# Perspectives on Compensating DER Aggregations

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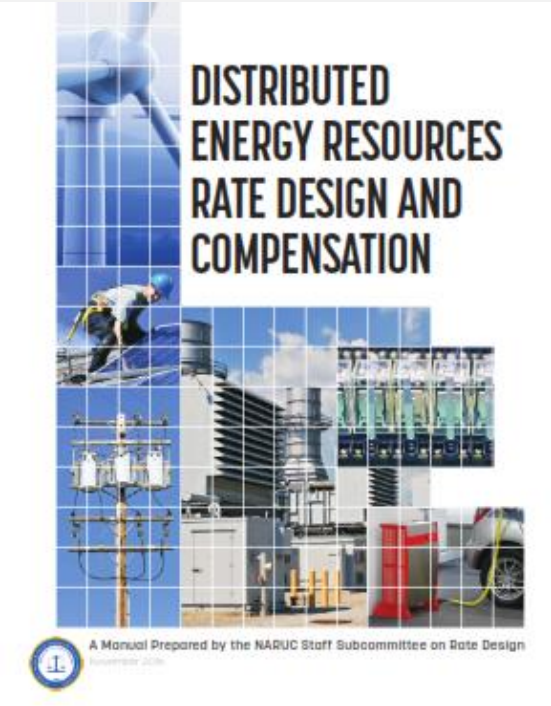
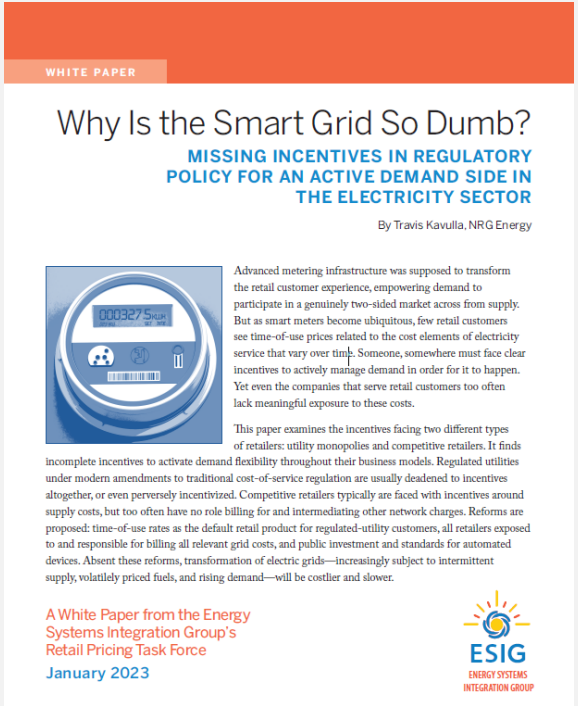
Vice President of Regulatory Affairs, NRG

DER Integration & Compensation Initiative
NASEO & NARUC Jan 8, 2024

# Not the First Rodeo…

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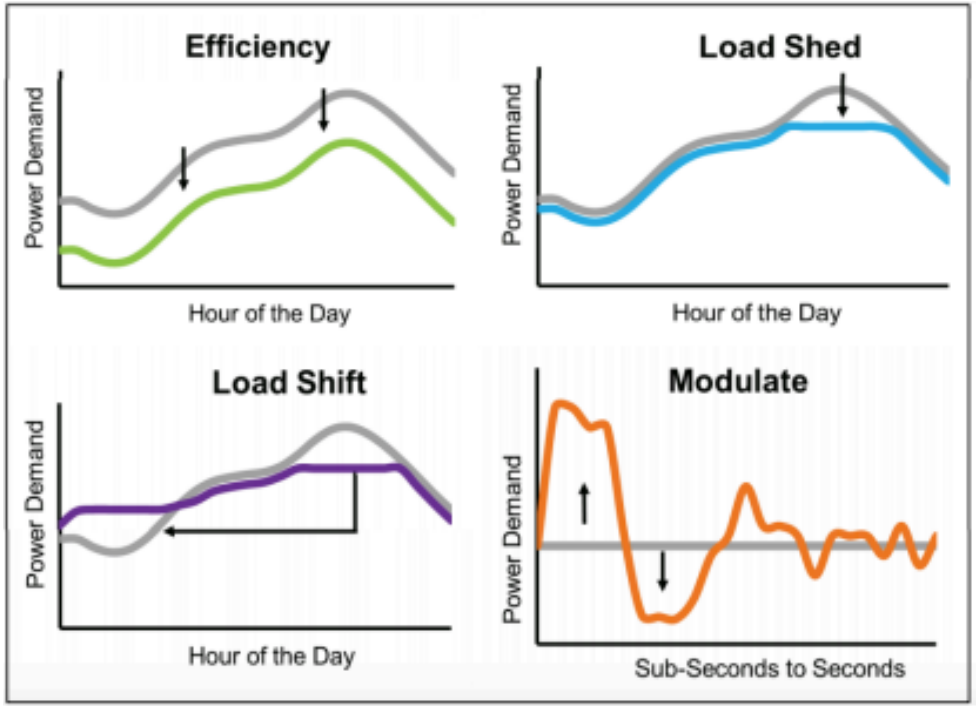
# Prices vs. Programs

- The idea that *changing the shape of demand over time* is a worthwhile undertaking for a consumer at all depends on *supply prices that vary over time*
  - Prices in the wholesale market are usually time-variable (e.g., energy & ancillary services) or demand-based (capacity & transmission)
  - Prices in retail market are often flat—they don't reflect the underlying cost characteristics of the wholesale market. But that is slowly changing…
- If ADER doesn't have access to 'Prices', then a regulator/utility can manufacture an indirect way to convey value for DERS' demand-shaping services: A 'Program'

