
Market and Policy Barriers for Demand Response Providing Ancillary Services in U.S. Electricity Markets

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Report Summary



Presentation Overview

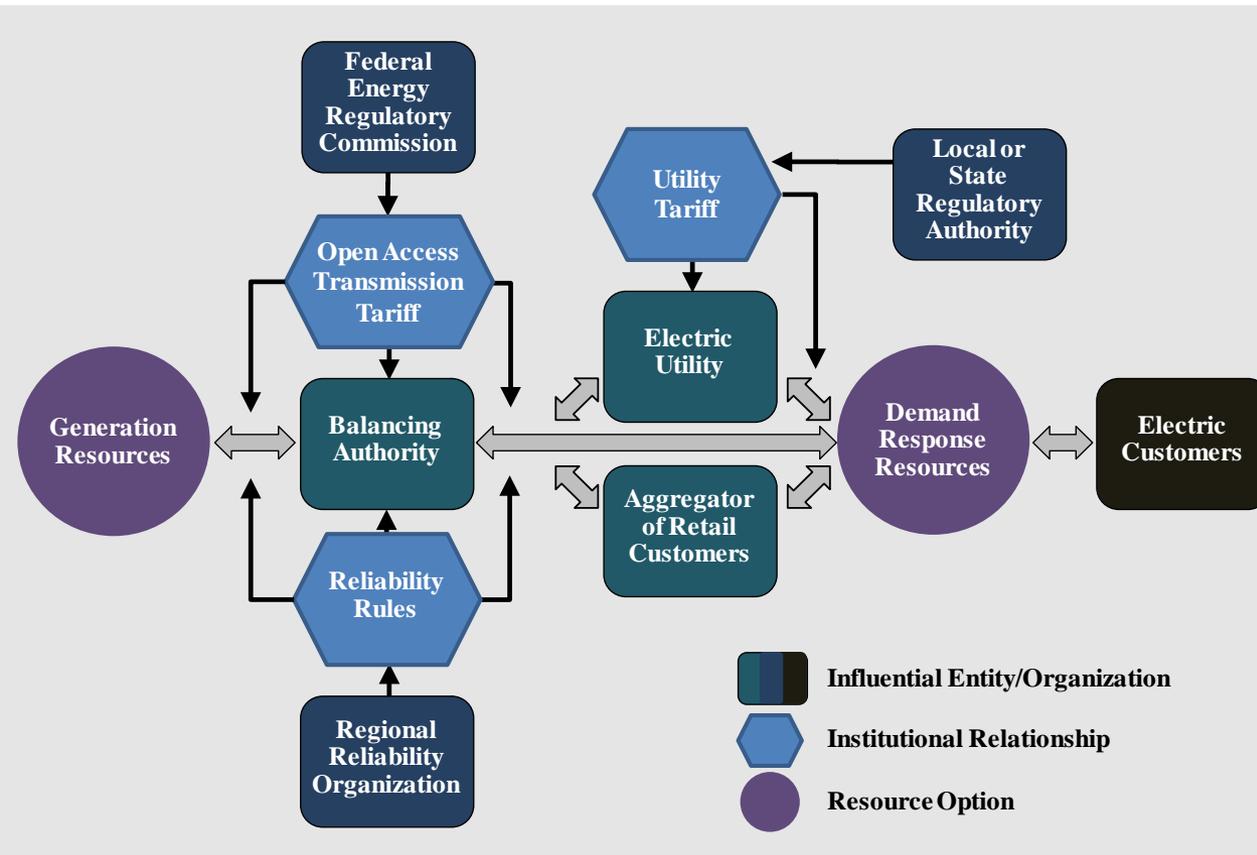
- **Objectives and Approach**
- Wholesale and Retail Market Environments
- Market and Policy Barrier Typology
- Prototypical Regional Barrier Assessment

A Role for Demand Response to Provide Ancillary Services

- **Increasing penetration of renewable energy generation in U.S. electricity markets means that bulk power system operators will need to manage the variable and uncertain nature of many renewable resources**
- **System operators will likely need to procure more ancillary services (AS) to fully accommodate the sizable addition of these variable generation resources**
- **Traditionally, AS has been provided exclusively by generators**
- **Conceptual studies as well as field tests have verified that Demand Response (DR) resources are capable of and well-suited to provide various types of AS**

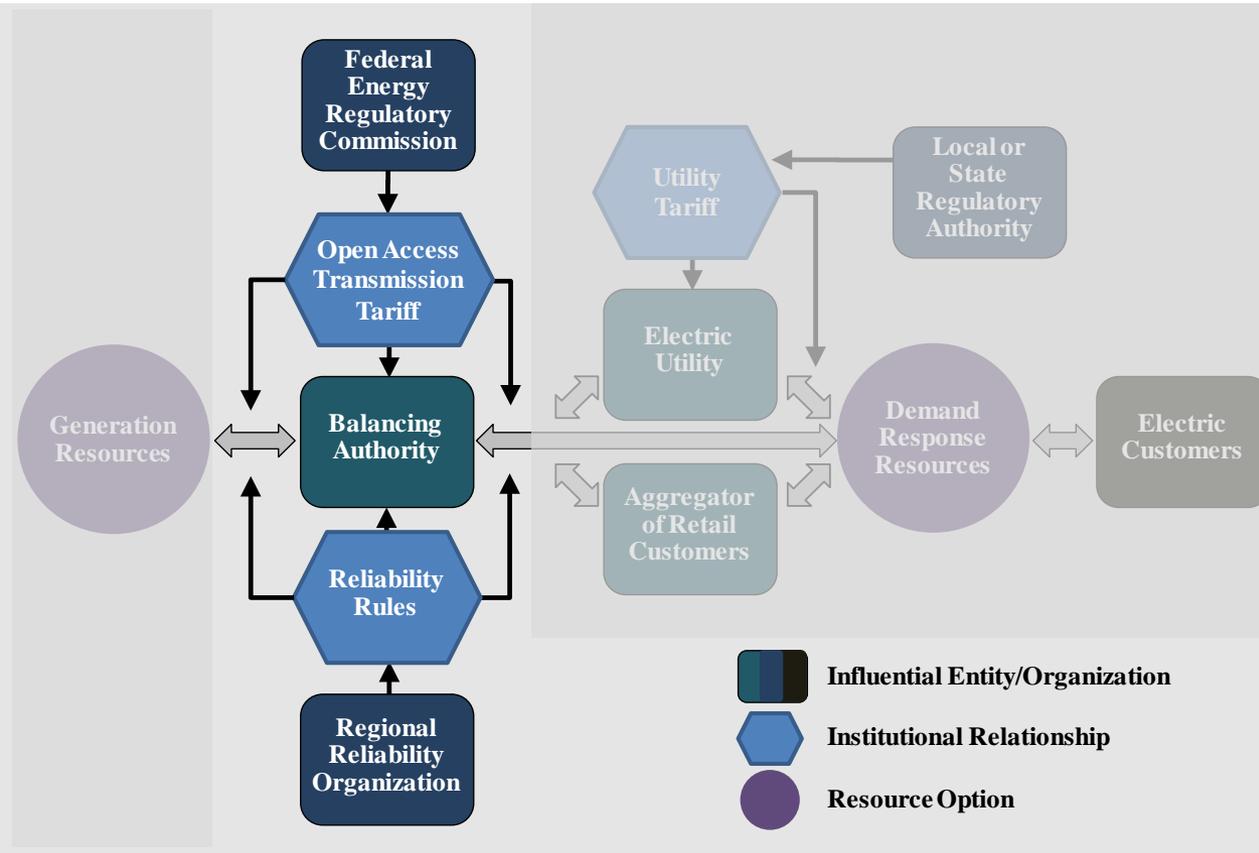
Barriers Exist Keeping DR Resources From Providing AS

