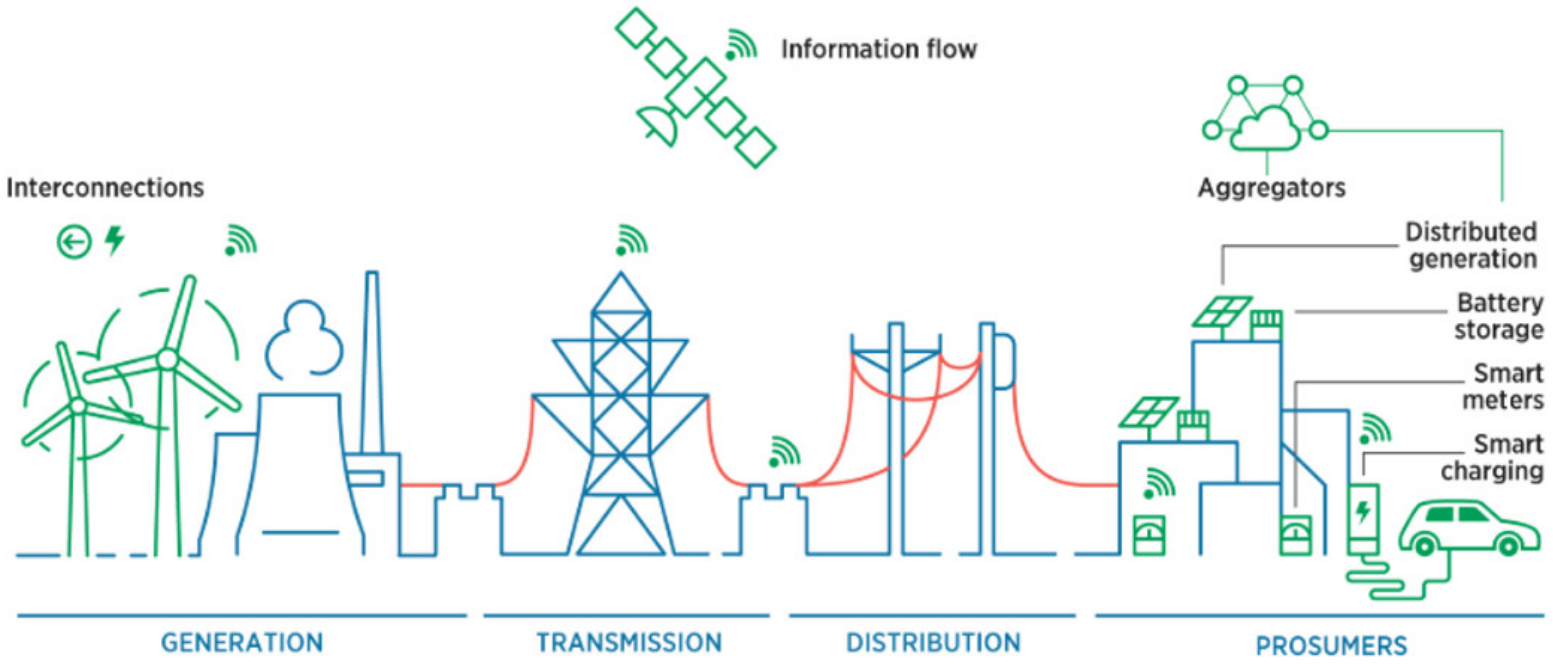
Why Are We Here Today?

The power ecosystem is changing, decentralizing/ multi-directional and becoming more complex in terms of how energy is being produced, delivered, and used.

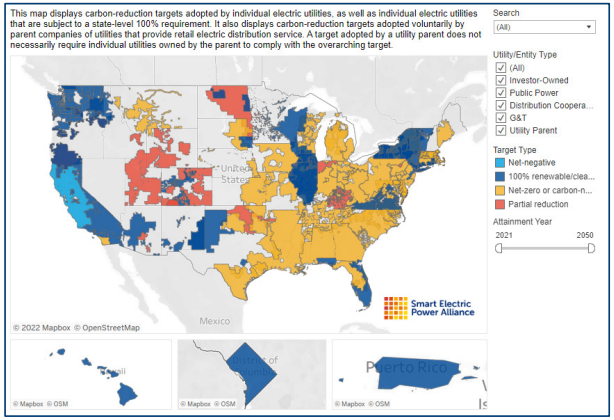


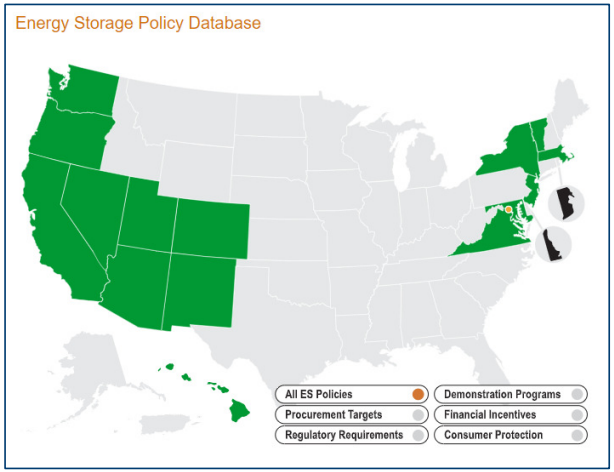
- Utilities are figuring out how to navigate in this new world
- Timing and response is utility specific but there are common challenges and opportunities across the industry
- Distributed energy resources (DERs) are a key component of these changes

What's Driving DER Penetration?

