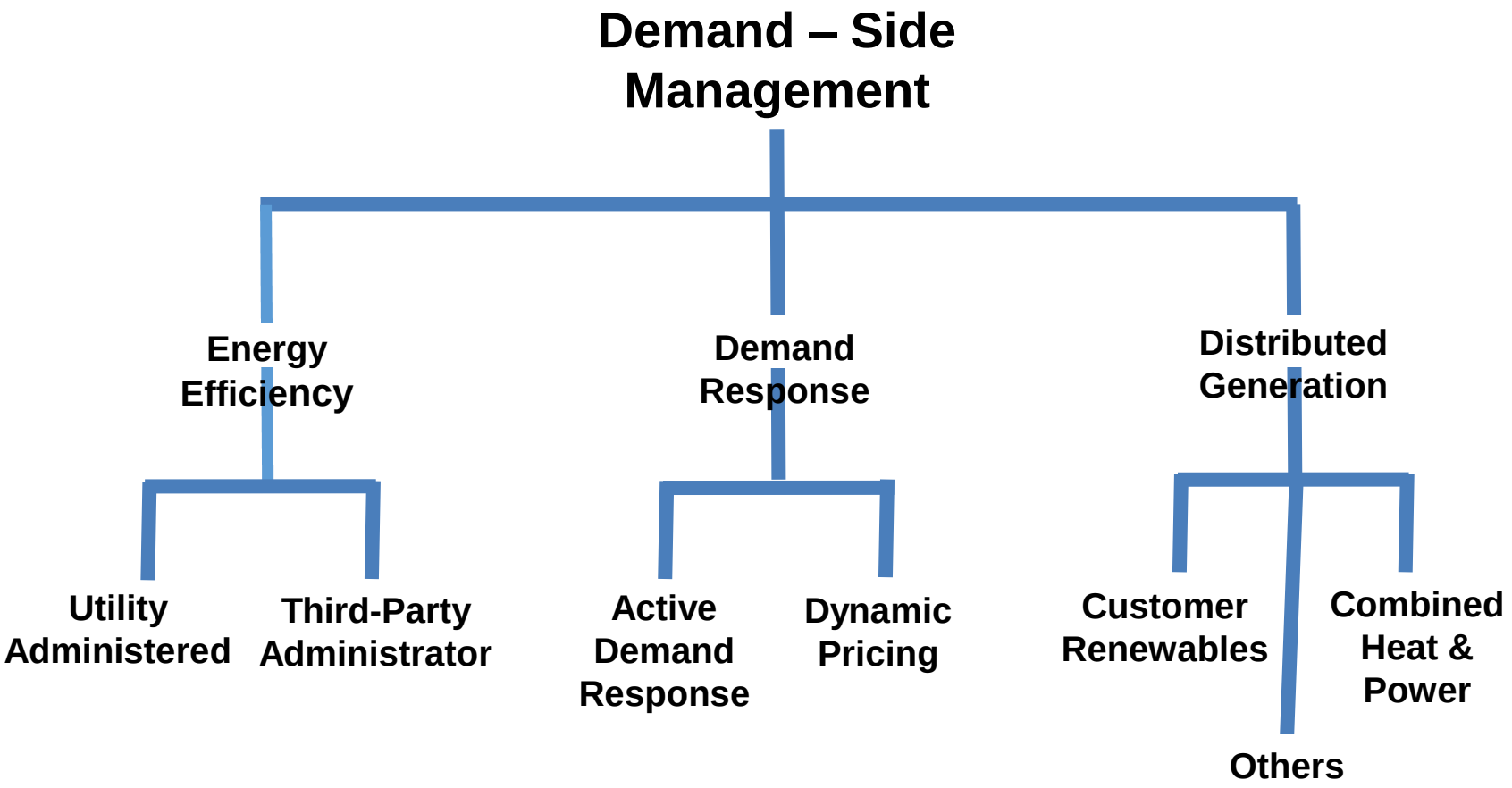
Pro Forma Results of Operations by Customer Group

