



KATHAN ENERGY
CONSULTING

Assessment of Current Demand Response and DER Data Collection Tools

David Kathan, Ph.D.

U.S. DOE

Electricity Advisory Committee

June 8, 2023

Energy Transition is Happening Fast, But Data Collection Lags

- Demand response, already significant, will likely increase
- Distributed energy resources (DERs) are being deployed at a rapid pace
- Electric vehicles adoption also experiencing rapid growth
- New capabilities and technology types will develop, e.g.,
 - Virtual Power Plants
 - Demand Flexibility
 - Price Responsive Demand

Unfortunately, accurate, consistent, and comprehensive data on these resources is lacking

Lack of Data Creates Challenges

- Difficulty in planning
- DER Visibility Issues
 - DERs are ‘sneaking up on us.’ For example, according to ERCOT, there already are about 3500MW of registered and unregistered DERs on the Texas grid now.
 - TSOs typically have no visibility about DERs concerning:
 - Location
 - Size
 - Technology
 - Capabilities
 - Real-Time Operation
- New business models are not well modeled or measured
 - Demand Flexibility
 - DER Aggregation
 - Virtual Power Plants

Demand Response

- There are many definitions of demand response
 - A reduction in the consumption of electric energy by customers from their expected consumption in response to an increase in the price of electric energy or to incentive payments designed to induce lower consumption of electric energy. (FERC in Order No. 719)
 - Changes in electric use by Demand-Side Resources from their normal consumption patterns in response to changes in the price of electricity, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized. (NERC)
 - Demand response provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage during peak periods in response to time-based rates or other forms of financial incentives. (DOE)
 - EIA uses two terms for “demand response programs” –
 - Demand response programs are incentive-based programs that encourage electric power customers to temporarily reduce their demand for power at certain times in exchange for a reduction in their electricity bills. Some demand response programs allow electric power system operators to directly reduce load, while in others, customers retain control. Customer-controlled reductions in demand may involve actions such as curtailing load, operating onsite generation, or shifting electricity use to another time period. (EIA Glossary)
 - Demand Response Programs are procedures that encourage a temporary reduction in demand for electricity at certain times in response to a signal from the grid operator or market conditions (EIA Form 861)

Demand Response Program Types

	Retail	Wholesale
Incentive-Based	<ul style="list-style-type: none"> Direct load control Smart Thermostats Interruptible/curtailable rates Demand bidding/buyback Emergency demand response 	<ul style="list-style-type: none"> Demand bidding/buyback Emergency demand response Capacity market Ancillary-service market
Dynamic Rates	<ul style="list-style-type: none"> Time-of-Use Rates Critical Peak Pricing Real Time Pricing 	<ul style="list-style-type: none"> Price Response Demand

Assessment of Demand Response Data Collection

- EIA collects “load management” data from retail utilities in Form 861
 - MWh and MW, both potential and actual
- EIA’s load management data
 - Does not include information on RTO/ISO demand response programs, especially from third-party aggregators
 - Does not include information on demand response programs operated by non-regulated LSEs, including community choice aggregators
 - Only collects data on number of customers in utility dynamic pricing programs, not energy or demand impact
 - Does not provide any detail on demand response program types
- RTOs and ISOs
 - Provide high-level summaries of total demand response that bid and cleared in wholesale markets
 - Some retail utilities aggregate demand response to bid into wholesale markets
 - RTO/ISO demand response summaries incorporate some retail demand response
 - Hence, EIA retail demand response and RTO/ISO wholesale demand response totals are not additive

Assessment of Demand Response Data Collection (Cont.)

- FERC conducted demand response and advanced metering surveys starting in 2006
 - Driven by lack of coverage of
 - Wholesale demand response
 - Lack of detail on program types
 - Dynamic pricing
 - Advanced metering
 - Addressed double-counting, but effort proved difficult
 - FERC abandoned survey after 2012
- NERC created the Demand Response Availability Data System (DADS) in 2011 to collect demand response information nationwide
 - Data structures and double-counting were well-designed
 - Still live, but NERC has not published information from DADS since 2017
- FERC collects data on market transactions in Form 760, which includes demand response bids
 - Data is not publicly available
- Consequently, comprehensive data on demand response in the U.S. is incomplete or is not publicly available

Distributed Energy Resources

- There are also many definitions of DERs.
 - Any resource located on the distribution system, any subsystem thereof or behind a customer meter. (FERC in Order No. 2222)
 - Any resource on the distribution system that produces electricity and is not otherwise included in the formal NERC definition of the Bulk Electric System. (NERC)
 - Small, modular, energy generation and storage technologies that provide electric capacity or energy where you need it. (DOE FEMP)
 - EIA does not have a DER definition. Instead, it uses the term “distributed generator” -- A generator that is located close to the particular load that it is intended to serve. General, but non-exclusive, characteristics of these generators include: an operating strategy that supports the served load; and interconnection to a distribution or sub-transmission system (138 kV or less). (EIA Glossary)