DR resources can technically provide various forms of AS, although they may not do so until enabled by the entities and organizations that directly and indirectly affect a electric customer's interaction with the bulk power system



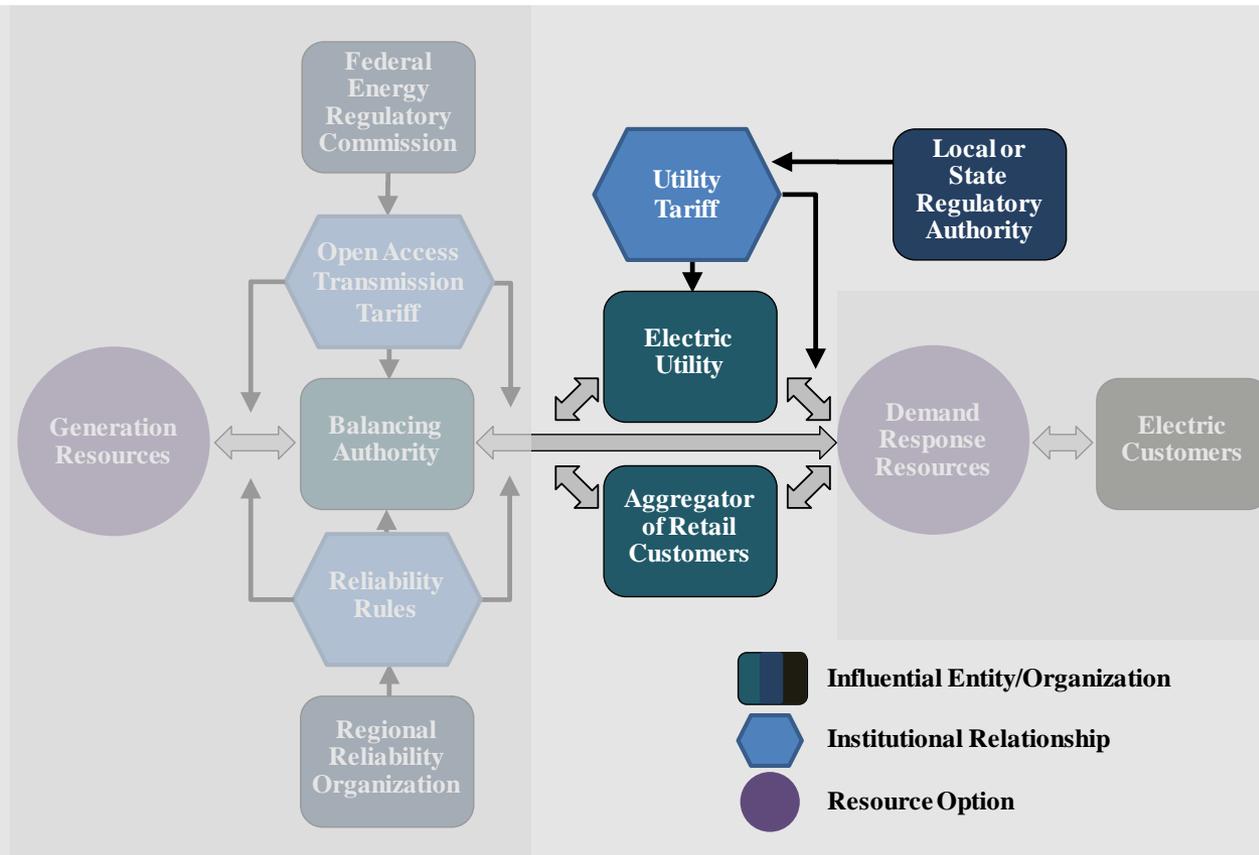
Barriers Exist Keeping DR Resources From Providing AS (2)

Federal regulators, reliability organizations, and balancing authorities (BA) create a framework for rules of operation through tariffs and other documents that dictate who qualifies as a resource and what types of bulk power system services they can provide



