Dynamic Pricing in a Smart Grid World

MADRI Dynamic Pricing Workshop

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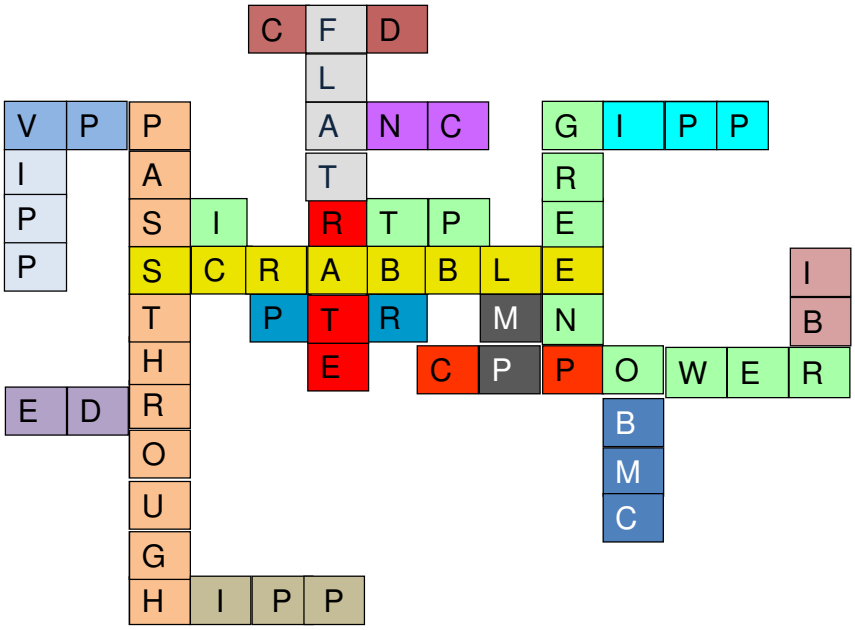
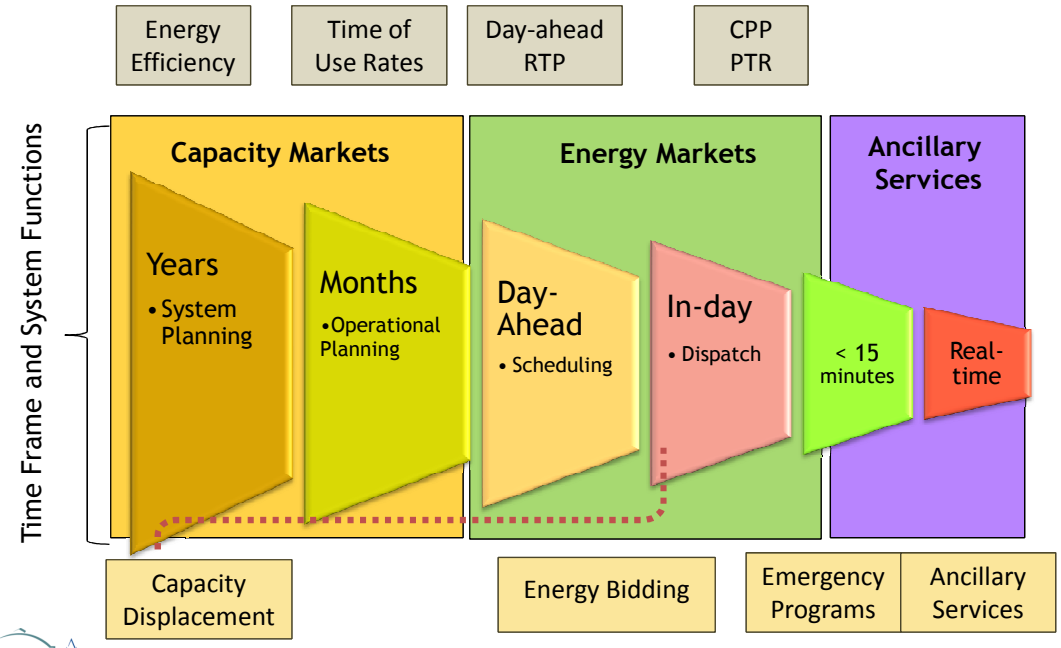
So Many Rates . . . So little time . . .

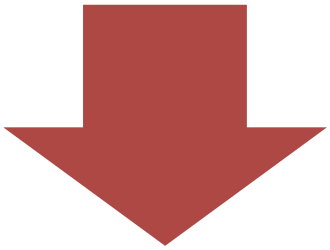


Source: B. Neenan, Electric Power Research Institute. Included with permission.

How Products Align with Market Time Frames



Tradeoffs: Basic Service or Product Overlay?

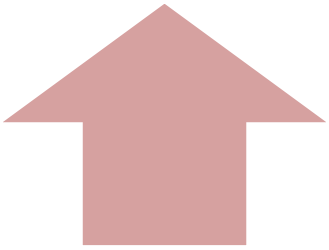


Basic Service

- Pros: Offers greatest potential for economic efficiency gains
- Cons: Will be more difficult due to conflicting regulatory goals (bill impacts)

Product Overlays

- Pros: Can design the overlay without having to re-design the underlying rate for basic service
- Cons: Will have more limited potential for improving overall economic efficiency



Defining Dynamic Pricing: Six Basic Structures for Firm or Default Service*

- ❑ Flat energy rates
- ❑ Flat demand/energy rates
- ❑ Tiered rates (inclining or declining blocks)
- ❑ Time of use (TOU) rates
- ❑ Variable peak pricing (VPP) rates
- ❑ Real time pricing (RTP) rates

*Most rate structures also include a customer or access charge.