Assessment of DER Data Collection

- EIA does a good job collecting several forms of DER data
 - Captures most BTM resources as net metering, including distributed storage
 - Virtual net metering (e.g., community solar) surveyed
 - Non-net metered distributed resources <1 MW surveyed, including technology
 - Backup generation connected to the grid surveyed
 - DERs greater > 1 MW surveyed all along with other generation resources on Form 860
- RTOs/ISOs and NERC do not collect or report data on smaller resources
- As DERs proliferate and new policies (e.g., Order No. 2222) are implemented, current EIA DER data collection may not be useful for planning or operations
 - Key actors are not surveyed, e.g., RTOs/ISOs, aggregators, and VPPs
 - Details on technology type (such as inverter) and configurations will be essential for operations
 - Information on location, particularly interconnection (distribution or transmission) will be key
 - Newer technologies and use cases are missing, e.g., managed EV charging

Solution: Creation of a DER Registry

What's in a Registry and Why?



Process must be 'physics based' not 'policy based'. Can't be hung up by naming conventions, market structures, and corporate structures. What is the core data required to enable DERs to make it all work?

REQUIREMENTS

- Requirements pouring in by the dozens/hundreds
- Each major group and their subgroups have their own concepts

Pre-Competitive DER Registry

The Base Data Set required for all stakeholders.

Aggregators	Regulator	ISO	Utility	Customer
All ISOs have different approaches but have to operate across the same	Federal vs State	FD 3331 Compliance	Customer Service	Equipment
Systems integration with all	New rule/fee #/etc	Systems	Distribution	Interconnection
Customer interaction	Customer protection	Tariffs - Market Products	Transmission	Operation
Business Models	Utility cases	Operations	Generation	Maintenance
Etc	Etc	etc	Regulatory	Cost
			Trading	Programs
			etc	etc

Proprietary and confidential

Collaborative UTILITY SOLUTIONS

Copyright © 2023 CUS | 16

A DER registry solves many problems

- By knowing where a DER is, what it is, and what it can do, distribution companies and grid operators can better plan and operate their networks.
- Creating a shared data source to collect standard data for DERs and their interconnection allows both distribution companies and grid operators to have a single point of truth to work from for optimal results.
- A common registry based on IEC CIMs removes the need for baseline DER system interfaces between all distribution companies, ISOs/Control Area Authorities, and Aggregators (saving billions of software costs for the industry) to access DER data.
- A registry allows broad information availability for every resource to become part of the collective solution to grid and market issues instead of an invisible problem to chase and guess about in daily operations.
- A registry will eliminate consumer barriers and complexity. For example, Aggregators will have one interface – Not 3000+.
- All these functions are pre-competitive and efficiently enable DERs to participate in grid and market activities at the lowest cost and much more quickly.

In Summary

- Demand response data: C+/B-
 - EIA data collection is missing significant amounts of demand response
 - NERC DADS: in-use, but NERC has not published data in years
 - RTO/ISO: Not standardized, but adequate at high-level for wholesale demand response
- DER data collection: B+/A-
 - EIA's data collection does a good job counting DERs
 - May not be adequate in the future
 - New DERs, use cases, and operational needs will necessitate enhanced data on DERs
 - E.g., whether interconnected at distribution or transmission
- New resources and use cases: Incomplete
 - Particularly EVs and EV charging

Recommendations

- Significantly redesign demand response data gathering
 - EIA should include RTO/ISO data or collect information from aggregators
 - Standardize demand response definition and collect additional information on program types
- Upgrade DER data collection to address new DER data requirements
 - Include point of interconnection in database
 - Add coverage of new technologies, use cases, and industry participants
 - Consider partnering with national DER Registry effort

Questions?