Straight Fixed / Variable:

100% of distribution system classified as customer-related



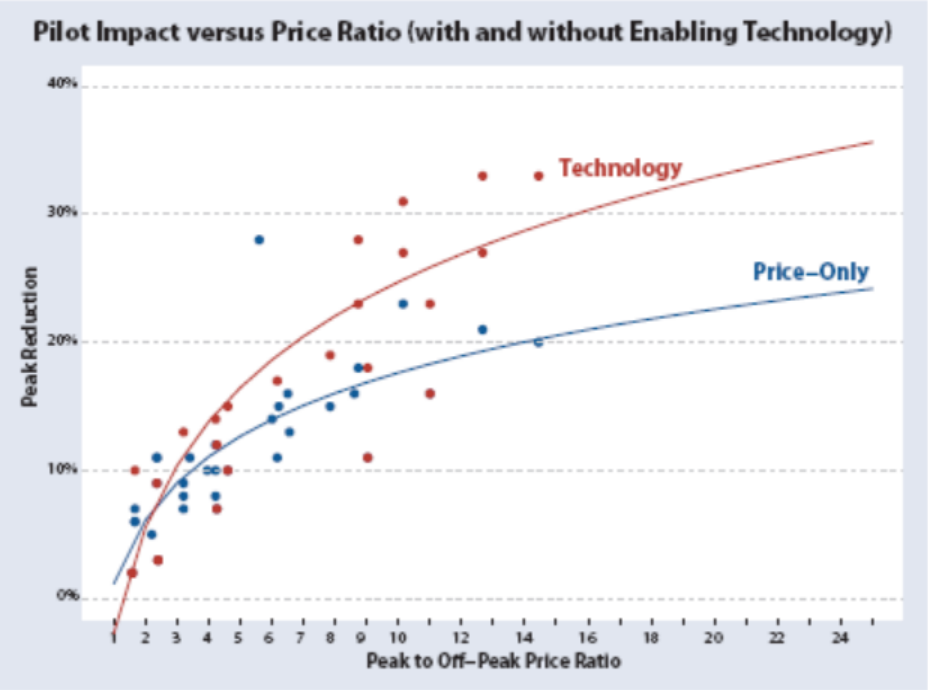
Demand-Side Management



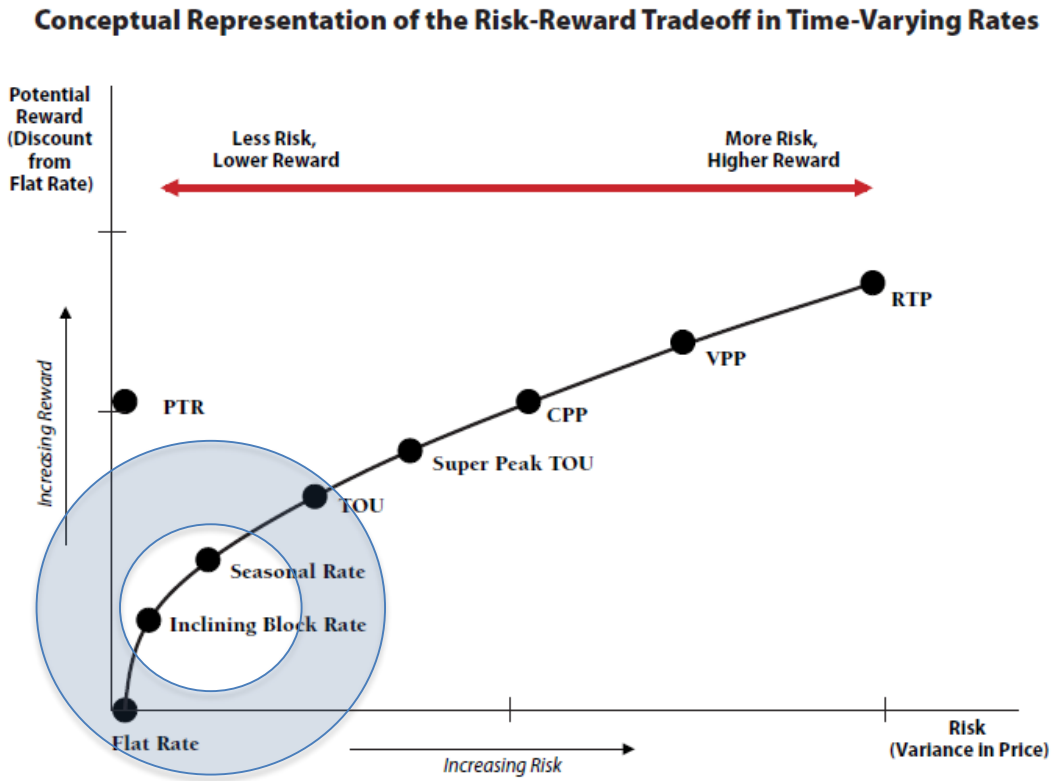
Enabling Consumer Technology For CPP and RTP

