

Why is the Smart Grid so Dumb?

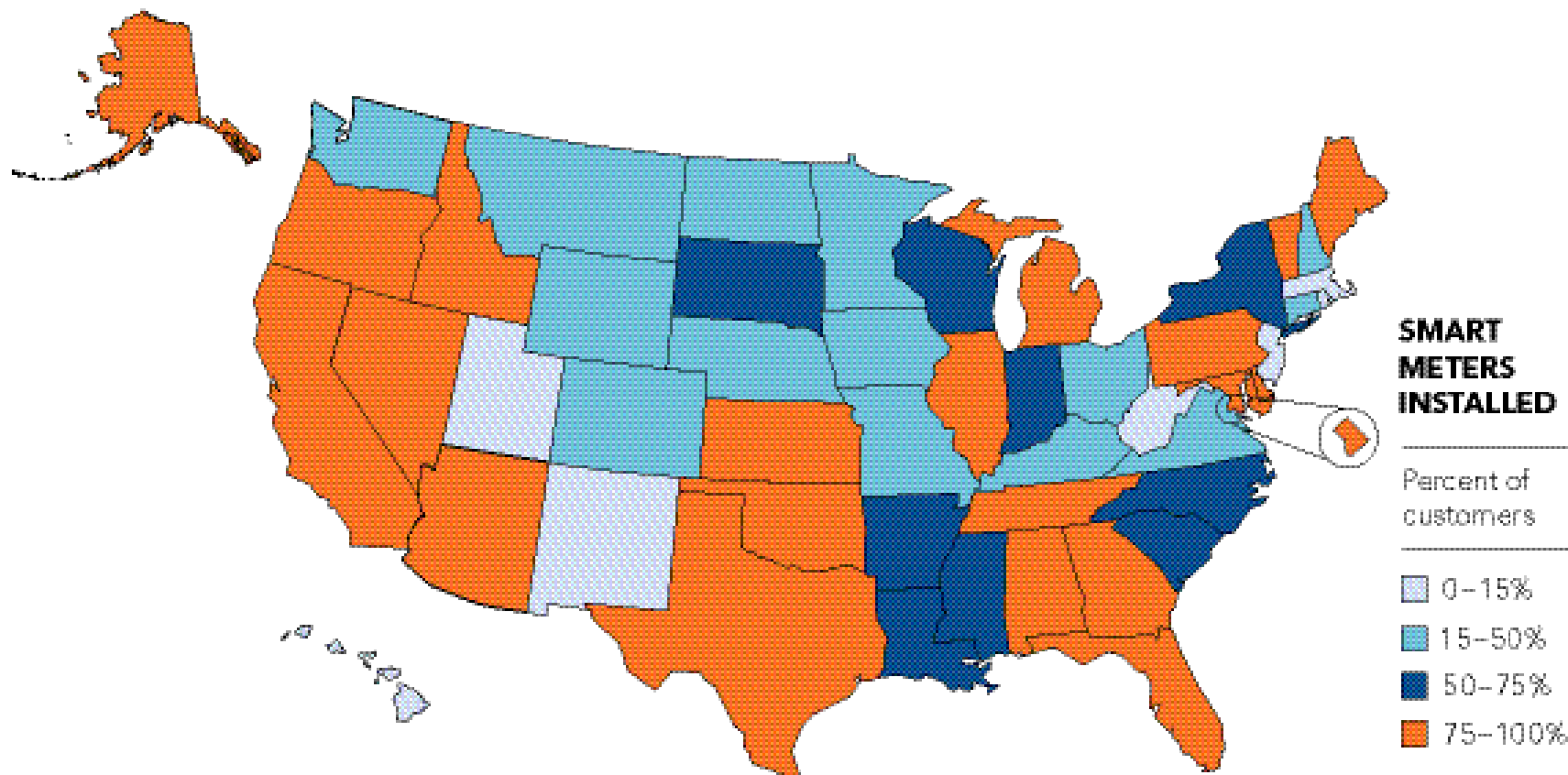
Missing Incentives in Regulatory Policy for an Active Demand Side of the Electricity Sector

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ESIG Fall Technical Workshop – St Paul, MN