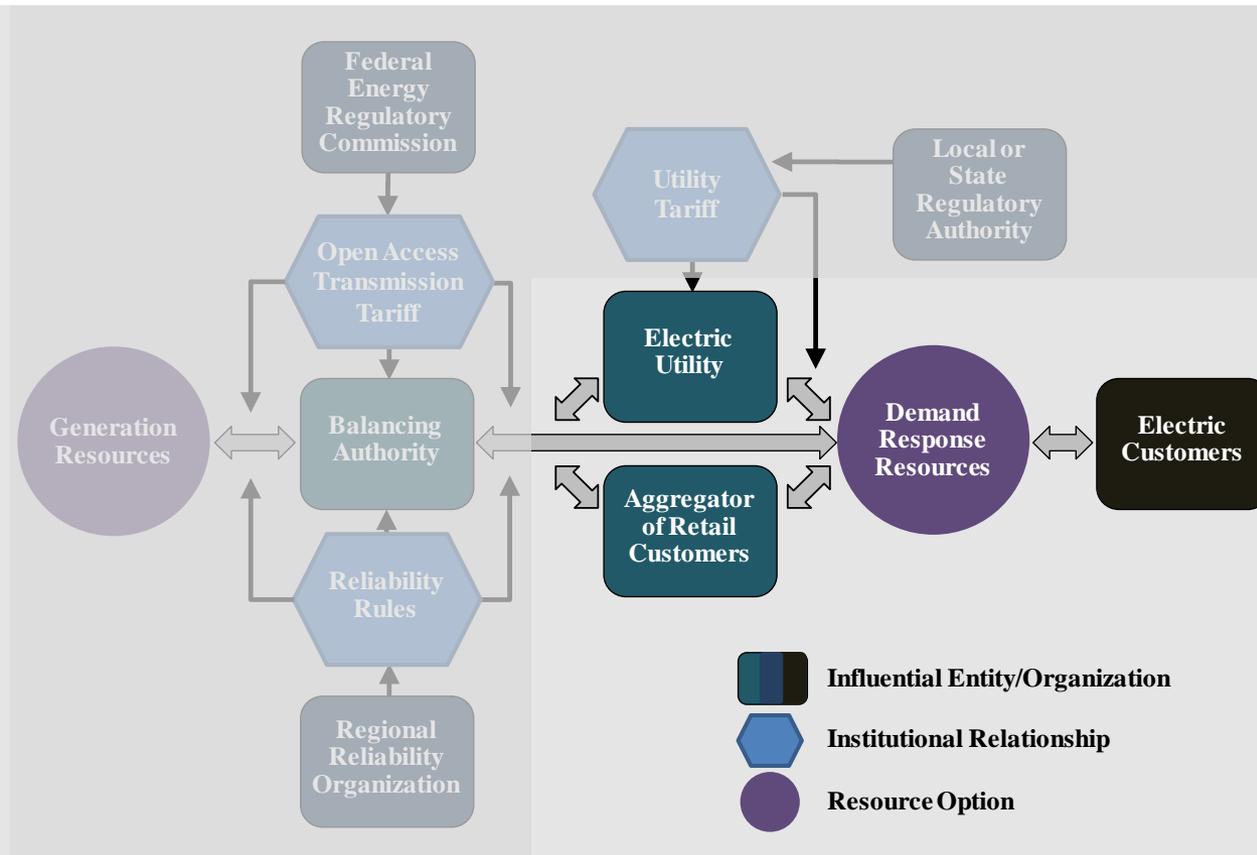
Barriers Exist Keeping DR Resources From Providing AS (3)

State regulators and legislators define the conditions under which program providers can engage with retail customers to develop DR resources



Barriers Exist Keeping DR Resources From Providing AS (4)

Electric utilities and ARCs, as program providers, have business considerations that dictate their interest in pursuing customers as DR resources



Study Objectives and Approach

- **Study Objective:**

- *Examine various market and policy barriers that affect the ability of utilities or load aggregators to utilize demand response resources to provide ancillary services in regions with and without ISO/RTOs*

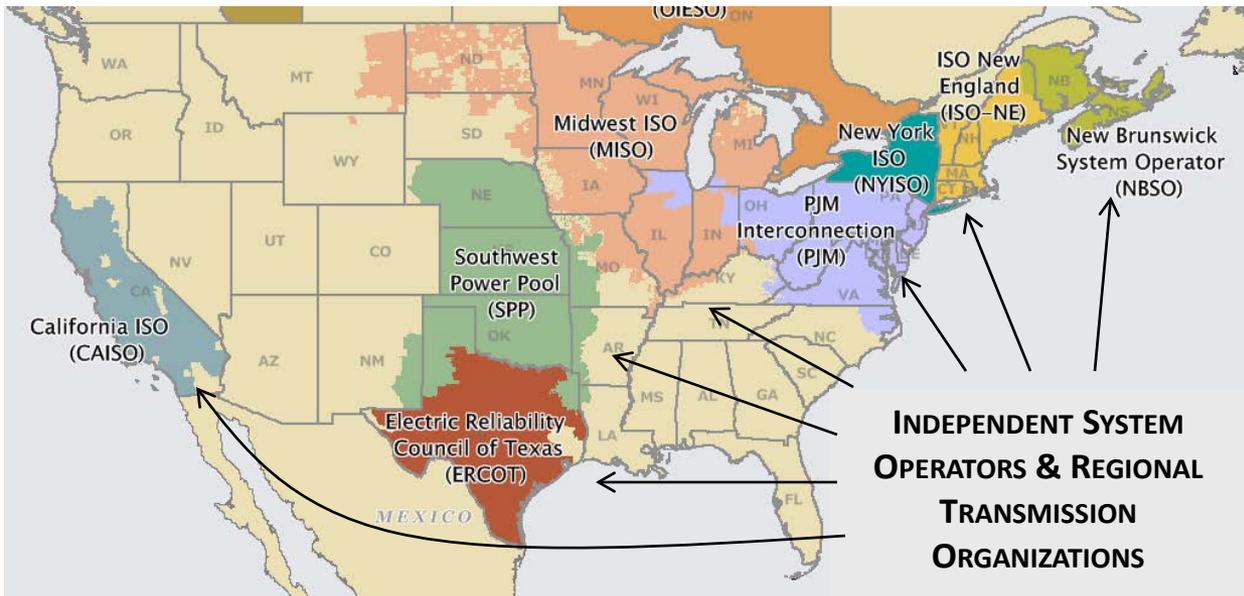
- **Approach**

- *Develop a typology of barriers focusing on smaller customers who must rely on a program provider to become a DR resource*
- *Examine existing regulatory structures, market environments, and product offerings through research and interviews*
- *Illustrate differences in barriers among various wholesale market designs and their constituent retail environments*

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- Prototypical Regional Barrier Assessment
- Conclusions

Different Wholesale Market Environments: ISO/RTOs



- 7 ISO/RTOs exist in the U.S.
- FERC regulates ISO/RTO via their market rules and tariff
- ISO/RTO receive input from stakeholders when determining market rules to alter