- Installation of energy management devices that automatically adjust energy use when a price signal is received.
  - Air conditioning
  - Process and water heat
  - Cold storage refrigeration
  - Eventually, minor loads like refrigerators, freezers, and laundry equipment

Enabling Technology Improves Price Response



Is Data for Peak Load Reduction?



Contrasting Direct Demand Response and Dynamic Pricing Goals

In determining whether to use a dynamic pricing rate design or a direct demand response program, the question is whether you want to lower the peak demand curve and shift load, in which case changes are incorporated through the rate design, **or** whether you want to create a product that can be controlled (by an operator) to reduce demand when system peaks are getting too high.

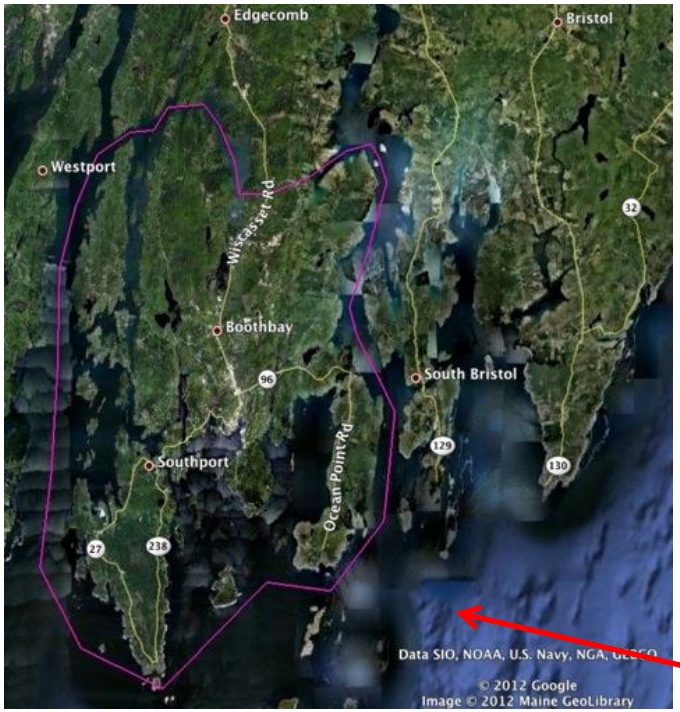
How Is Dynamic Pricing and Demand Response Priced (Designed)?

- Dynamic pricing established through ratemaking either in a regulatory setting or an offering by a competitive supplier. (Here there are issues of whether the LDC has appropriate metering and billing technology to accommodate).
- Demand response is set through the capacity-market price in most cases (exception: industrial curtailment contracts that may be commission-approved).

