

Aligning Retail Rates with the Needs of Transitioning Power Systems

Energy Systems Integration Group

October 25, 2022



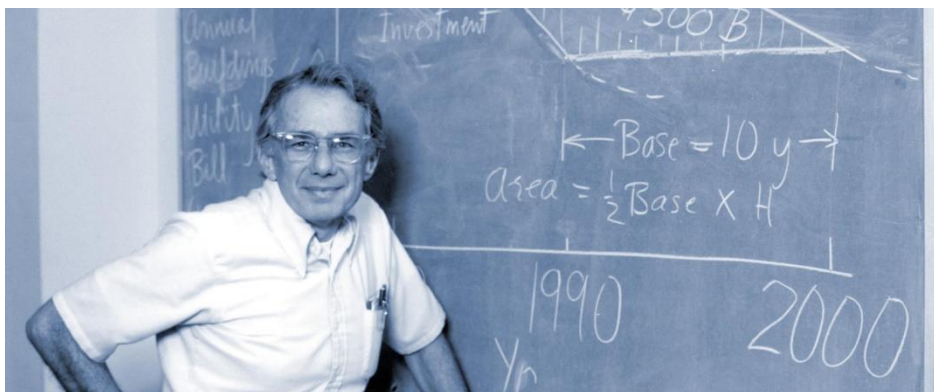
Energy+Environmental Economics



Times have changed, and our rate designs must change too

“Then”

- + Fuel was expensive and power was dirty no matter when it was consumed
- + Conservation was a key strategy to save fuel and reduce emissions
- + High volumetric rates – e.g., inclining blocks – were aligned with environmental and equity goals



“Now”

- + Clean energy is abundant during many hours of the year
- + Electrification is a key strategy to decarbonize cars and buildings
- + High volumetric rates are a major impediment to achieving our environmental goals





Times have changed, and our rate designs must change too

“Then”

- + Reducing consumption avoided fuel combusting generation with high variable costs

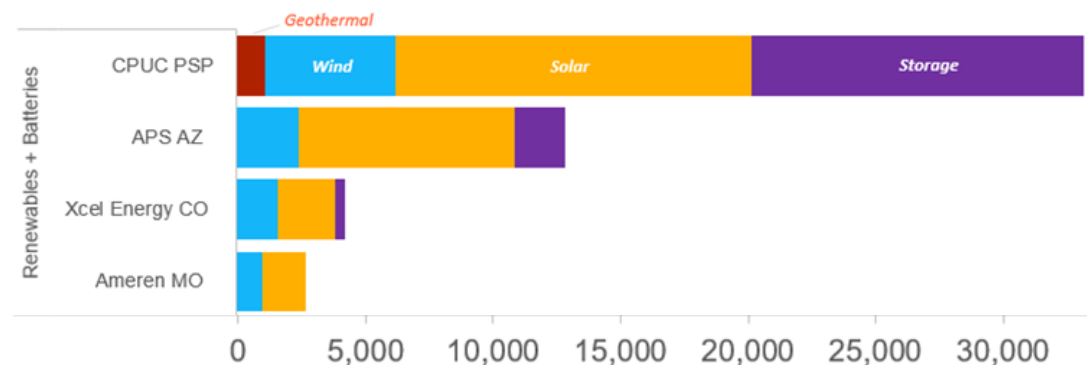


“Now”

- + Avoidable resources have high fixed costs and almost no variable costs



Resource Additions by 2030, MW Nameplate

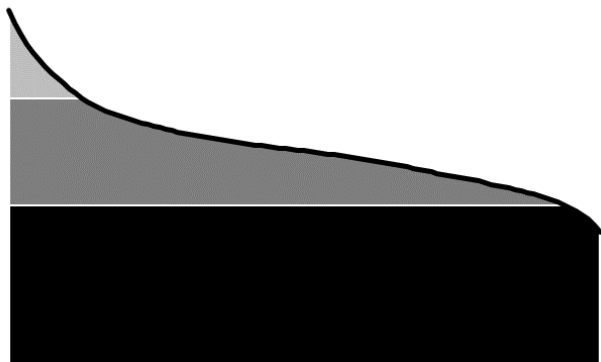




Times have changed, and our rate designs must change too

“Then”