Ways in which DERs can shape demand on the grid




Source: U.S. Department of Energy

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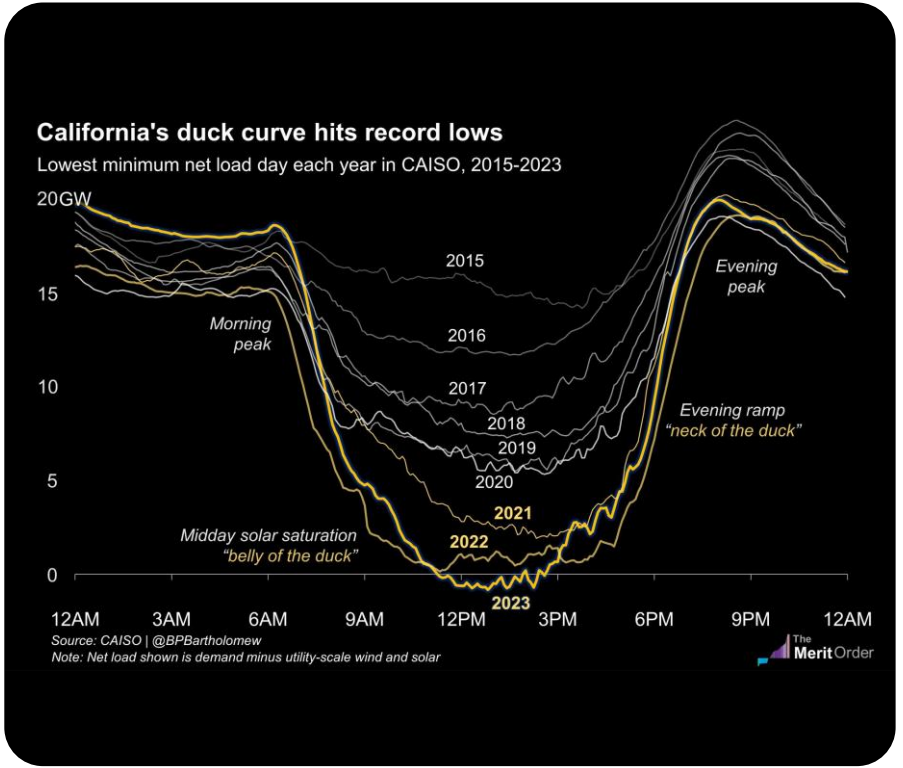
# Supply Growing More Volatile and Peaky, as Demand Grows …Will Prices Reflect That?

**Demand side of market has increasingly obvious role to play**

- "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)
- New York's Climate Leadership Council estimates a $41B cost to deep decarbonization with 'uncontrolled' electrification -- $28B with efficient rate design

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# Prices:
# Retail Rates & Wholesale Markets

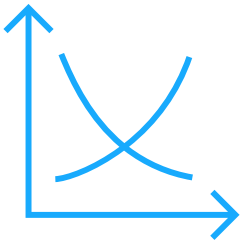
# So What Are ‘Prices’?

## Retail rates are prices

Ratemaking a process by which to collect a utility’s embedded cost structure

A century-old problem in utility regulation is how to align rates more to marginal cost to allow demand to participate

In places with retail competition, the supply portion of the bill is not subject to ratemaking & marginal-cost principles apply



## Wholesale markets set price by auction, bilateral trade, or ratemaking

RTO energy auctions and bilateral trading usually are reflective of marginal costs

Transmission rates for wholesale service are based on embedded cost of service but are usually demand-based (e.g., billed based on a transmission customer’s peak demand)

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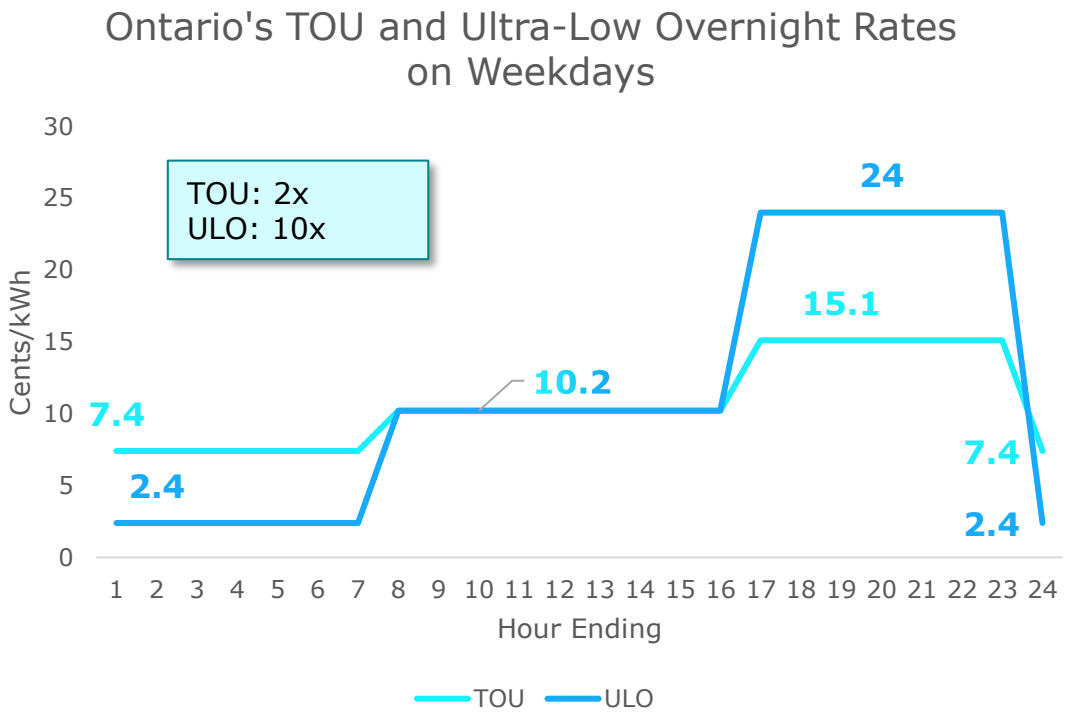
# Prices: Time-of-Use Rates

- Time-of-use rates have been theorized for a century, and in effect in some places for many decades
- TOU rates are evolving to be peakier, reflective of evolving cost structure & new sources of demand (e.g., EVs)
- The deployment of Advanced Metering Infrastructure allows TOU to be billed more accurately, at more granular intervals, ubiquitously across the customer base




Source: Ontario Energy Board, circa May 2022. Link.