Distribution Planning

- Largely done today outside the view of the regulator
- Keep depreciation line steady
  - Fill in urgent projects to fill budget
- In most places, still a one-way system
  - But signs of change are evident
  - Can distribution planning drive distributed resource deployment? And vice versa?

Boothbay Non-Transmission Alternative (NTA) Project



- Radial nature of electric service and local distribution circuits on the Boothbay peninsula defines the electrical region for the pilot project.
- Total peak load: approximately 30 MW.

Source: GridSolar NRRI Presentation

Largest Transmission for New England Up to 2009 Proposed for Maine

- Maine Power Reliability Program (MPRP)
  - $1.5 billion transmission upgrade to provide grid reliability to meet NERC Standards
  - Justification: Based on 10-year load peak load forecasts
  - Standard stress test analysis
  - Needs assessment showed reliability concerns at very high load levels that would occur during very few hours of the year
  - Those hours were very hot summer afternoons when AC loads are expected to be at their highest.
  - Initially included a $18 million upgrade to CMP Sub-Transmission Line serving the Boothbay Peninsula

Source: GridSolar NRRI Presentation

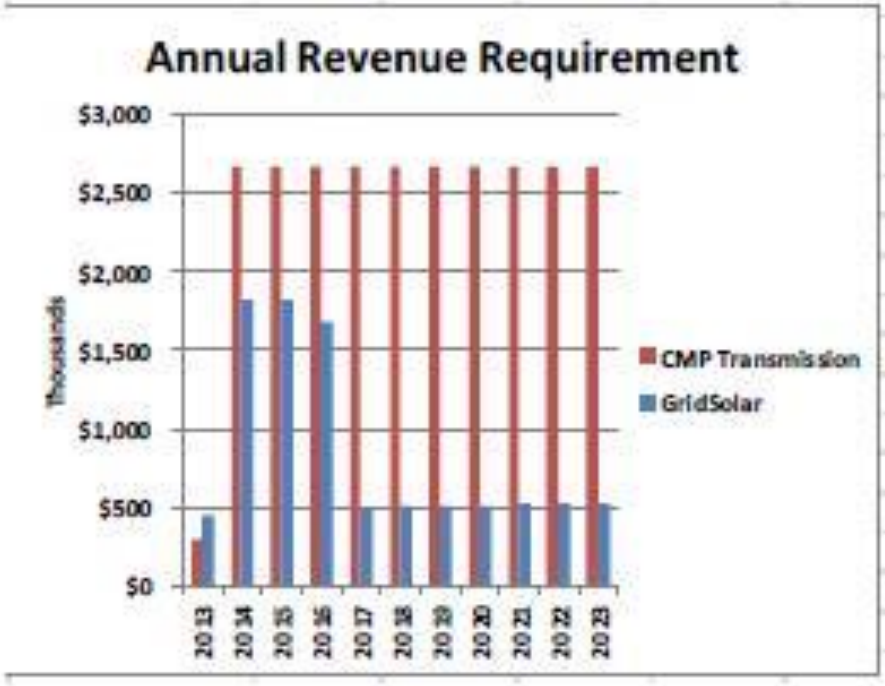
Boothbay, Maine, NTA Pilot Resource Mix

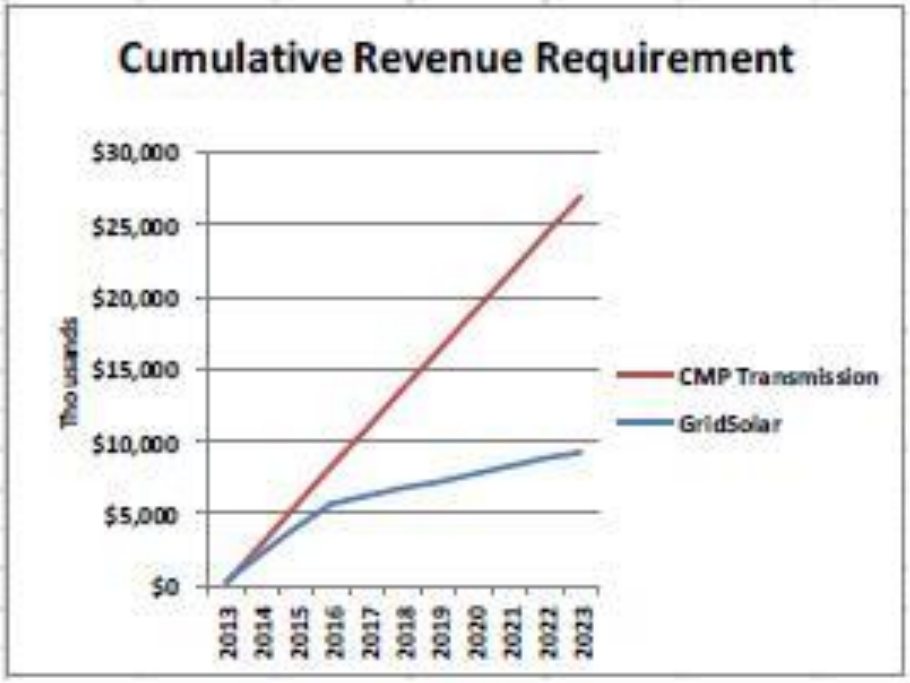
	RFP I*	RFP II	Totals	Pct.	Units	Weighted 3 Year Price	10 Yr. (Levelized) Price
Efficiency	237.00	111.25	348.25	19%	7	$23.51	$10.47
Solar	168.83	106.77	275.60	15%	14	$46.05	$13.19
BUG (same)	500.00	500.00	500.00	27%	1	$17.42	$20.63
Demand Response	0.00	250.00	250.00	13%	1	$110.00	$57.65
Battery	0.00	500.00	500.00	27%	1	$163.70	$75.99
Total	905.83	1468.02	1873.85		24		

* RFP I excludes Maine Micro Grid project; Efficiency increased to reflect EMT contract option.

Source: NEEP, EE as T&D Resource (Jan. 2015), p. 38.