- ISO/RTOs generally run competitive energy and ancillary services markets, most of which are co-optimized to produce an overall least cost market solution
- ISO/RTO markets accept offers to supply and bids to purchase bulk power system services and uses them to produce a transparent market-clearing price for each service

Different Retail Market Environments

Ownership and Regulatory Models

- **Electric cooperatives**
 - Generally owned by members and overseen by board of directors
- **Public utilities**
 - Generally owned and overseen by the municipalities they serve
- **Investor-owned utilities (IOU)**
 - Owned by private shareholders and regulated by either elected or state-appointed group of utility commissioners
- **We will focus exclusively on IOUs**

Different Retail Market Environments

Electricity Supply Service

- **States that do not allow retail electric competition**
 - IOUs have monopoly status for the provision of transmission, distribution and electricity services
- **States with Retail Competition**
 - IOUs provide transmission and distribution services as a regulated monopoly but not electric supply service in 17 states and DC
 - Customers are free to chose an electricity supplier

Different Retail Market Environments

Ownership of Generation Resources

■ **Vertically Integrated IOU**

- IOU has its own fleet of generation resources that are used to serve the capacity, energy and ancillary services needs of its customers
- IOUs may also procure power from non-utility electricity suppliers via long-term power purchase agreements or short-term bilateral contracts

■ **Distribution System IOU**

- IOU does not own generation assets and so must exclusively contract with non-utility electricity suppliers to serve its customers' long-term and short-term needs

Case Study Regions Represent Diversity of Wholesale and Retail Market Environments

	Colorado	Texas	Wisconsin	New Jersey	
Wholesale	Dominant Balancing Authority	PSCo	ERCOT*	MISO*	PJM*
	Capacity Market Exists?	N/A	No	Yes[†]	Yes
	Co-optimized Energy & Ancillary Services?	N/A	Yes	Yes	Yes
	AS Capacity Determination?	Constant, Annually	Constant, Annually	Daily shape, monthly	Based on Forecasted Load
Retail	Allows retail competition?	No	Yes	No	Yes
	Distribution IOU?	No	Yes	No	Yes

* Represents an ISO/RTO environment

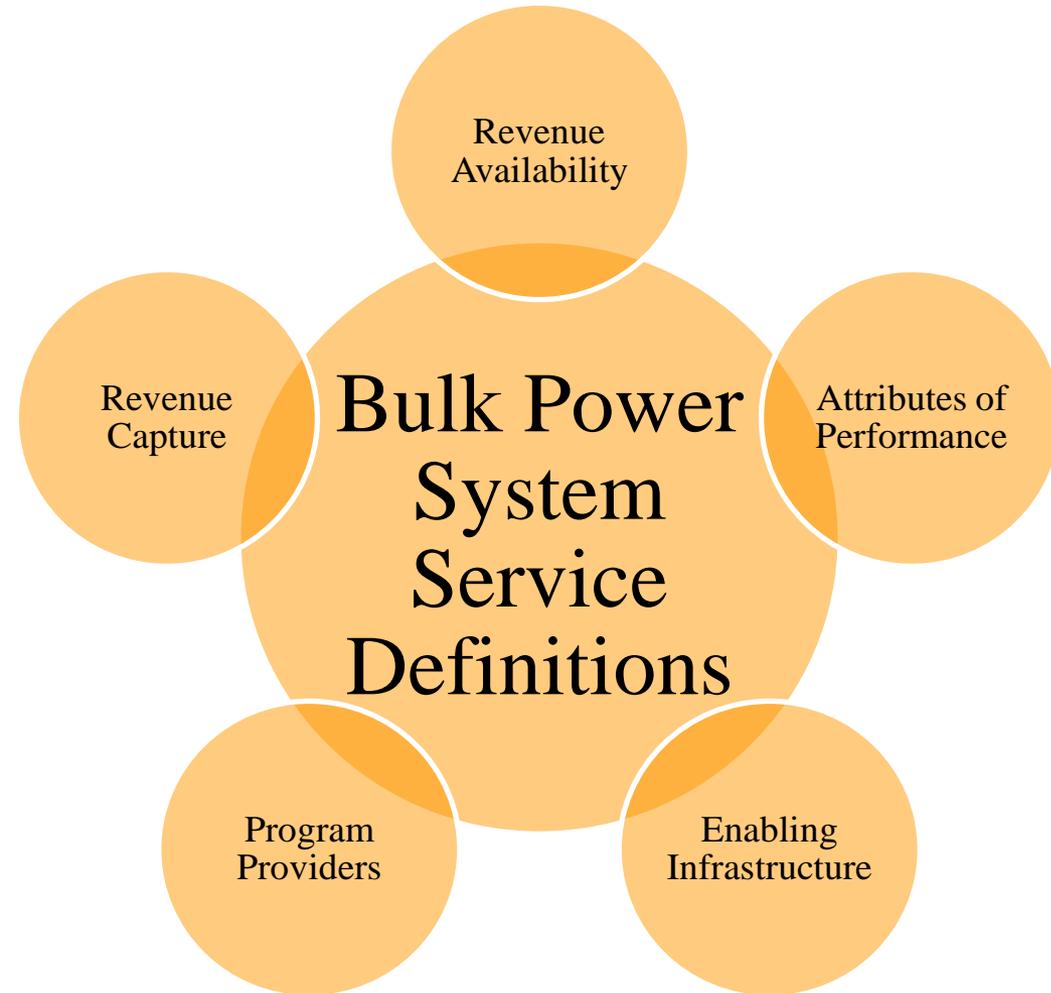
† MISO's monthly capacity market is strictly voluntary at this time