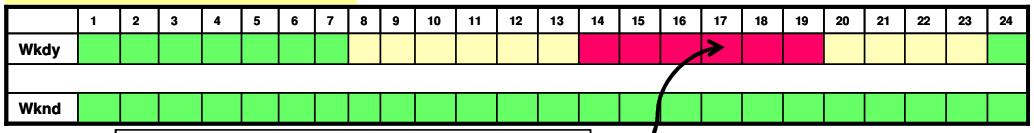
Time-Varying Rate Structures (typical designs)

- **Time of Use**
  - Prices for peak, shoulder and off-peak periods established a year in advance
- **Variable Peak Pricing (VPP)***
  - A hybrid of TOU and RTP
  - The on-peak ***period*** (hours and seasons) is defined in advance
  - Peak period ***prices*** for the next day are established based on the day-ahead forecast of wholesale market prices
- **Real-time Pricing (RTP)**
  - Hourly prices change based on system or market conditions on a day-ahead, hour-ahead or real-time basis

*There is also a product overlay known as variable peak pricing which is a variant of critical peak pricing.

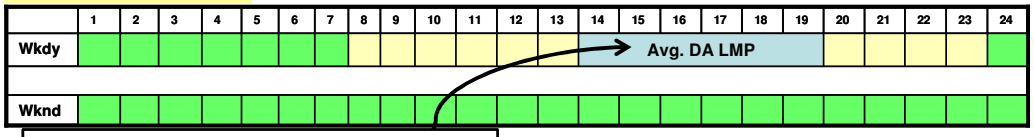
Comparison of TOU and Variable Peak Pricing

Proposed 3-Part TOU

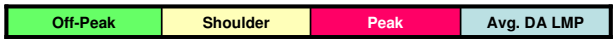


Under traditional TOU, the peak, shoulder and off-peak price would typically be established a year in advance.

Proposed VPP



Under VPP, the on peak price is set equal to the average day-ahead wholesale market price for the on-peak hours



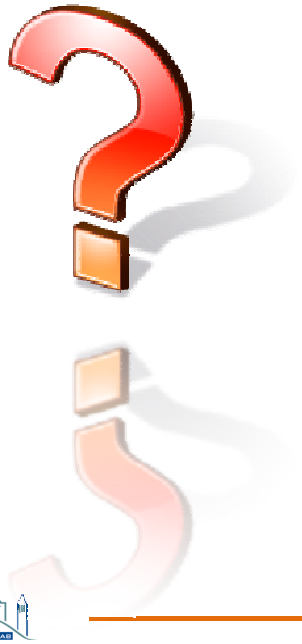
Defining Dynamic Pricing: Product Overlays

- A product overlay can simply be layered on top of the existing firm rate under specified conditions, with no (or minimal) adjustments to the underlying basic firm rate.
- Examples:
  - Reliability-differentiated
    - Interruptible/curtailable (I/C) rates
    - Direct load control (DLC)
  - Economic Overlays
    - Critical peak pricing (CPP)
    - Peak time rebate (PTR)
    - 2-part real time pricing (2-Part RTP)

Economic Potential, Bill Impacts and Smart Grid Benefits of Different Rates (compared to flat rates)

Rate Structure	Economic Efficiency Potential	Initial Bill Impacts (assumes no response)	Potential to Maximize Smart Grid Benefits
Flat Rates + PTR or CPP Overlay			
Flat + PTR	Low/moderate	Low	Moderate
Flat + CPP	Low/moderate	Moderate	Moderate
TOU + PTR or CPP Overlay			
TOU + PTR	Moderate/high	Moderate/high	Moderate
TOU + CPP	Moderate/high	Moderate/high	Moderate
Dynamic Base Rates			
Two-Part RTP	High/higher w/ technology	Low	High/very high
TOU-VPP	High/very high	High	Moderate/high
Real Time Pricing	High/higher w/ technology	Very high	Very high

Contact Information



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Appendix

Pricing Product Overlays: CPP & PTR (Typical Designs)

Design Feature	Critical Peak Pricing	Peak Time Rebate
Resource goal	Peak load reductions	Same
Critical Peak Period Definitions	Typically defined in advance	Same
Event Price	Typically defined in advance	Same
Revenue Neutrality (relative to base case)	Firm rate + CPP rate designed to be revenue neutral ▪ Can create windfall gains & losses ▪ May need revenue adjustments if all events are not called in order to recover required revenue	PTR not designed to be revenue neutral (requires initial rate increase to cover rebates) ▪ Can create windfall gains due to how the CBL is defined ▪ Can be called only as needed
Customer-specific baseline load (CBL)	Not required	Required – a major implementation issue

Pricing Product Overlays: Two-Part RTP Overlay

- Part 1 – Customer baseline load (CBL):
  - Retains the price hedge embedded in the customer's basic service rate
  - Requires setting a CBL, typically defined by the historical hourly load profile
- Part 2 – Hourly marginal cost:
  - Changes in usage from the CBL would be priced at utility's marginal cost (or market price)

Pricing Product Overlays: Two-Part RTP Overlay