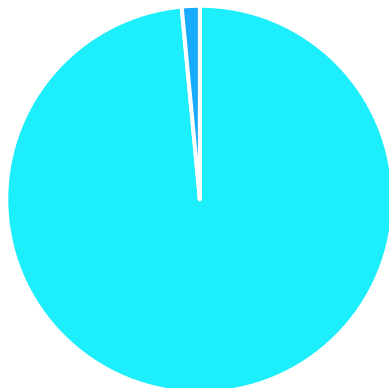
Oct. 25, 2022

Smart Meter Deployment – 2022



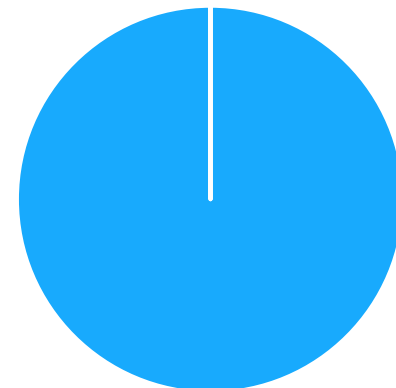
- Commissioner Rob Powelson (PA PUC): “To be frank, it is pointless to have smart meters if you are still going to have ‘dumb’ rates.” (2009)
- Pennsylvania law (AB 129) makes smart meter deployment contingent on time-varying rate offerings
- By 2019, FirstEnergy’s 4 operating companies have deployed 2 million advanced meters in the Commonwealth
- At the highest point, 94 customers have opted into FE’s TOU rates, an enrollment rate equal to five-thousandths of 1%