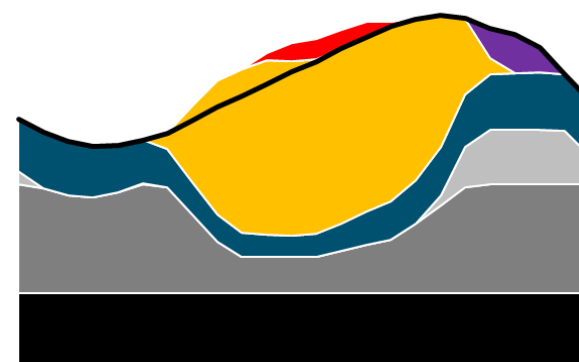
- + Market prices and emissions rates varied by time of day and time of year, but gas was almost always on the margin and the hourly variations were relatively small



Traditional Load Duration Curve

“Now”

- + Market prices are frequently negative during daylight hours, especially in the spring, and much higher during the evening after sundown



Storage discharges to meet net peak

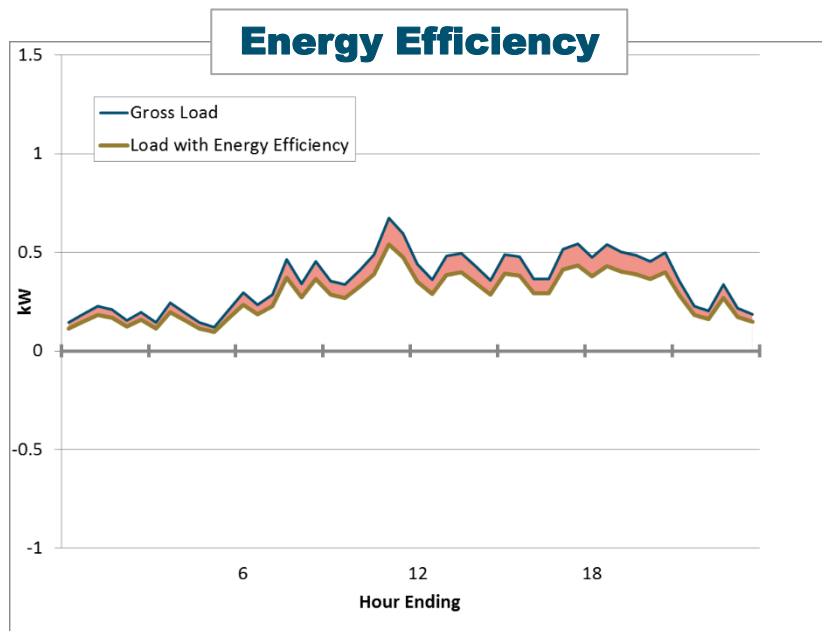
Potential 24-hour Generation Profile



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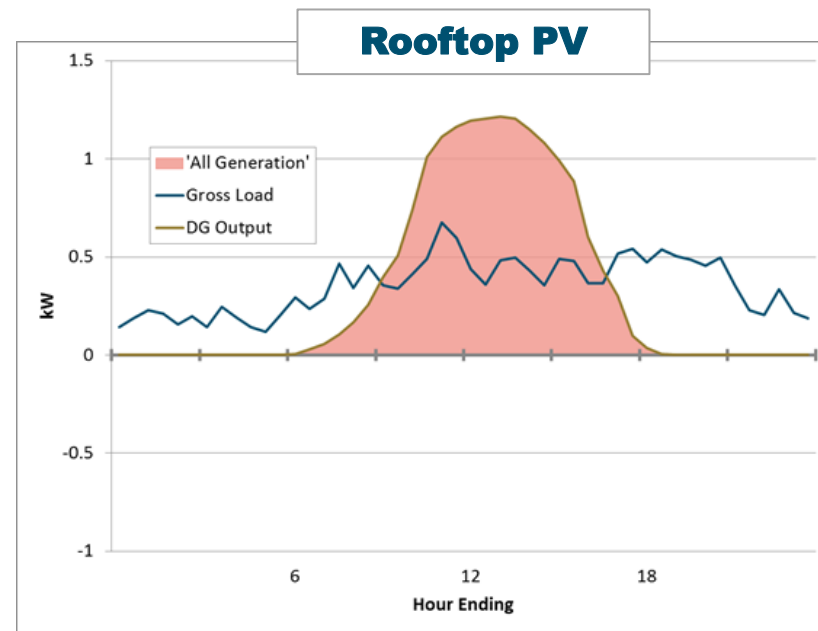
“Then”