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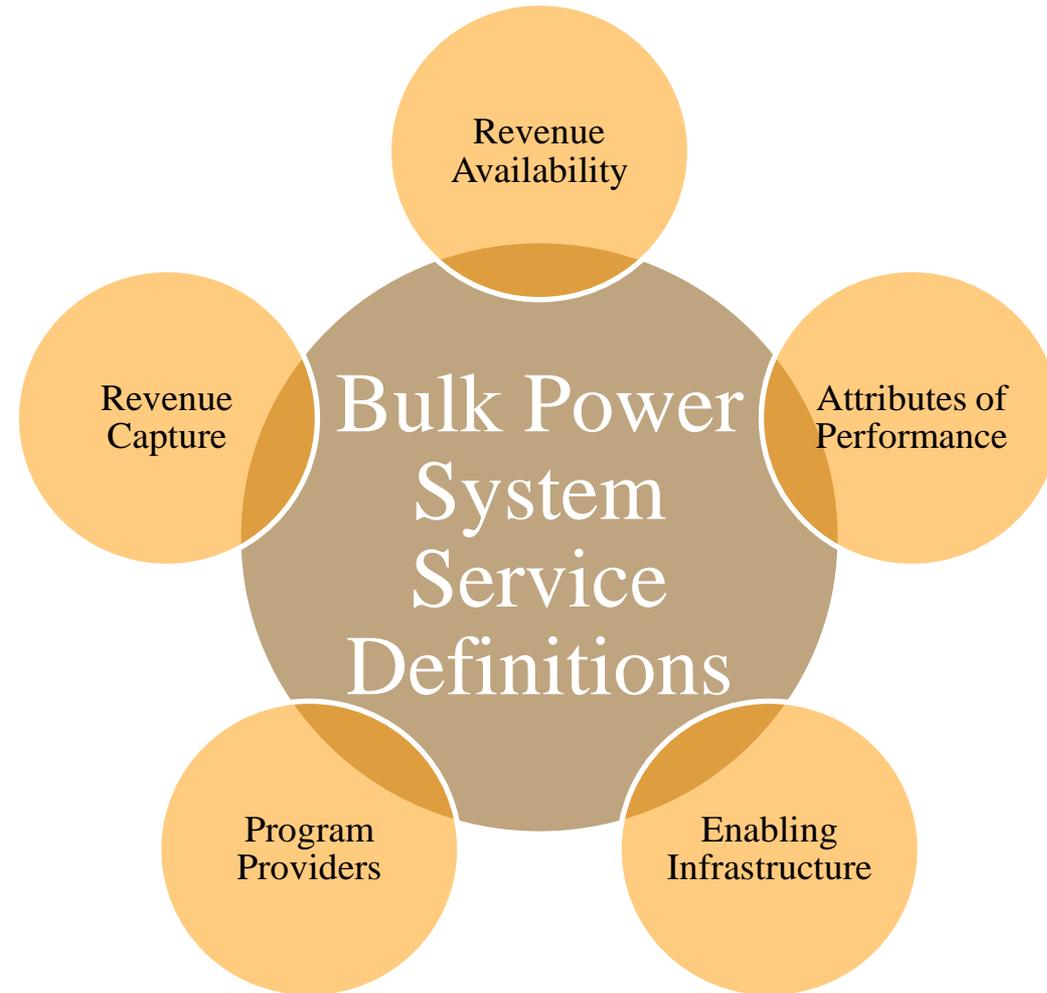
Conceptual Framework for Market and Policy Barrier Typology



- Typology is based on perspective of DR program provider (IOU, ARC) who must overcome various types of barriers to engage customers to become DR Resources providing AS
- Some of these barriers must be approached sequentially; others are inter-related

Market and Policy Barrier Typology

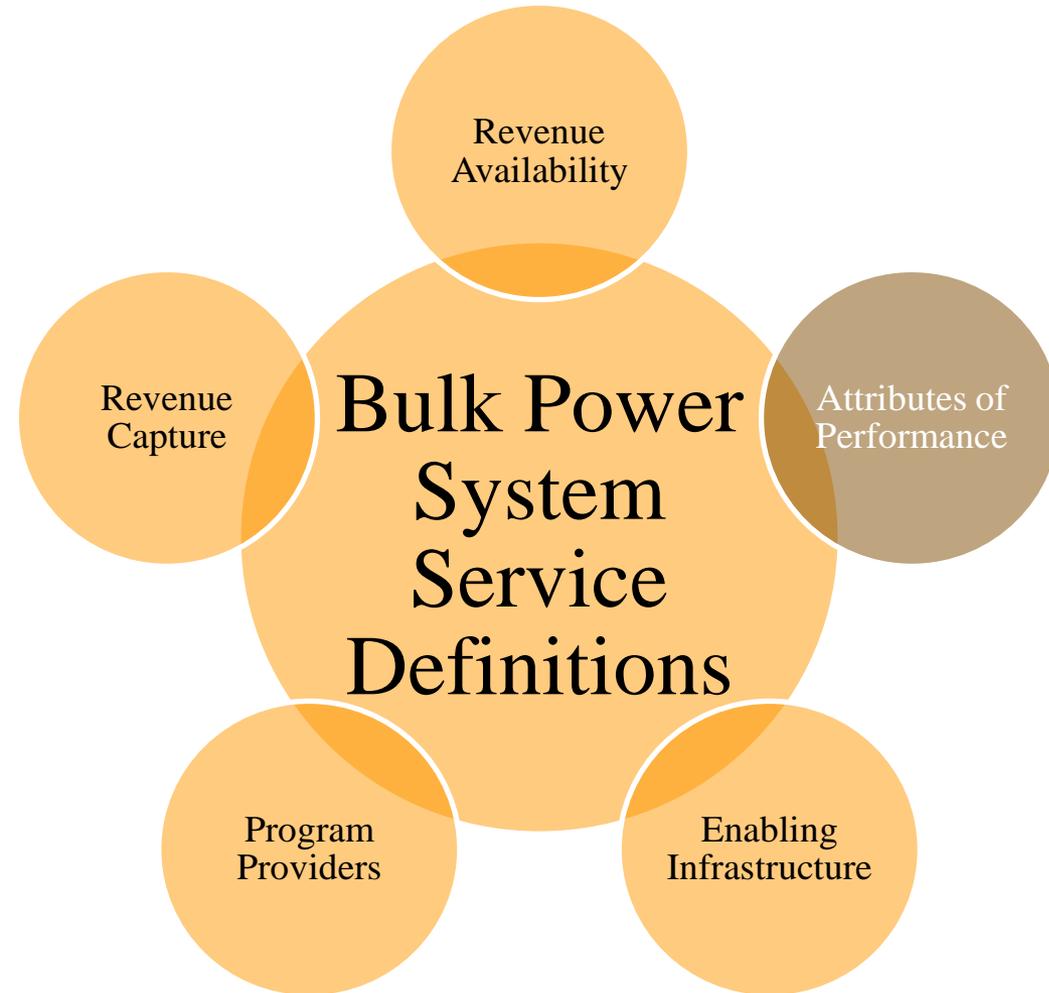
Bulk Power System Service Definitions



- These barriers relate to the way in which reliability councils and the BAs chose to define AS that includes or excludes certain classes of resources explicitly
- Must be dealt with first or else DR is ineligible to provide such services