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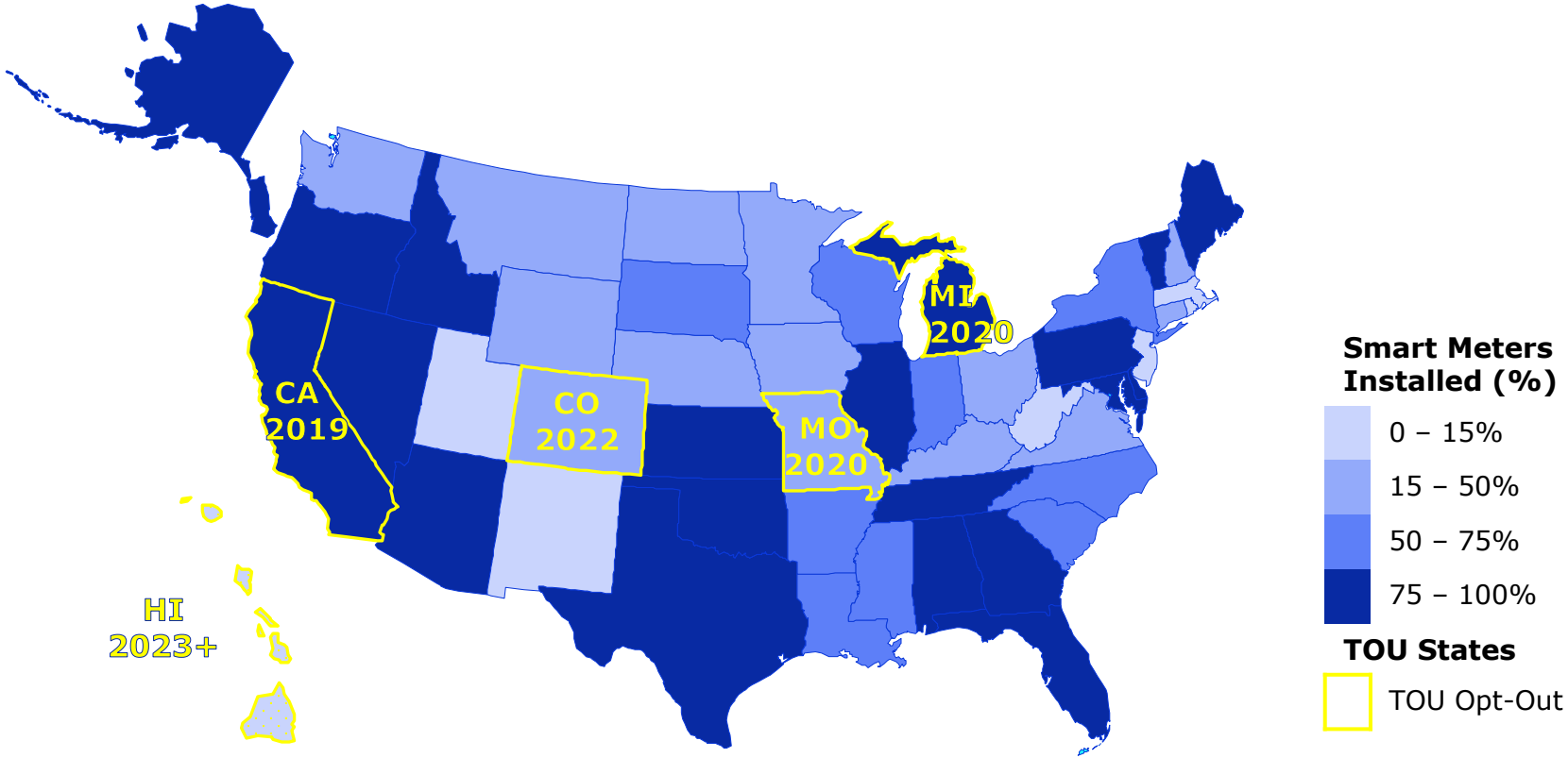
# In USA, Smart Meters Widely Deployed…
# Only 5 States Use Them for Default Retail Pricing




Adapted from: Cooper and Shuster, "Electric Company Smart Meter Deployments: Foundation for a Smart Grid," Institute for Electric Innovation, April 2021, p. 3.

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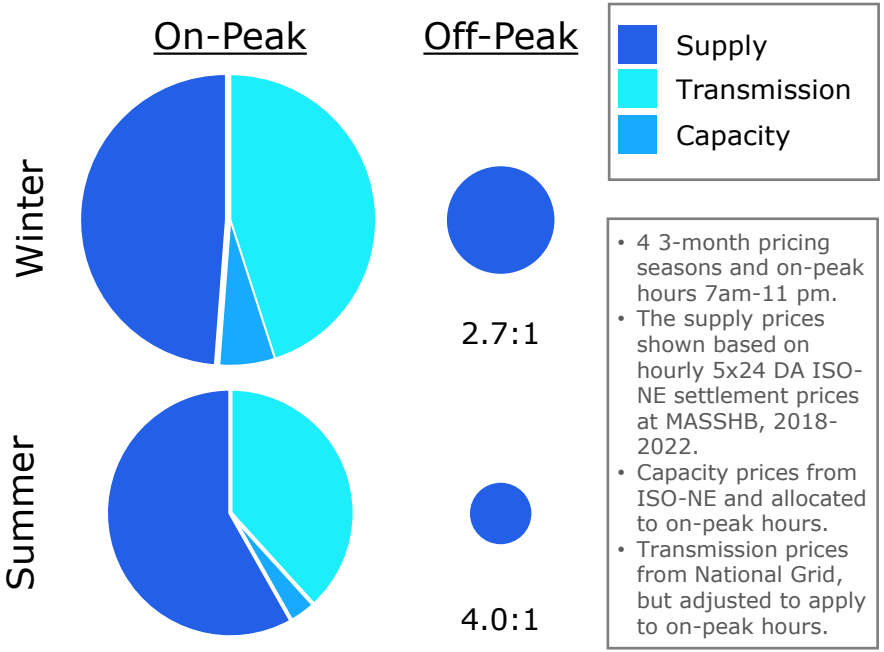
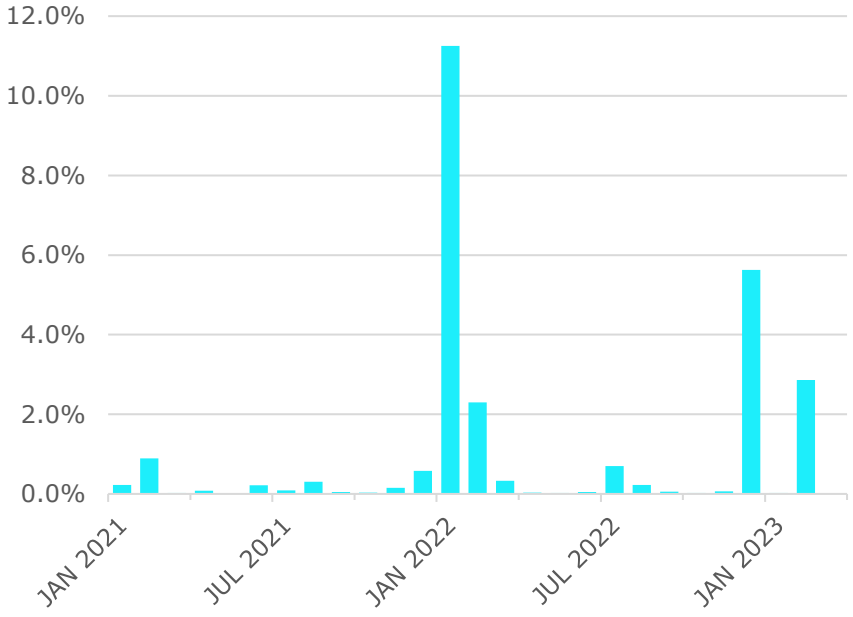
# What Goes Into a Time-of-Use Rate?

## *Illustrative* National Grid MA TOU Rate




- 4 3-month pricing seasons and on-peak hours 7am-11 pm.
- The supply prices shown based on hourly 5x24 DA ISO-NE settlement prices at MASSHB, 2018-2022.
- Capacity prices from ISO-NE and allocated to on-peak hours.
- Transmission prices from National Grid, but adjusted to apply to on-peak hours.