- + Customer response to price signals was predictable
- + Blunt price signals were sufficient to induce beneficial response



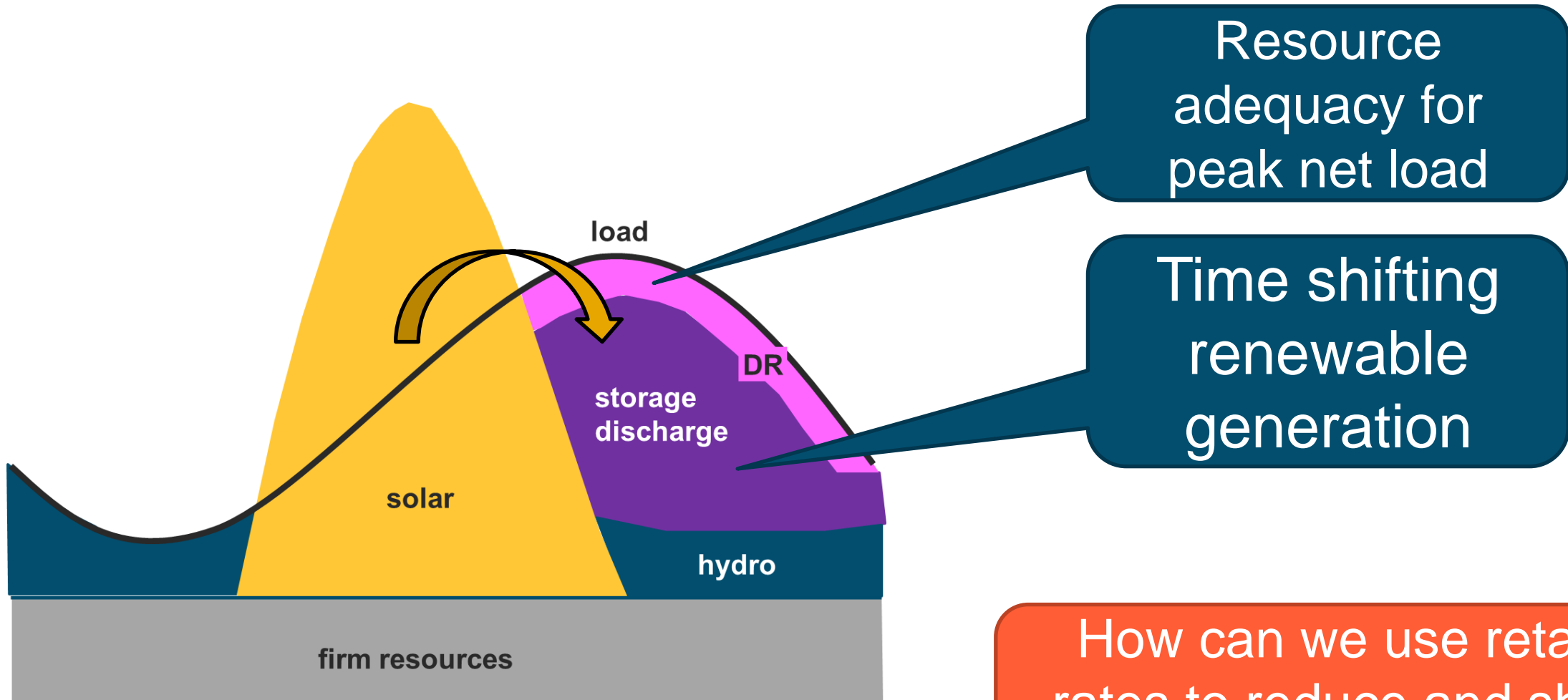
“Now”