Market and Policy Barrier Typology

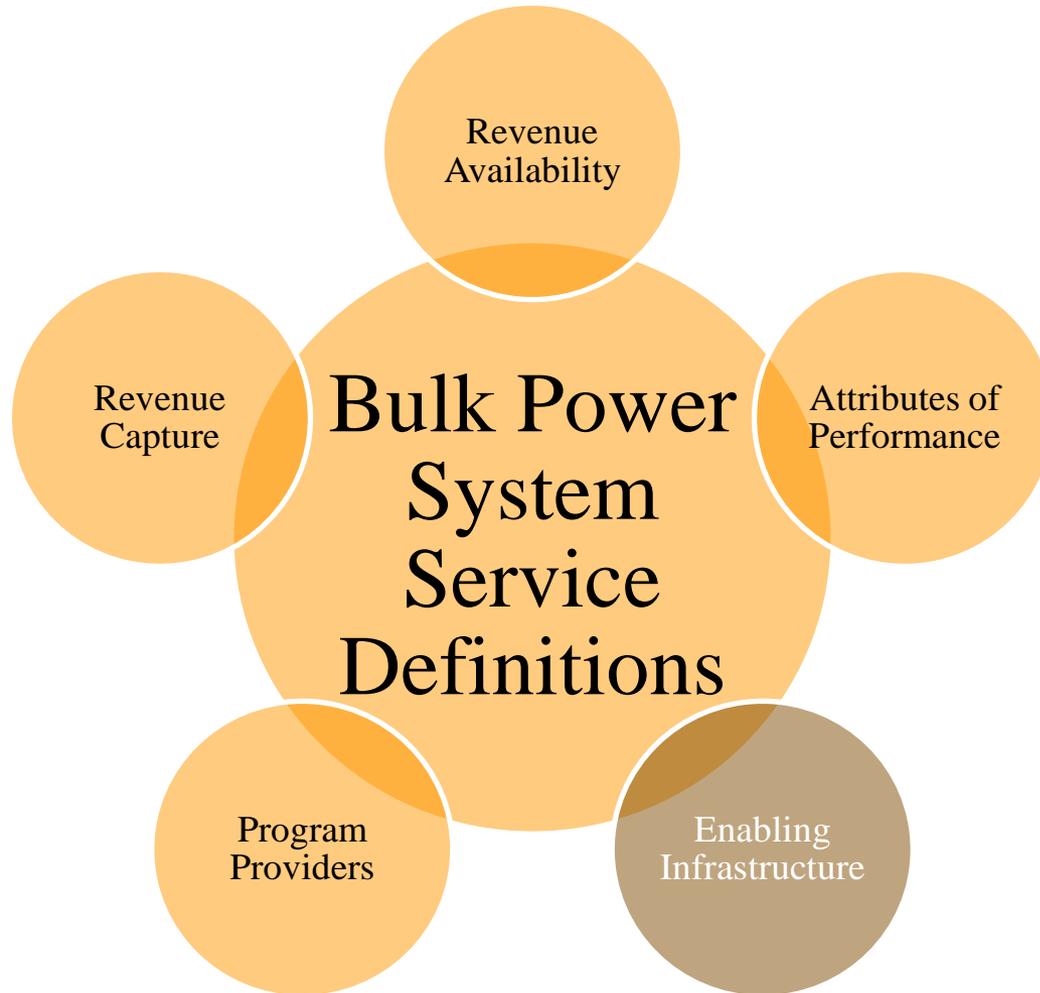
Attributes of Performance



- These barriers relate to the rules that a BA develops to define participation and performance requirements of resources wanting to provide AS and dictate how such resources are integrated into its market operations