## Oil-fired generation as a % of total supply in ISO-NE 01/21 to 03/23

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# Real-Time Pricing, a.k.a. Dynamic Rate

Incoming

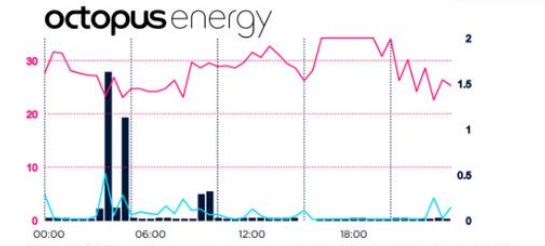
Sunday
26th February 2023

For electricity meter

Total cost
£ 1.05

Total consumption
4.17 kWh

Weighted average unit rate
25.14 p / kWh




| Period | Rate p / kWh | Consumption kWh | Cost p |
|---|---|---|---|
| 00:00 - 00:30 | 27.68 | 0.02 | 0.554 |
| 00:30 - 01:00 | 31.66 | 0.02 | 0.633 |
| 01:00 - 01:30 | 31.39 | 0.02 | 0.628 |
| 01:30 - 02:00 | 28.09 | 0.01 | 0.281 |
| 02:00 - 02:30 | 27.65 | 0.01 | 0.277 |
| 02:30 - 03:00 | 27.28 | 0.01 | 0.273 |
| 03:00 - 03:30 | 27.19 | 0.12 | 3.263 |
| 03:30 - 04:00 | 23.32 | 1.62 | 37.778 |
| 04:00 - 04:30 | 26.86 | 0.13 | 3.492 |
| 04:30 - 05:00 | 23.10 | 1.12 | 25.872 |
| 05:00 - 05:30 | 24.73 | 0.02 | 0.495 |
| 05:30 - 06:00 | 24.73 | 0.01 | 0.247 |
| 06:00 - 06:30 | 24.20 | 0.01 | 0.242 |
| 06:30 - 07:00 | 24.20 | 0.02 | 0.484 |
| 07:00 - 07:30 | 24.82 | 0.02 | 0.496 |
| 07:30 - 08:00 | 26.33 | 0.01 | 0.263 |
| 08:00 - 08:30 | 23.12 | 0.01 | 0.231 |
| 08:30 - 09:00 | 29.70 | 0.01 | 0.297 |
| 09:00 - 09:30 | 28.64 | 0.28 | 8.019 |
| 09:30 - 10:00 | 29.59 | 0.31 | 9.173 |

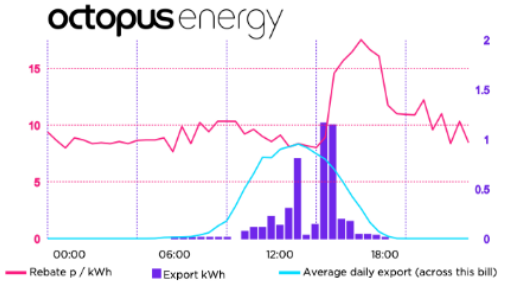
Monday
1st May 2023

For electricity meter

Total rebate
£ -0.52

Total export
4.76 kWh

Weighted average unit rebate
-10.83 p / kWh




| Period | Rebate p / kWh | Export kWh | Rebate p |
|---|---|---|---|
| 00:00 - 00:30 | 9.39 | 0.00 | 0.000 |
| 00:30 - 01:00 | 8.64 | 0.00 | 0.000 |
| 01:00 - 01:30 | 7.98 | 0.00 | 0.000 |
| 01:30 - 02:00 | 8.87 | 0.00 | 0.000 |
| 02:00 - 02:30 | 8.68 | 0.00 | 0.000 |
| 02:30 - 03:00 | 8.36 | 0.00 | 0.000 |
| 03:00 - 03:30 | 8.44 | 0.00 | 0.000 |
| 03:30 - 04:00 | 8.36 | 0.00 | 0.000 |
| 04:00 - 04:30 | 8.54 | 0.00 | 0.000 |
| 04:30 - 05:00 | 8.36 | 0.00 | 0.000 |
| 05:00 - 05:30 | 8.64 | 0.00 | 0.000 |
| 05:30 - 06:00 | 8.68 | 0.00 | 0.000 |
| 06:00 - 06:30 | 8.68 | 0.00 | 0.000 |
| 06:30 - 07:00 | 8.87 | 0.00 | 0.000 |
| 07:00 - 07:30 | 7.64 | 0.01 | -0.076 |
| 07:30 - 08:00 | 9.88 | 0.01 | -0.099 |
| 08:00 - 08:30 | 8.36 | 0.01 | -0.084 |
| 08:30 - 09:00 | 10.22 | 0.01 | -0.102 |
| 09:00 - 09:30 | 9.41 | 0.01 | -0.094 |
| 09:30 - 10:00 | 10.33 | 0.01 | -0.103 |
| 10:00 - 10:30 | 10.33 | 0.01 | -0.103 |
| 10:30 - 11:00 | 10.32 | 0.00 | 0.000 |
| 11:00 - 11:30 | 9.20 | 0.07 | -0.644 |
| 11:30 - 12:00 | 9.62 | 0.11 | -1.058 |
| 12:00 - 12:30 | 8.99 | 0.11 | -0.989 |
| 12:30 - 13:00 | 8.54 | 0.22 | -1.879 |
| 13:00 - 13:30 | 9.11 | 0.13 | -1.184 |
| 13:30 - 14:00 | 8.07 | 0.30 | -2.421 |
| 14:00 - 14:30 | 8.36 | 0.80 | -6.688 |
| 14:30 - 15:00 | 8.16 | 0.03 | -0.245 |

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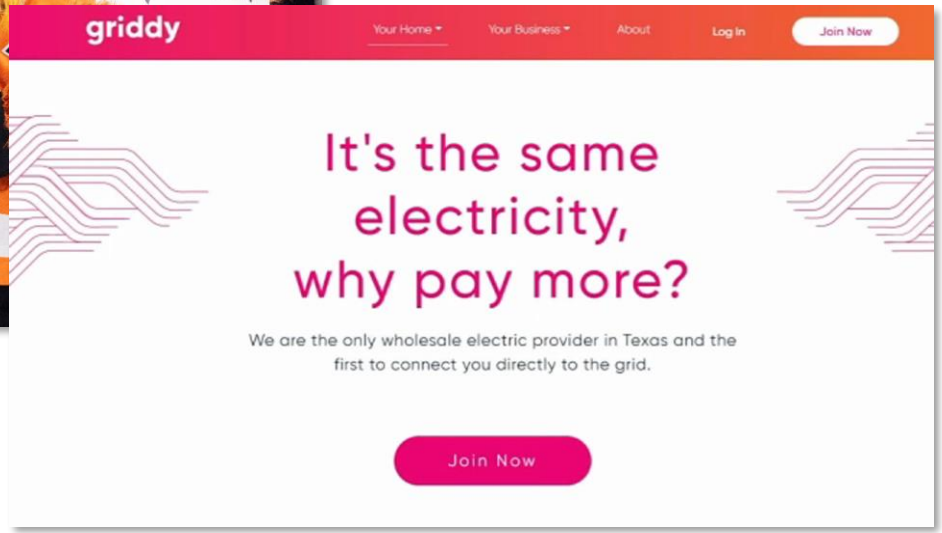
# A Cautionary Tale from Texas