- + Customers are increasingly able to respond dynamically to price signals
- + More precise price signals will be necessary to avoid harmful arbitrage





The two dominant needs for low-carbon grids are resource adequacy and energy time shifting

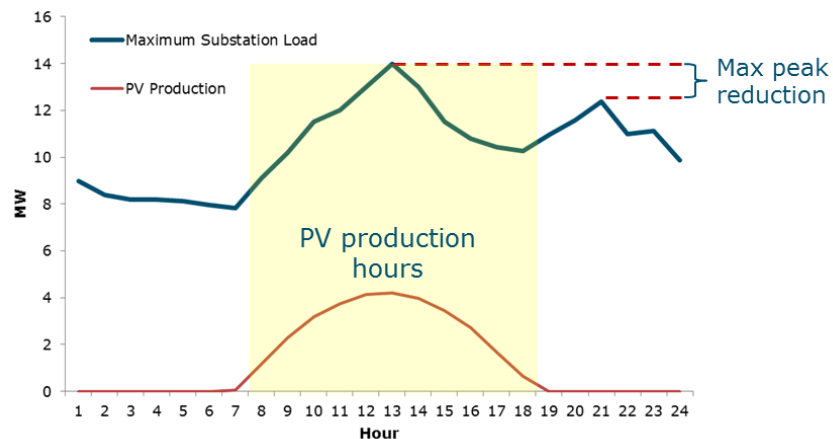


How can we use retail rates to reduce and shift peak loads?

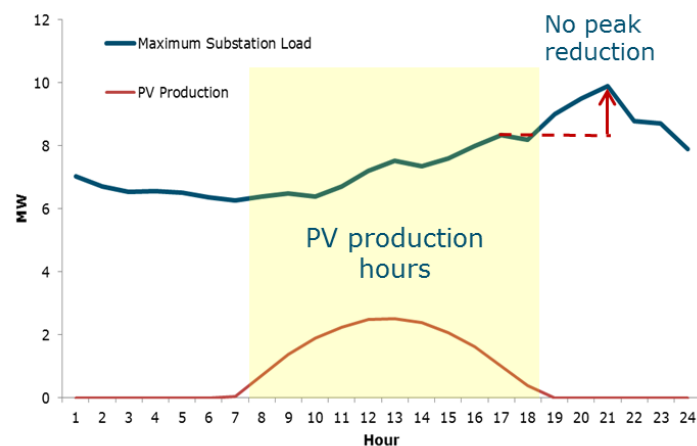


To avoid fixed costs, customer response is required at very specific times and locations