Market and Policy Barrier Typology

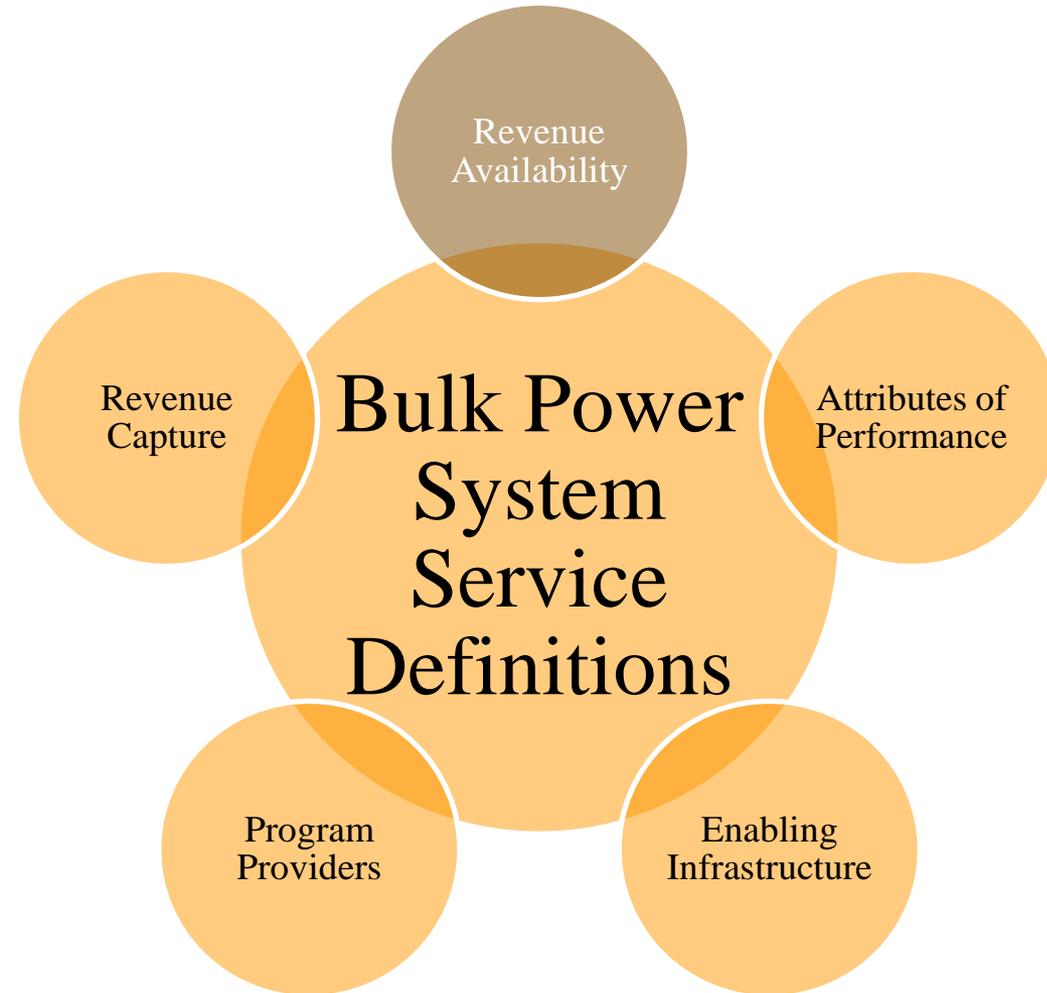
Enabling Infrastructure Investments



- These barriers relate to the required investments in enabling control, automation, remote monitoring, and communications technologies that customers and/or their program providers must make to develop DR resources that may provide AS

Market and Policy Barrier Typology

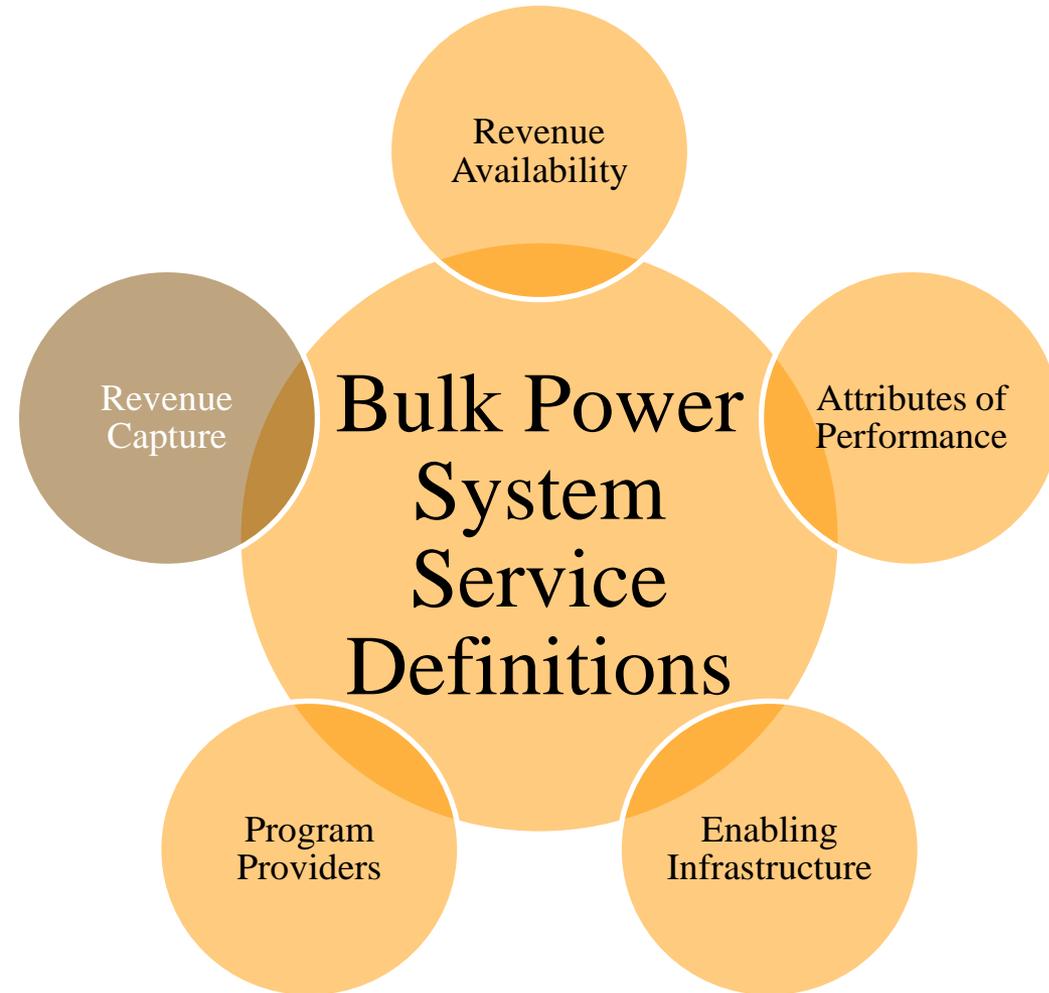
Revenue Availability



- These barriers relate to whether the available revenues from providing AS are sufficient to meet simple payback periods of customers' or return on investment criteria of IOUs'/ARCs' enabling infrastructure investment costs