- Griddy (not to be confused with Gritty) offers a cautionary tale
- Griddy, an ERCOT Retail Electric Provider, offered to pass through wholesale energy pricing directly to retail customers for a small monthly subscription fee
- Catastrophically failed during Winter Storm Uri when wholesale prices = $9,000/MWh
- Griddy, an exception that proves the rule: *Intermediaries* bear an important role standing between wholesale market & retail customers

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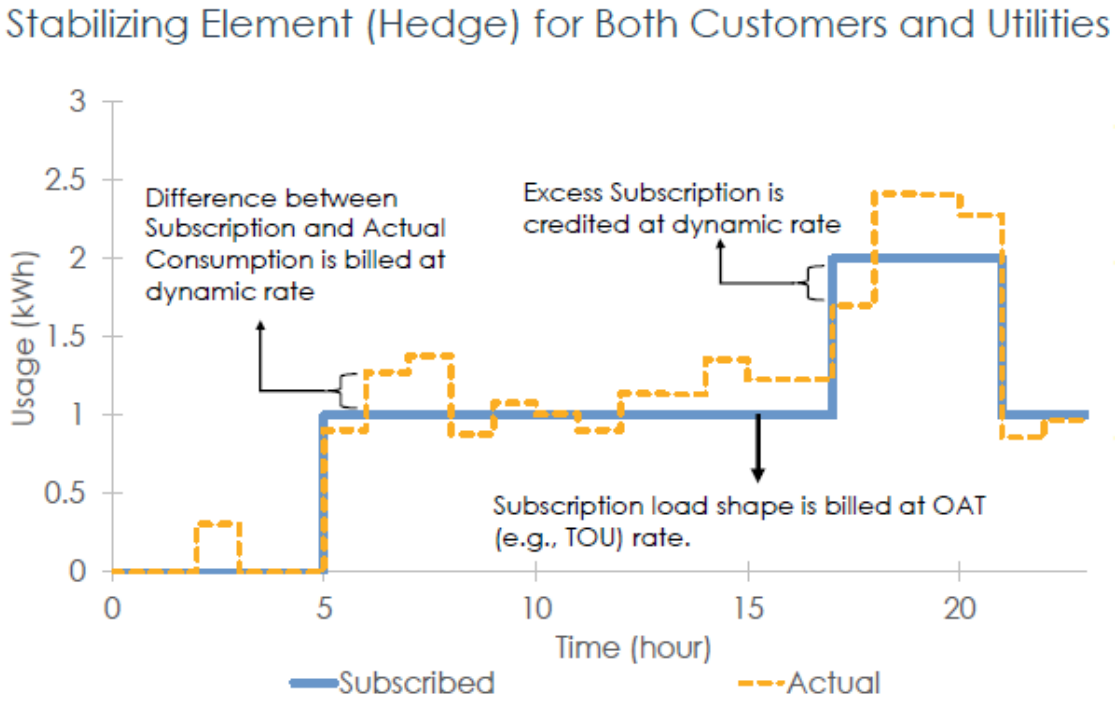
# Monthly Subscriptions

- Subscriptions offered by utility
- Third party aggregators/brokers could evaluate offers and manage risk
  - Hedges
  - Comprehensive device management




Source: California Public Utility Commission, Demand Response and Retail Rates Sections, Energy Division, "Workshop: CalFUSE Whitepaper & Staff Proposal," July 21, 2022, slide 48. Link.

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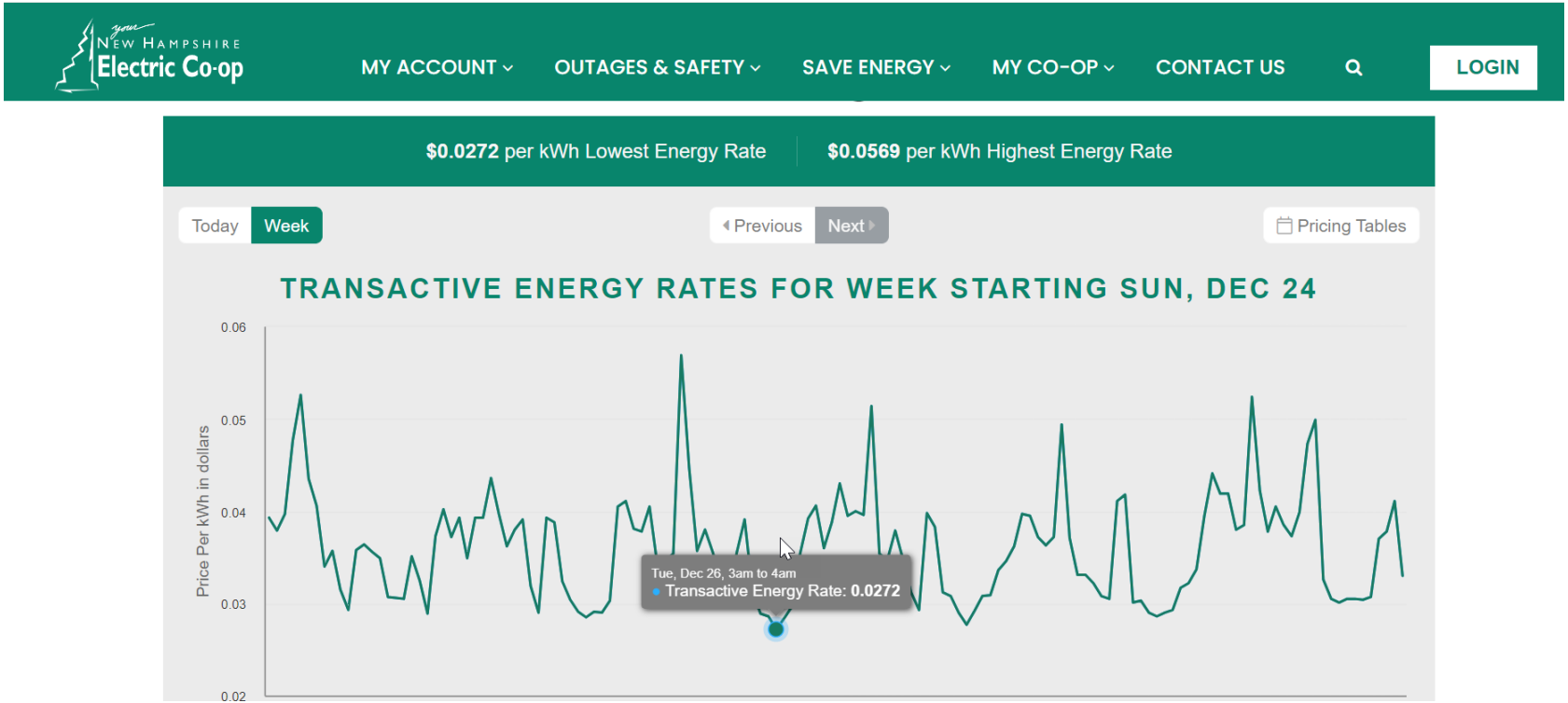
# Device-Specific Dynamic Rates