Meters



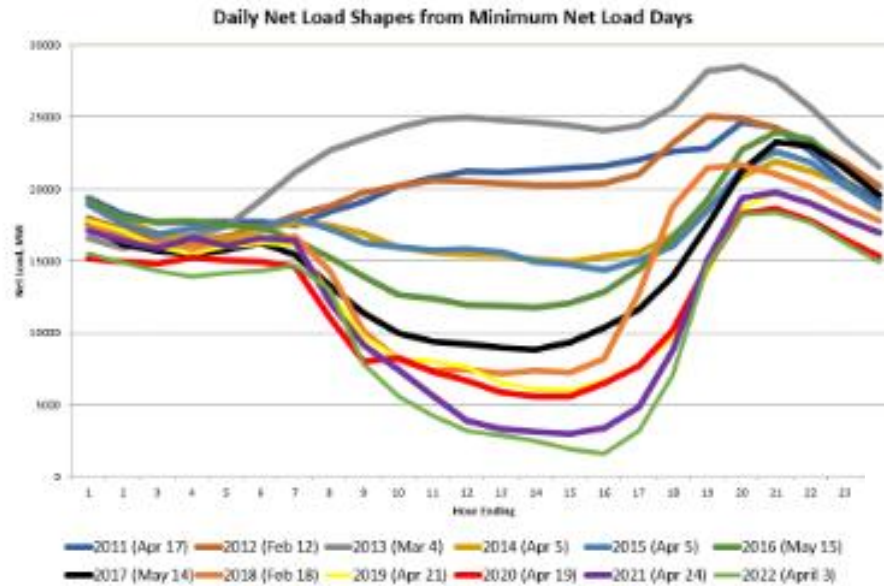
■ Smart ■ Dumb

Rates

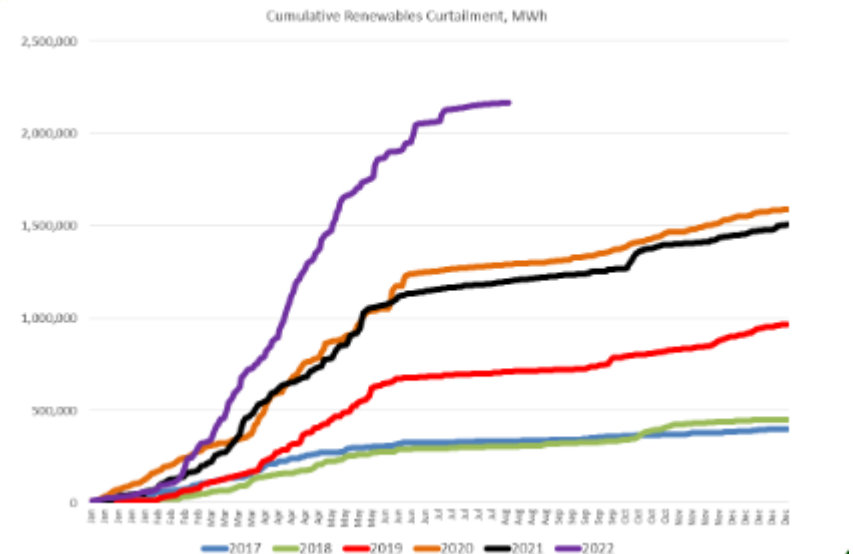


■ Time-Varying ■ Flat

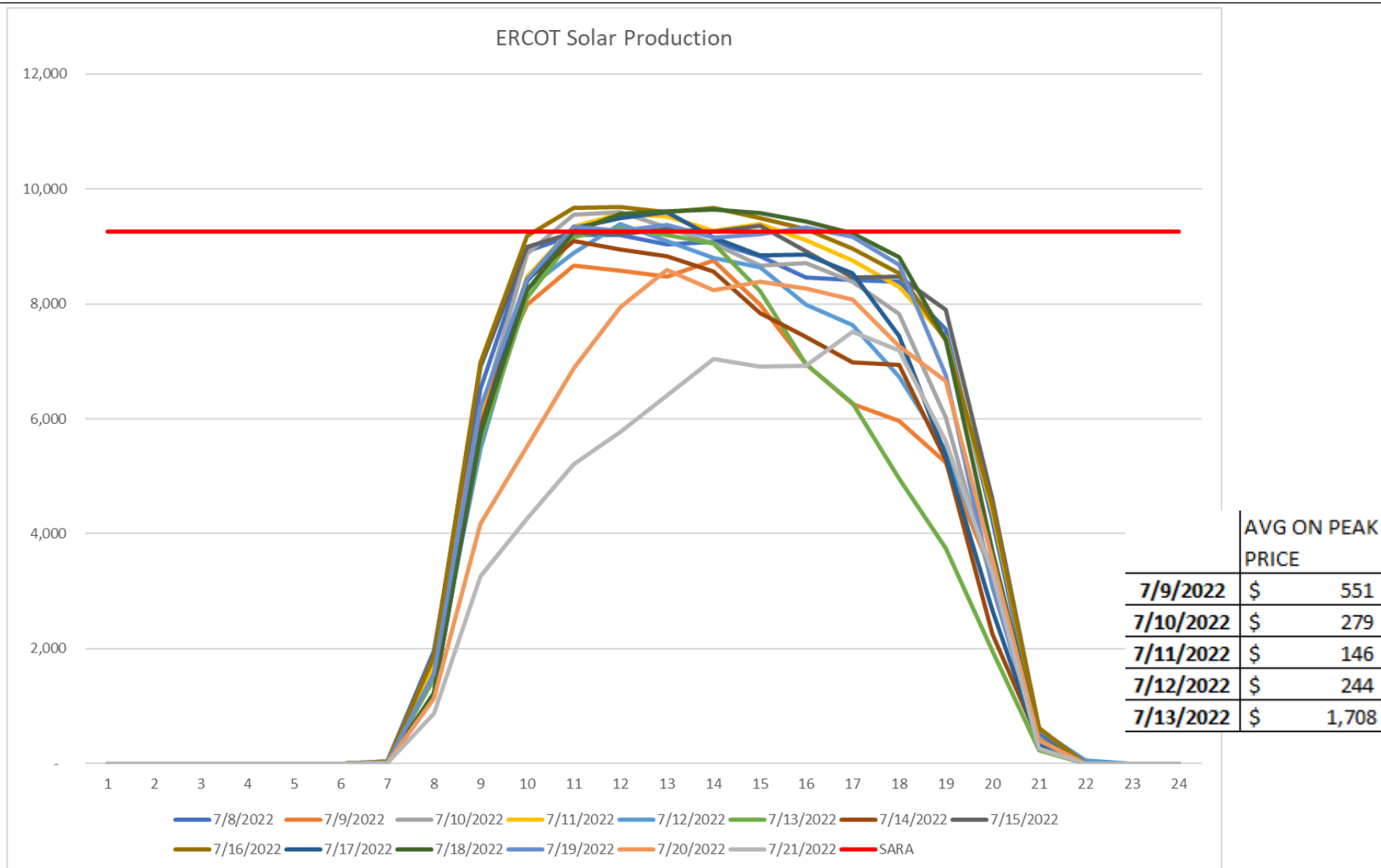
And yet there's a clear (& growing!) role for demand flexibility...



Minimum Net Load Day



It's not just California's duck...