Market and Policy Barrier Typology

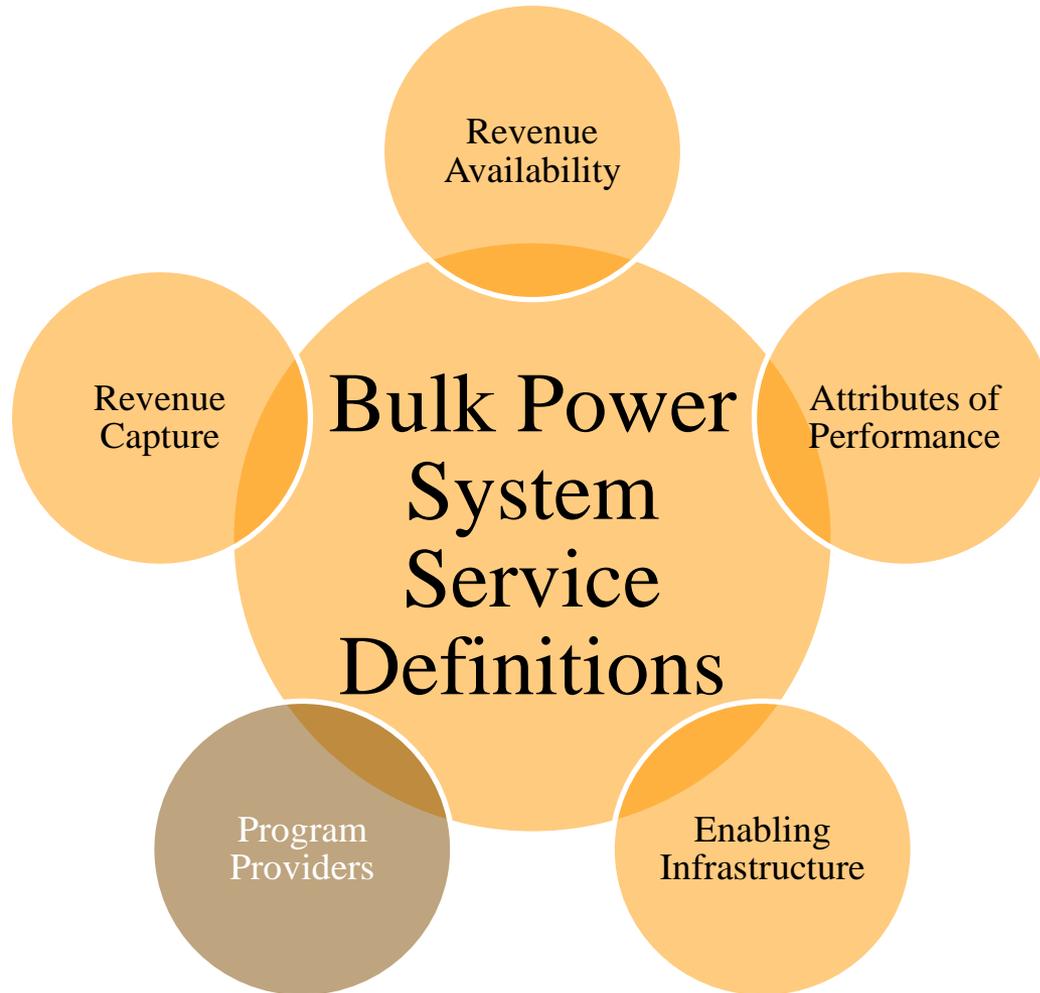
Revenue Capture



- **These barriers relate to whether the available or forecasted revenues from providing AS can be captured with enough certainty to meet simple payback periods of customers' or return on investment criteria of IOUs'/ARCs' enabling infrastructure investment costs**

Market and Policy Barrier Typology

Program Providers



- These barriers relate to business model and other corporate issues that limit or inhibit a program providers' interest in pursuing DR resources as an AS provider

Entities and Organizations Responsible For Creating and Affected by Identified Barriers

	Reliability Council	BA	IOU	ARC	Utility Regulator	End-use Customer
Bulk Power System Service Definitions	*	* , ●	●	●		
Attributes of Performance		*	●	●		●
Enabling Infrastructure Investments		*	●	●		●
Revenue Availability		*	●	●		
Revenue Capture		*	●	●		●
Program Providers		*	●	●	*	●

- * - Entity/Organization responsible for creating the barrier
- - Entity/Organization affected by the barrier

Actions Required to Overcome Identified Barriers

	Change Definition	Change Requirement	Change Process	Reduce Costs	Increase Benefits
Bulk Power System Service Definitions	◆				
Attributes of Performance		◆			
Enabling Infrastructure Investments		◆		□	
Revenue Availability					◆
Revenue Capture		◆			
Program Providers			◆	□	□

- ◆ - Primary action to overcome barrier
- - Secondary action to overcome barrier

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Prototypical Regional Barrier Assessment: *Colorado*

- Colorado has a vertically integrated retail utility environment that operates within a non-ISO/RTO area
- WECC does not allow DR to provide spinning reserve service
- Little to no opportunities for ARCs to directly solicit customers to provide other types of ancillary services
- IOU, as the sole provider of electricity service to customers, have only modest profit motives to pursue non-generation resources, like DR to provide AS
- Colorado IOUs and PUC have not placed expansion of DR to provide AS as a high priority given the excess capacity situation currently experienced by the state's utilities

Prototypical Regional Barrier Assessment: Texas

- Texas has an open retail market within an ISO/RTO, which allows DR to provide various forms of AS
- ERCOT currently has enrolled ~2,400MW of capacity to provide spinning reserves
 - The vast majority of this is provided by larger industrial facilities utilizing under-frequency relays that were installed through utility-sponsored instantaneous interruptible tariffs years prior to the advent of the organized wholesale market
 - Relatively few new and substantially smaller DR resources have been brought to market
- The distribution utilities have little profit motive to pursue such DR programs as they can't capture the cost savings



Prototypical Regional Barrier Assessment: *Texas (2)*

- **Competitive retail electricity suppliers do not yet see a value proposition in offering the requisite types of enabling technology as an additional service due in part to short customer contract lengths which do not exceed the return on investment hurdle rates on the equipment**
- **High reserve margins coupled with major changes at ERCOT to a nodal market over the last several years resulted in time and effort not being directed towards creating greater opportunities for DR resources**
- **More recent reserve shortages are causing ERCOT and the Texas PUC to resolve these issues in part by improving the environment for DR in general**

Prototypical Regional Barrier Assessment: *New Jersey*

- New Jersey has an open retail market within an ISO/RTO, which allows DR to provide various forms of AS
- Distribution utility procures energy, capacity and ancillary services as a bundled product through a multi-year contracting (i.e., auction) process where the costs are completely passed through to customers
 - Little incentive for the distribution utility to pursue lower cost options to provide these services *outside of the auction process* nor any ability to do so within the auction process since the products are bundled
- Absent regulatory engagement to alter the IOU's business model, only ARCs or competitive retail electricity providers will likely offer such DR programs



Prototypical Regional Barrier Assessment: *Wisconsin*

- Wisconsin has a vertically integrated retail utility environment that operates within an ISO/RTO, which allows DR to provide a few forms of AS
- ARC restricted from offering DR programs to customers
- IOU can capture reductions in non-fuel operating expenses from more efficiently operating its fleet of resources but only until new rates are set
- PUC does not allow IOU to retain any profits from off-system sales
- To facilitate access to DR resources that can provide ancillary services will require regulatory engagement to alter the IOU's business model and/or lift the ban on ARC