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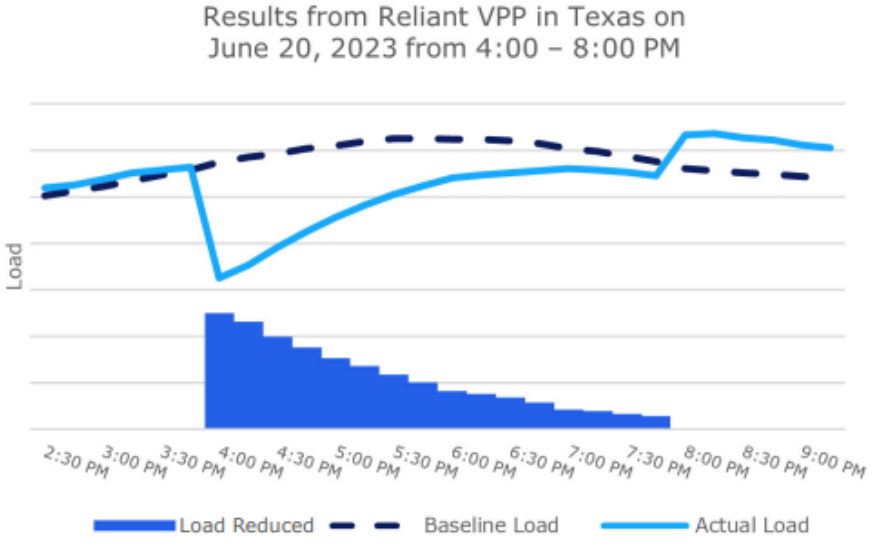
# Competitive Retailers' Offerings

- Reliant (NRG retailer) has been able to engage its customers in demand response through smart thermostats in two ways:
  - Direct Load Control: Average 20-30% reduction in customer demand during the period thermostat is controlled.
  - Behavioral DR: Customers who actively participate lower their demand by approximately 10-15%.
- Reliant's standalone thermostat ADER program has grown 40% in 4 years.
- Customers are also increasingly adopting other DERs like battery storage. A customer in a detached single-family home that has smart HVAC controls paired with battery storage can reduce demand by up to 40-100% (on average) over a four-hour period, depending on the size of their battery.

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# So What About Wholesale Pricing?

- FERC Order 719 (2008) allows Demand Response to be aggregated for sale into RTOs
  - DR aggregators may sell energy, capacity, ancillary services into RTO auctions
- FERC allowed states to forbid third-party aggregators from participating in RTOs
  - MO recently lifted its ban, while MN recently decided not to lift its ban

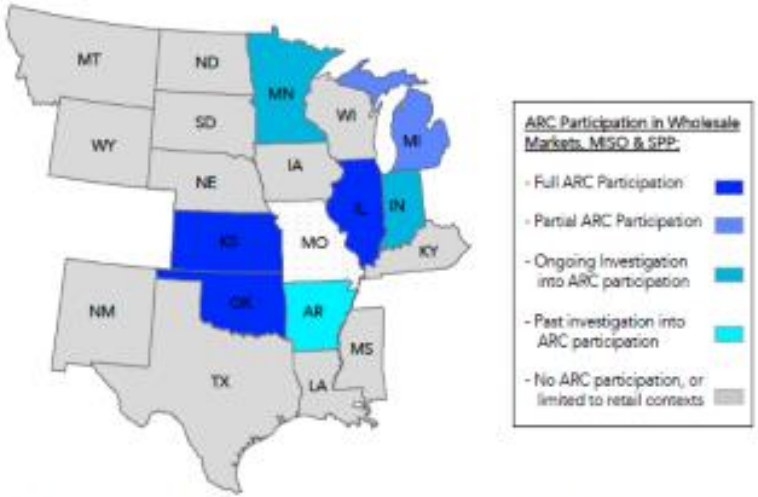


**Figure ES - 1. Status of organized wholesale market participation rules for aggregators of retail customers in MISO and SPP states**

Source: Sydney P. Forrester, Cole Triedman, Sam Kozel, Cameron Brooks, and Peter Cappers, Lawrence Berkeley National Laboratory, *Regulation of Third-Party Aggregation in the MISO and SPP Footprints*, p. iv. Link.

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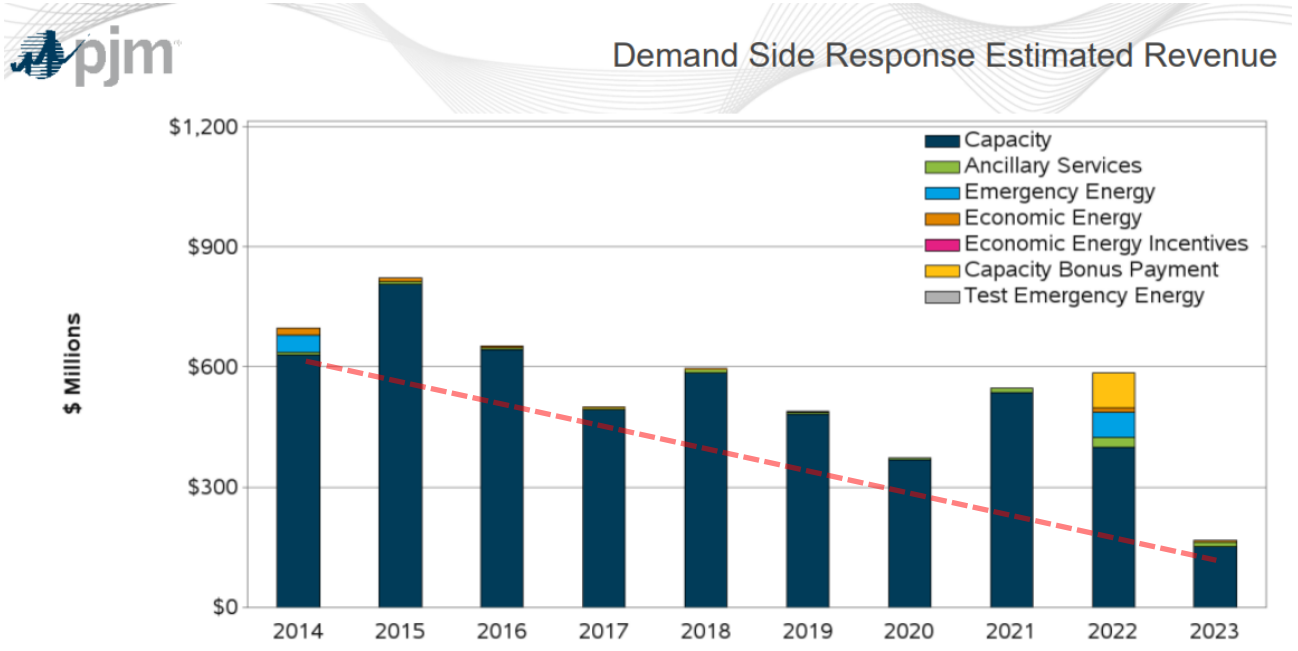
# Declining Wholesale Revenues for Demand Products