- “Retail rate design reduces the amount of capacity procured and triples the capacity contribution of solar in the electrification scenario.” PJM, *Energy Transition in PJM: Emerging Characteristics of a Decarbonizing Grid* (May 17, 2022)
- “The Pilot results indicated that customers, both overall and low- and moderate-income customers specifically, responded to the rate by **shifting usage off-peak ... by 9.3 percent to 13.7 percent in the summer months** and by 4.9 percent to 5.4 percent in the winter months.” Staff, MD PSC, *Re: PC44 Rate Design Work Group Leader’s Report and Recommendations on Full-Scale Time of Use Rate Offerings* (June 3, 2022)
 - Beginning of pilot process to today: 5 years
- Electrification in New York costs ~\$27B in cap-ex assuming demand flex, rising to \$41B in an “unmanaged electrification” scenario
- But...Only a few jurisdictions have moved to do time-of-use rates on an opt-out basis (the same as smart meters themselves)
 - Ontario
 - California
 - Michigan
 - Colorado
 - Missouri

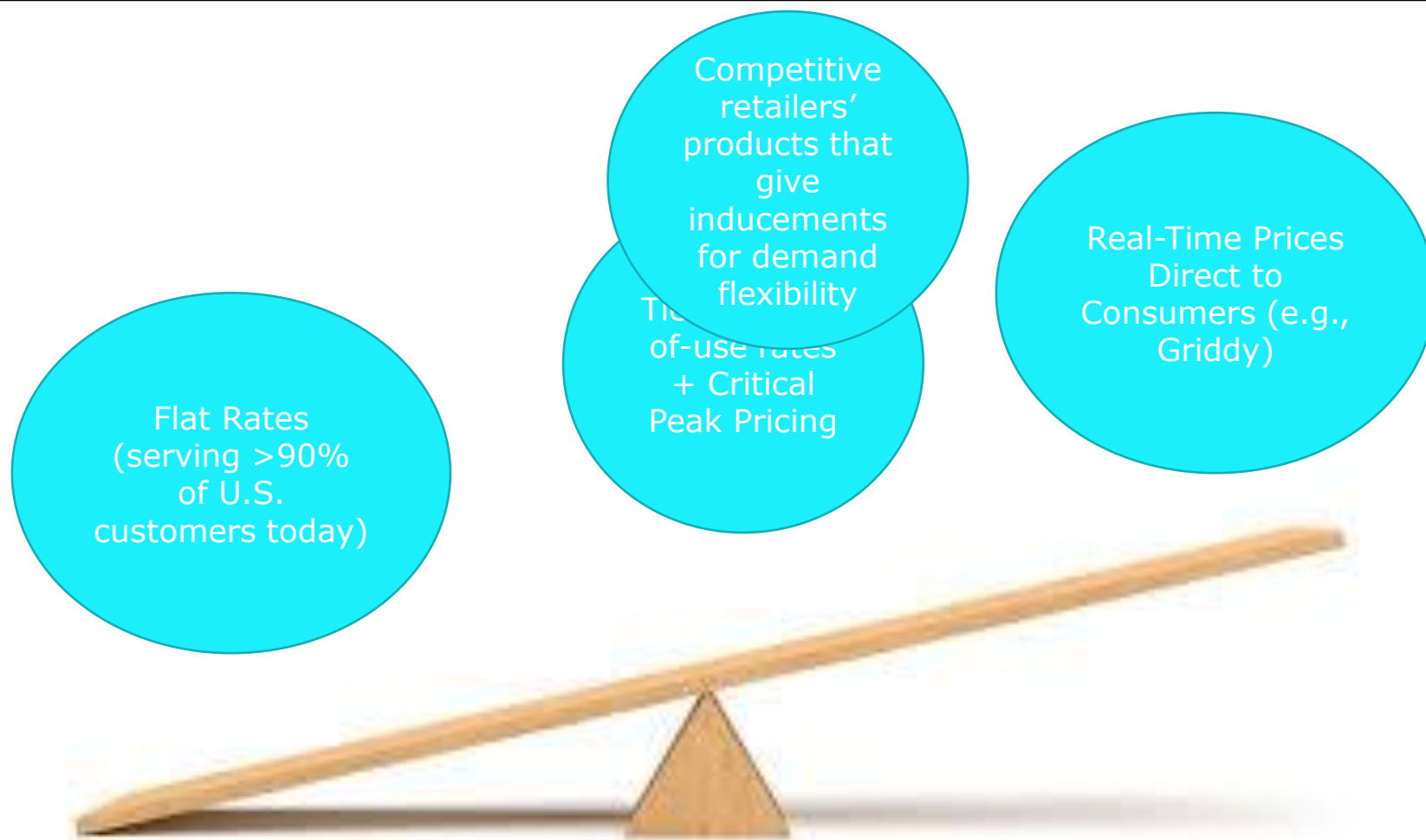
Regulated, Cost-of-Service Utility or Default Supplier