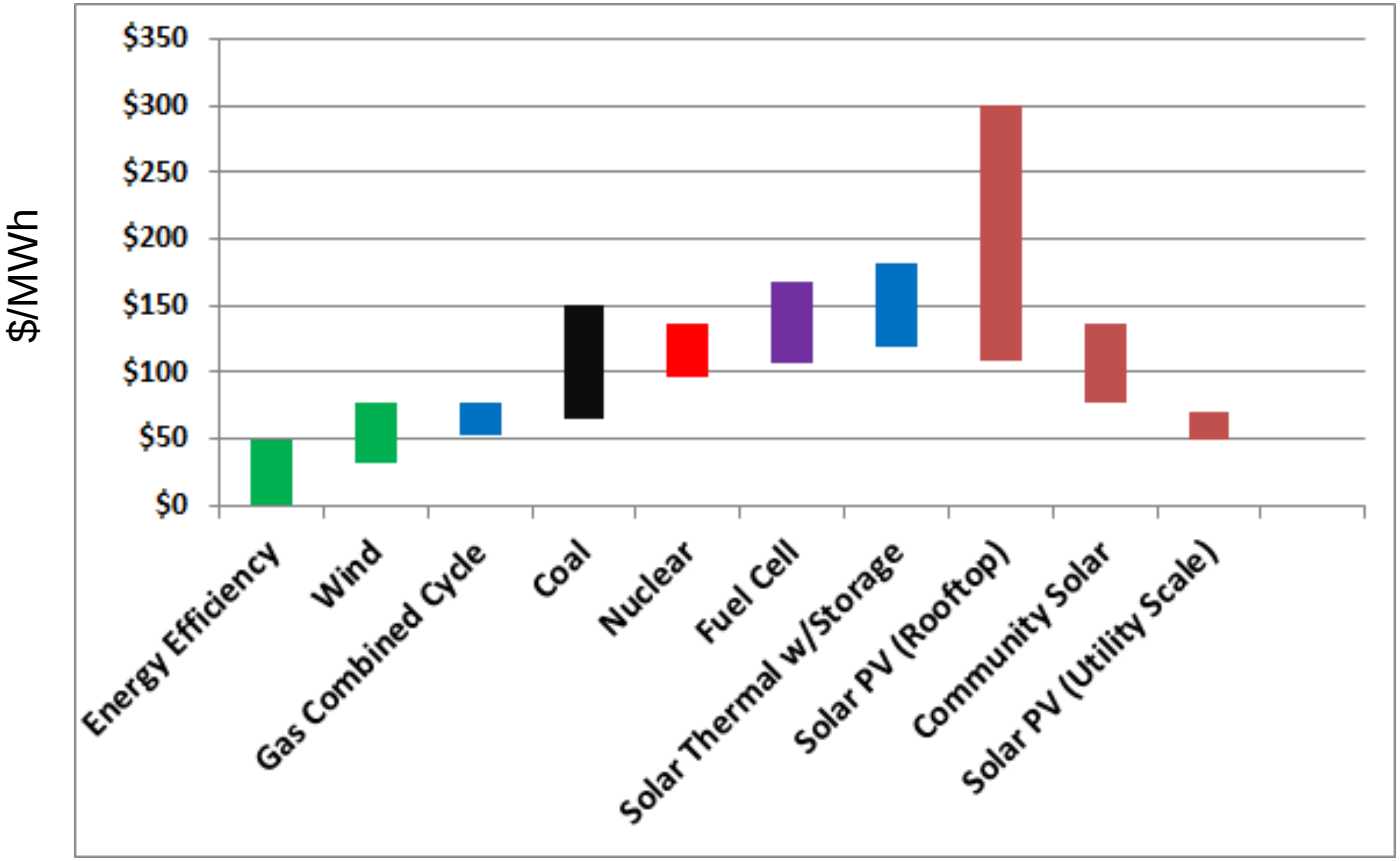
Boothbay NTA Pilot
Cost Comparison of NTA v. Transmission





Source: NEEP, EE as T&D Resource (Jan. 2015), p. 41.

Energy Efficiency Is the Lowest-Cost Resource



Source: Lazard, 2015

Demand Response and Dynamic Pricing are Different Tools

- Dynamic pricing can result in a steady fairly reliable reduction in peak demand, thereby altering the daily load curve, but it cannot impact the need to reduce demand as a result of a specific event.
- Active load control is typically employed to respond to specific emergency events to maintain reliability.

What Type(s) of Dynamic Pricing?

- Time of Use: Set rates that include an off-peak, on-peak and sometimes a shoulder rate

- Real Time Pricing: Rates that may vary as frequently as hourly based on a price signal that is provided to the user on an advanced or forward basis, reflecting the utility's cost of generating and/or purchasing electricity at the wholesale level. When used, usually applies to large customers. Requires Advanced Metering Infrastructure (AMI).

- Critical Peak Pricing: A TOU price that has a much higher price for a limited number of peak hours. (Requires AMI)