- Participation in eastern markets dominated by capacity products
  - Follow the money!
- "Classic" revenue streams for demand products are trending down as capacity prices fall and energy markets are tempered




Source: PJM, "Markets Report," MC Webinar, November 13, 2023, slide 40. Link. Trend-line added.

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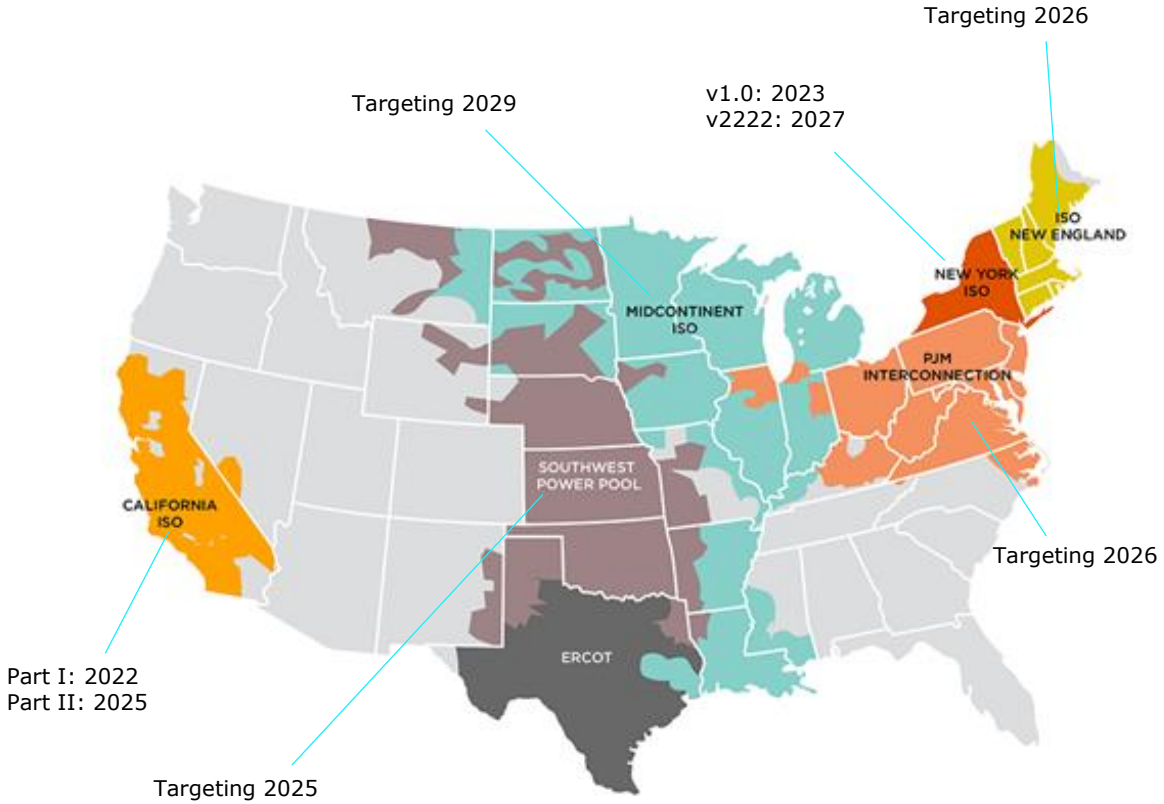
# Order 2222

- Extends Order 719 principles of market access for DR to ADER
- No state opt-out
- Applies *only* in RTO footprints (so not West or Southeast)
- RTOs all over the map on implementation timeline

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# The Price Is Right?

- ‘Price’-oriented ADER business models require prices that express marginal cost and grid needs – rather than being flat and non-time-varying
  - Most retail rates continue to be flat
- Requires that prices, collectively, express the full range of value of ADER
  - E.g., DER may not earn transmission avoided-cost benefit if regulator sets transmission retail pricing flat (regardless of upstream demand-related rate design)
- Retail competition and RTOs are useful, if not necessary, for ‘Price’-oriented ADER
  - Multiple competitive retailers will evolve to cater to and compete for DER-adopting customers, and pace of innovation > utility regulation
  - RTOs markets present some barriers, but more open than non-RTO, vertically-integrated utilities
  - If Retail Competition/RTOs don’t exist to express prices, then diverse and time-varying utility rate offerings can be a path for “Price”-based ADER

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# Programs

# An Alternative or Supplement to Incomplete Prices

- So perhaps you don’t think that prices are a good way to efficiently allocate scarce resources

- You can always stand up a ‘Program’ instead to do what ‘Prices’ do
  - May be particularly appropriate where there are specific needs for ADER (like local distribution system congestion)

- Typically rely on incumbent utilities to finance them with ratepayer subsidies
  - Also examples where competitive retailers offer rebates for activating customer DER, or
  - Where RTOs solicit (outside the typical markets they run) for particular needs

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# Subsidy for Device in Exchange for Utility Control

- The most common type of 'Program' which uses ratepayer funding to incentivize customer adoption of DER (in this case, a smart thermostat)
- Compensation not directly aligned to value of energy, capacity, transmission
- Gives utility right in pre-specified conditions to dispatch ADER remotely through its DERMS provider

pepco℠ AN EXELON COMPANY | Energy Wise Rewards

| CYCLING OPTION | TEMPERATURE INCREASE | ANNUAL REWARD* | INSTALLATION CREDIT** | TOTAL REWARDS FOR YOUR FIRST 12 MONTHS* |
|---|---|---|---|---|
| 50% | 1-3 DEGREES | $40 | $40 | UP TO $80 |
| 75% | 2-4 DEGREES | $60 | $60 | UP TO $120 |
| 100% | 4-7 DEGREES | $80 | $80 | UP TO $160 |