Mixed commercial/residential feeder

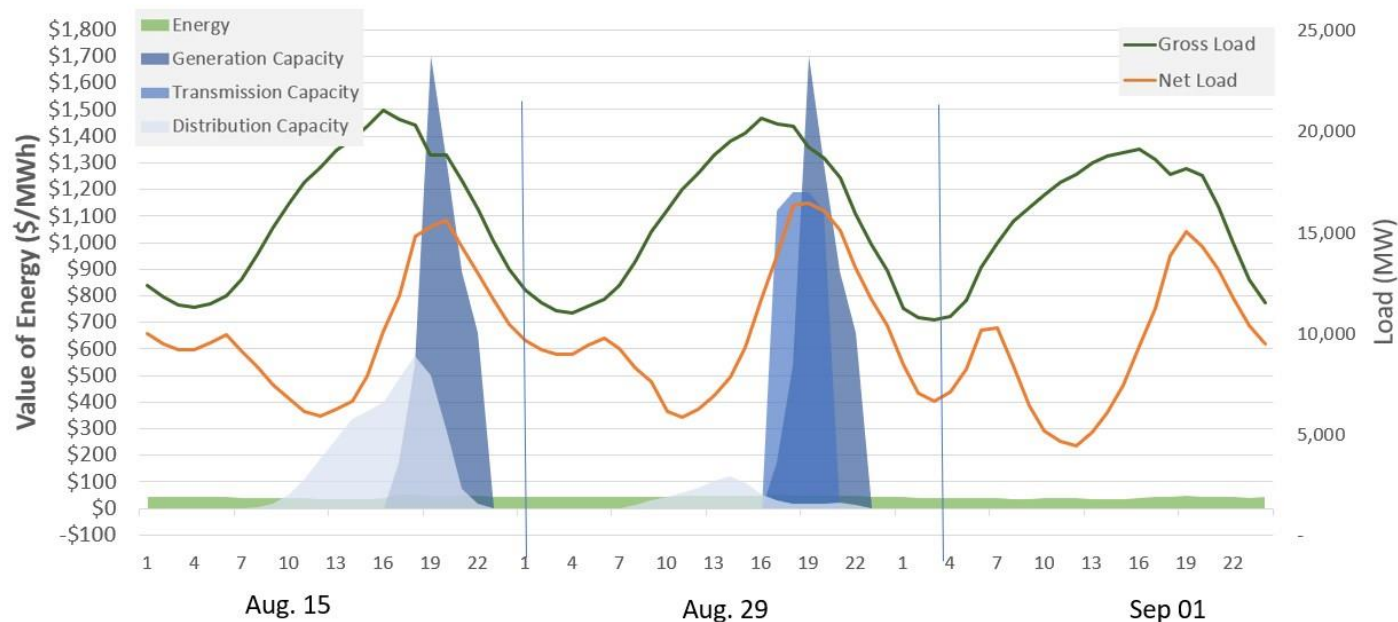


Residential only feeder



- + Generation capacity “events” may occur during ~30 hours per year
- + T&D “events” may occur at different times
- + Recovering fixed costs during non-events is sending a bad price signal!

Components of a dynamic retail rate





The extent to which customer response can avoid electricity system costs varies based on the type of cost

Cost Category	Avoidability Rating	Comments	Rate Design Focus
Generation fuel	★★★★	Savings accrue immediately almost anytime and almost anywhere	Mostly efficient price signals
Generation emissions	★★★★	Savings accrue immediately almost anytime and almost anywhere	Mostly efficient price signals
Generation capacity	★★★	Avoiding generation investment requires customer response at the right time	Mostly efficient price signals
Transmission costs	★★	Avoiding transmission investment requires customer response at the right time and in the right location	Mix of efficient price signals and fixed cost recovery
Distribution costs	★	Avoiding distribution investment is hardest due to precise timing and locational requirements, lack of load diversity in small areas	Mostly fixed cost recovery



Elements of rate designs that can help achieve societal decarbonization goals

General concept of a multi-part rate:

- + Send good price signals to induce beneficial behavior at the margin**
 - Energy and demand charges based on long run marginal cost (LRMC)
 - This will result in some fixed cost recovery since $LRMC > SRMC$
- + Recover remaining costs through non-bypassable charges designed for equity**
 - Demand subscription
 - Ratchet demand charge
 - Income-based fixed charges
 - Low-income discount incorporated here
- + Legacy rate for those who can't or don't want to be prosumers**

Specific elements:

- 1. Dynamic hourly energy rates that align with wholesale market prices**
- 2. Demand charge or dynamic energy charge adder aligned with wholesale capacity market structures or utility resource adequacy needs**
- 3. Demand charge or dynamic energy charge adder coincident with transmission peak**
- 4. Non-coincident demand charge for distribution costs**
- 5. Equity-based cost recovery charge**



The idea that fixed charges are not found in nature is false!



The
New York
Times

Thank you!

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