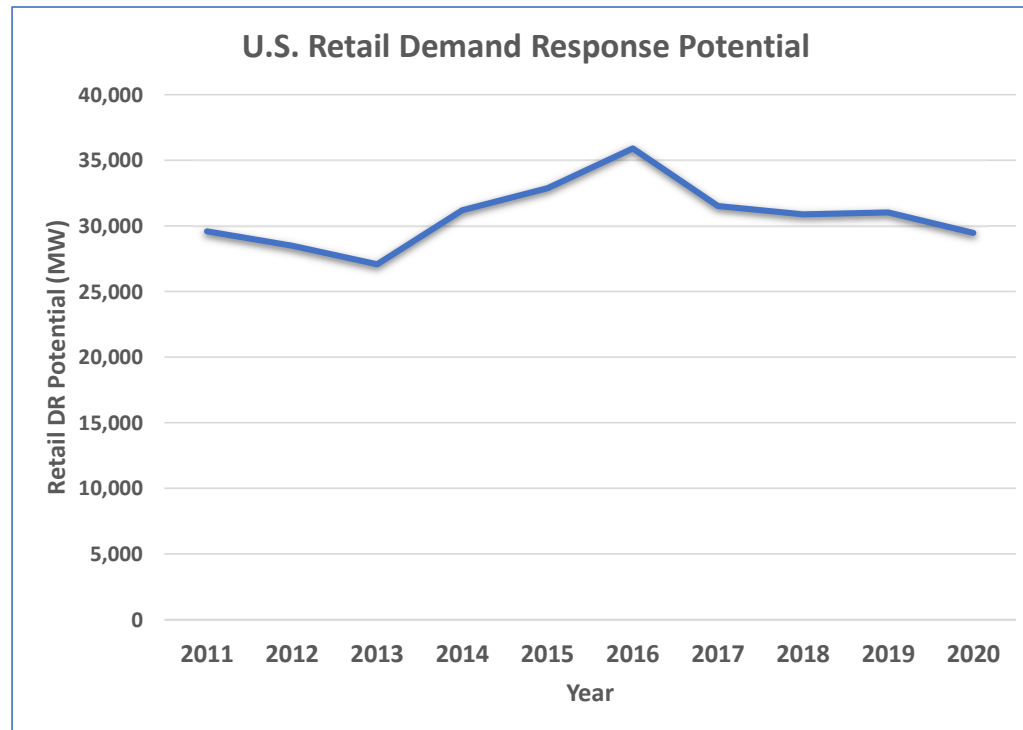
David@kathanenergy.com



KATHAN ENERGY
CONSULTING

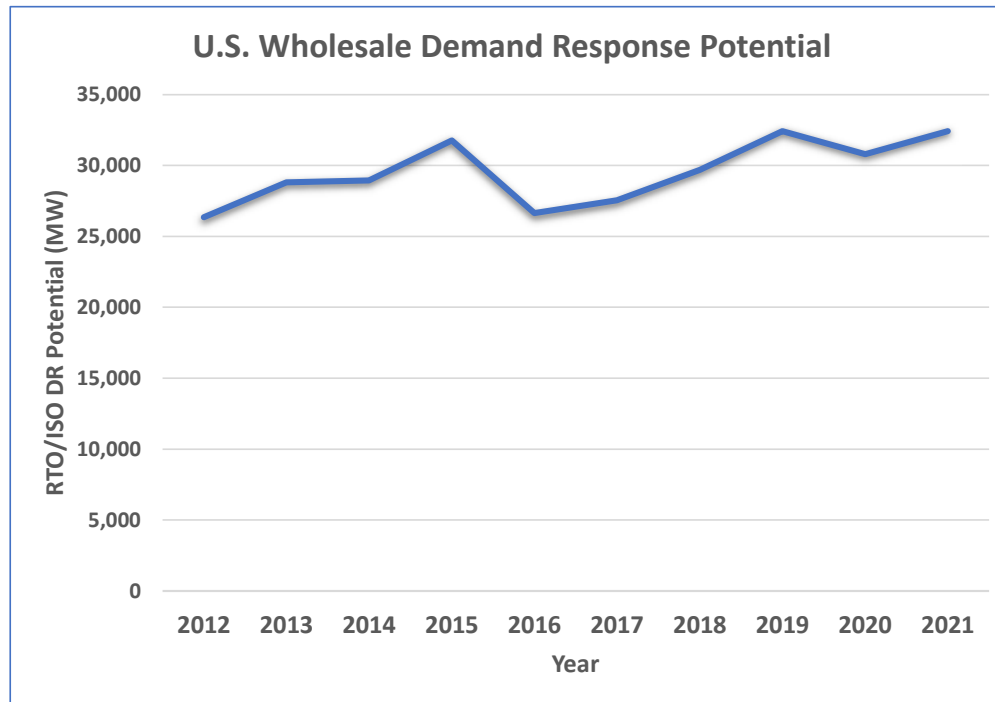
Background Slides

U.S. Retail Demand Response Trend



Source: FERC Annual DR and AMI Reports

U.S. Wholesale Demand Response Trend



Source: FERC Annual DR and AMI Reports

Figure 3-5. Reported potential peak reduction by program type and by customer class in 2012 FERC Survey