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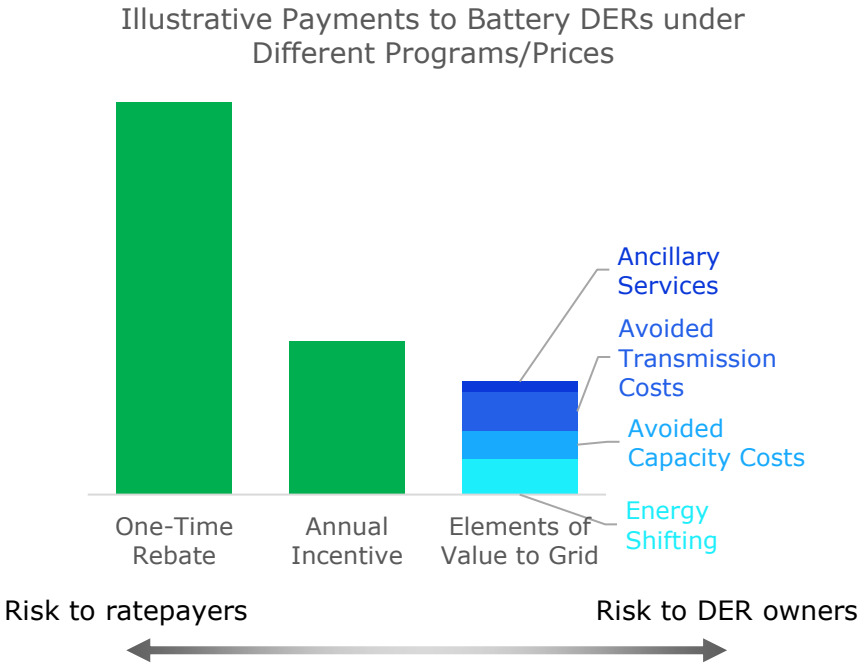
# Some Utilities Also Extending this Program to Batteries

GREEN MOUNTAIN POWER

## Benefiting you and Vermont

You save money by joining GMP's BYOD program. If you enroll a battery for ten years, we'll give you an upfront payment of $850 per kW of storage enrolled for three hour discharge, $950 per kW for four hour discharge. If you're retrofitting an existing solar system in one of the areas of the state where extra storage will help the grid most, we'll give you an extra $100 per kW. Plus, get the benefit of knowing your device is helping to cut carbon emissions and costs for all GMP customers!




Source: While the graph is illustrative, the One-Time Rebate column is based on the participation of a Powerwall 3 in Green Mountain Power's BYOD program (link), and the Annual Incentive column is based on National Grid's ConnectedSolutions program. The final column illustrates the different ways a battery could participate on the grid.

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# Pay for Performance

- An alternative to an up-front subsidy in exchange for capacity rights to ADER is a pay-for-performance model
- To the right is an example from National Grid's "Connected Solutions"
- Again, the benefit paid under this program is a value approved by regulators based on an approximation, and not directly connected to more dynamic 'Prices'

## Connect with a battery storage partner.

Energy-sharing events through our ConnectedSolutions program call on your battery system to automatically discharge during peak demand days, which occur as follows:

- From June 1 – September 30
- Between 3pm - 8pm
- No more than 60 times each summer
- A maximum of 3 hours per event
- You can opt out at any time

**Incentives**

Participating customers will receive an incentive every year based on the performance of their battery system at a rate of **$275 per kW** performed between June 1 and September 30. On average, customers have received $1,500 per year.

The incentive rate is locked in place for the first five summers the customer is enrolled in ConnectedSolutions with all new systems. Your battery system performance will vary based on size, configuration, internet connectivity and other factors.

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# Certain RTOs Have 'Programs' for DER as Well

ERCOT has a small, standalone capacity market for Demand Response, known as Emergency Response Service (ERS), which exists outside its ordinary energy markets

## EMERGENCY RESPONSE SERVICE (ERS)

**ERCOT offers two types of Emergency Response Service: 10 Minute and 30 Minute.**

| | 10 MINUTE DEMAND RESPONSE PROGRAM (ERS 10) | 30 MINUTE DEMAND RESPONSE PROGRAM (ERS 30) |
|---|---|---|
| Notification | Customers will be notified of an event via email, phone, text and/or electronic signal per customers' instructions and must fully curtail within 10 minutes of start of event. | Customers will be notified of an event via email, phone, text and/or electronic signal per customers' instructions and must fully curtail within 30 minutes of start of event. |
| Minimum Size | No minimum size; accounts of under 100 kW curtailment will be aggregated. | |
| Participation | 4 month contract periods starting February, June and October. Each period contains 6 optional time slots: weekdays 5-8AM(Time Period 1), 8AM-1PM (Time Period 2), 1-4PM (Time Period 3), 4-7PM (Time Period 4), 7-10PM (Time Period 5), and weekends/nights/all other hours including ERCOT holidays (Time Period 6). | |
| Enrollment Deadline | One month before each contract period (January 1st, May 1st, September 1st). | |
| Distributed Generation | Can participate independently or in conjunction with Load. | |
| Metering/Direct Load Control (DLC) | Each account must have at least a 15 minute interval or smart meter (per ERCOT) and may also require CPower's monitoring solution, which provides one-minute usage data. | |
| | Customers over 1 MW of curtailable load must have DLC via CPower's monitoring solution (CPower's requirement). | No DLC requirement |
| Number & Duration of Load Response Events | Customers may be called to curtail load for up to 12 hours per contract period. | |
| Testing | At a minimum, a 15-30 minute test event will be called once per year absent successful event deployment. | |
| Capacity Payments | Customers are paid based upon the clearing price, contract capacity and participation hours. | |
| Settlements | Customers receive payments within 60 days of the end of the contract period. | |
| Compliance | Customers must meet their performance obligations during events and test events, and must meet their availability requirements all other committed times. | |
| Consequence of Non-compliance | Availability and performance factors are taken into consideration and can reduce payments. Non-performance | |

Source: CPower

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# Comparing ‘Programs’ and ‘Prices’

| | Programs | Prices |
|---|---|---|
| **What** | • Utility subsidies for device adoption<br>• Procurements for targeted needs | • Time-varying retail rates<br>• Wholesale/RTO: Capacity, Energy, A/S auctions + Trans. rates |
| **How** | • Regulatory process defines avoided-cost value | • Rate design<br>• Market design |
| **Business Model** | • ADER a utility vendor | • ADER more of a free agent |
| **Pros & Cons** | • A clear value target<br>• Limits to quantity and pace | • More open market<br>• Less stable revenue<br>• Questions on how to monetize |

The two can be complementary, especially when ‘Prices’ fail to convey ADER a particular value that is not appropriately priced (e.g., distribution or transmission)

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