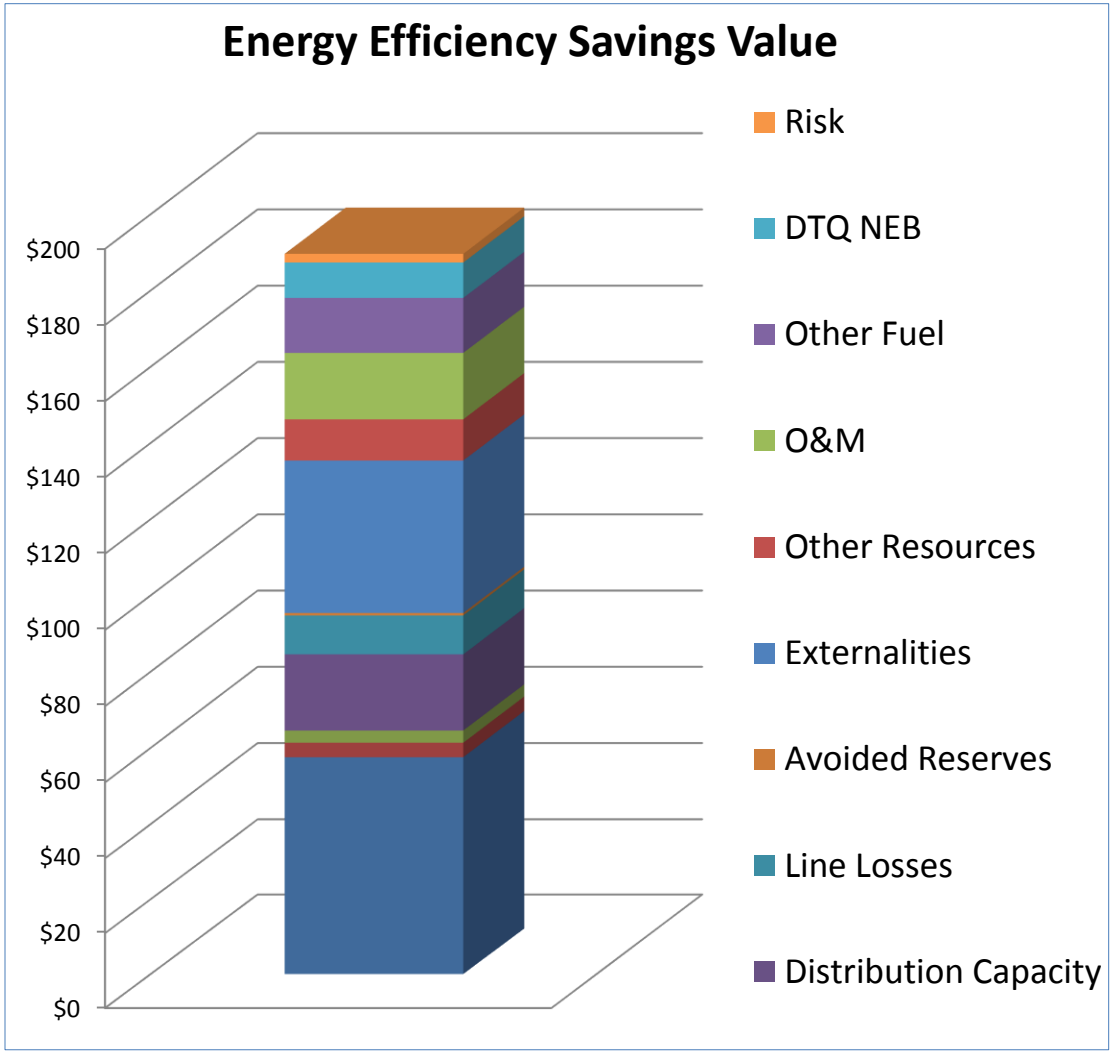
What Type(s) of Dynamic Pricing?

- Variable Peak Pricing: A hybrid of time-of-use and real-time pricing where the different periods for pricing are defined in advance, however, the price established for the on-peak period varies by utility and market conditions. (Requires AMI)

- Peak Time Rebates: Where customers are compensated on an incident by incident basis for reducing their load – voluntary program, no penalty for not participating

- Industrial Interruptible Contracts: Customer receives a reduced rate in exchange for providing the utility the opportunity to call on the customer to reduce load during system emergencies

Multiple Benefits of EE



Most analyses of EE are incomplete:

- Some look only at avoided energy costs.
- Many include production capacity costs, but not transmission or distribution capacity or line losses.
- Few include other resource savings (water, gas, oil).
- Very few try to quantity non-energy benefits.

About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power sector. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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