- Regulators responsible to ensure revenue from tariffs $\sim$ costs
- Ubiquitous “trackers” & deferral accounts. The price you are paying for the kwh you are using right now is often not its *full* price
- No incentive to avoid high marginal costs. Or perverse incentive, due to continuing rate-base opportunities for owned generation and T&D
- **Lacking an incentive to activate demand themselves, their rates should be reflective of short- and long-run marginal costs for demand to become active**

Competitive Retailer

- Businesses responsible to ensure revenue from rate plans $\sim$ costs
- Contractual obligation to serve retail customer (usually at fixed tenor / price structure). No opportunity to surcharge when costs $>$ revenue.
- Regulation usually ‘passes through’ to customer T&D costs, without retailer intermediation
- **Substantial incentives to manage costs, exposure to wholesale energy prices. However, often does not face same incentive for transmission, distribution, capacity, & other demand-billed charges.**

Two Extremes of Retail Rate Design for Mass Market



- So, again: Utilities' exposure really is consumers' exposure because of trackers / rate-base incentive, but consumers with flat rates have no indication they are being exposed
 - *someone, somewhere* should have a consistent, price-based incentive for demand to respond to supply
- **Reform #1: Opt-out time-varying rates.**
 - Regulated rate should reflect both routine (e.g., tiered TOU) and extraordinary (e.g., Critical Peak Pricing) wholesale-market & long-run marginal cost dynamics
 - CA, CO-Xcel, MI, MO-Ameren, and Ontario have default tiered time-of-use rates (or are implementing them) in North America.
 - Many jurisdictions have opt-in TOU and/or CPP, though often not widely subscribed.

- Unlike regulated utilities, retailers *do* intermediate retail price & wholesale 'cost of goods'
 - They are fully exposed to all power costs, and face wholesale price exposure at the margin
 - They are *not* often exposed to costs of Transmission & Distribution
- **Reform #2: Expose retailers to all cost elements.**
 - ERCOT, ISO-NE, NYISO Transmission costs are pass-through to end-use residential consumers.
 - PJM faces load-serving entities with allocation of Capacity & Transmission costs, but often on a load-profiled basis (not actual loads) depending on utilities' deployment of AMI and its utilization
- **Reform #3: Create direct retailer-customer relationship**
 - Most customer billing continues to occur through T&D utilities, and not retailers. Supplier-consolidated billing is an important complement to Reform #2

The Piece of the Pie that isn't on the Table

ERCOT Case Study



- The largest driver of Demand Response in ERCOT is the savings that derive from avoiding transmission costs through the 4CP transmission cost allocation methodology.
 - C&I customers are able to avoid substantial transmission costs based on peak load reduction during the summer months.
 - Residential customers are billed transmission costs on a year-round, kwh-basis in competitive territories. Accordingly, Retailers and their Residential customers enjoy no significant benefit from residential demand reductions of avoided transmission costs.
- Retailers would have a much more profound incentive to deploy DR to residential customers if billed transmission costs on their customers' cumulative demand
- Example of Texas retail electric supplier's avoidance of 1 kw of residential consumer use during each of 4 highest-peak hours during summer.
 - Comparing peak-energy costs vs. peak- energy plus transmission costs (billed based on ERCOT 4CP):



- Though results suggest Customers are behaviorally responsive to TOU, they can be further empowered to respond to price signals through home automation.
- Just like rates aren't smart by default, many major appliances also not 'smart' by default
- In Competitive Markets, Retailers may face the stranded costs of small devices that discourage demand flexibility.
 - If a retailer gives away a 'free' smart thermostat on a 1-year residential retail contract, it may require years of successful performance to recover the cost – something that won't be possible if the customer shops away to another retailer
- **Reform #4: Nudge Smart Devices**
 - Standards for certain demand-flexible appliances (e.g., West Coast states)
 - Regulatory programs for Energy Efficiency should target subsidizing cost of smart thermostats and other devices that can be interoperable across Retailers from/to whom a customer may shop

- Regulation's attempts to date to activate demand have often been to jerry-rig demand as a supply resource
- The goal should be: A two-sided market where demand acts as demand. That happens when either:
 - Retail prices mirror a utility's cost structure
 - A competitive retail market structure exists to take responsibility full responsibility for the full cost to serve demand