- Recent FERC Orders (841 and 2222)
- Utility Clean Energy and Carbon Commitments
- Changing Customer Demand and Expectations for Managing their Energy Use
- Utility or Jurisdictional Driven Focus on Non-wires Alternatives to Traditional Utility Investments
- Smart Grid Initiatives
- Jurisdictional Mandates for Energy Storage, EVs
- Optimizing Generation Reserve Margins

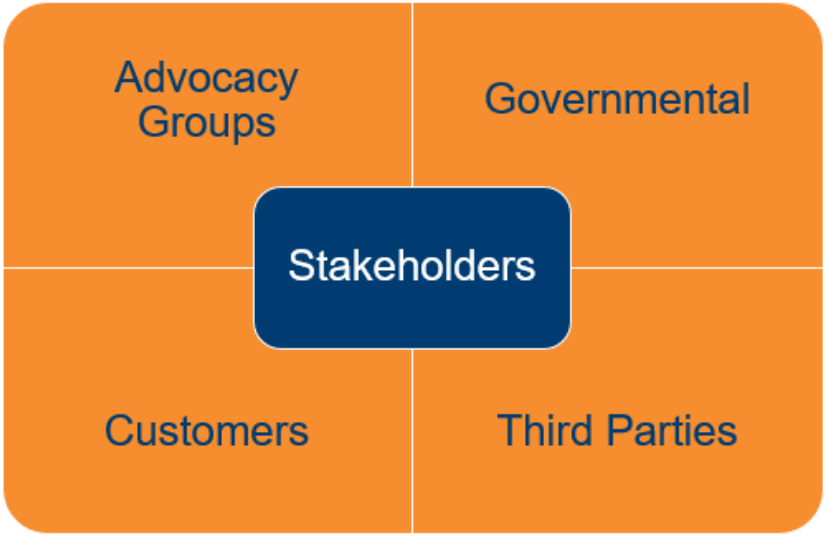
The Result: Many Utilities are Looking to be DER Centric





What do stakeholders want?

- Advocacy groups
  - Civil
  - Environmental
  - Community
  - Trade



- Governmental
  - Legislative
  - Public Service Commission
  - Consumer Advocates
  - State Energy Office

- Customers
  - Residential
  - Commercial & Industrial
  - Institutional
  - Community Organizations

- Third Parties
  - Developers
  - Aggregators
  - Solution Providers

Utility Concerns and the “Future Grid”

Typical Utility Focus Areas

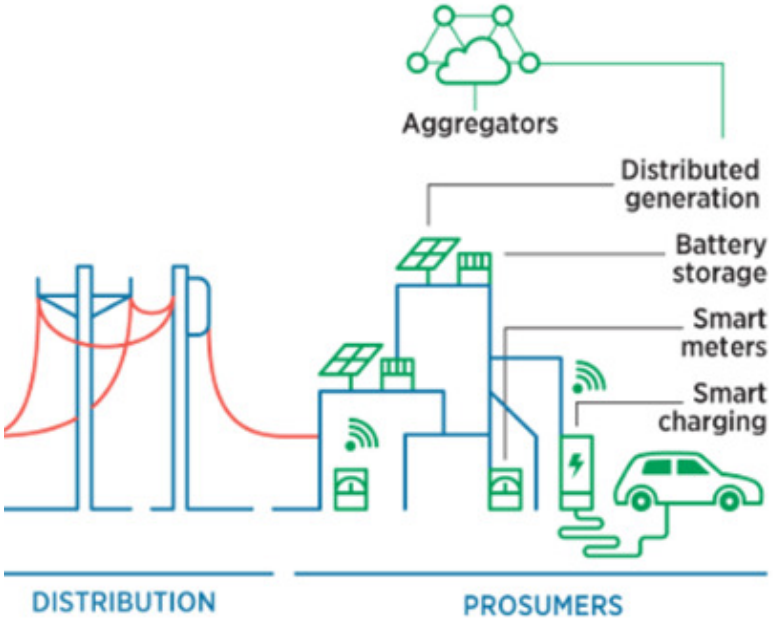
- Safety – protect workers and customers
- Affordability – customer value, drive new business
- Reliability – reduce outage events, outage duration, power quality
- Resilience – reduce events, event duration, survivability
- Flexibility – predict and automatically respond to grid changes
- Efficiency – work and operate more efficiently
- Customer Engagement – communicate, integrate DERS, provide services

The question: What role should DERs play? How and when do I need to incorporate DERs?

DER Centric Requires DER Management

High Level Use Cases

- DER Visibility – Inventorying & organizing DER information & providing visibility into their location & operation
- Demand Management – Optimizing & controlling DERs to provide energy or capacity to reduce or shift peaks
- Grid Services – Optimizing & controlling DERs to address voltage, frequency, PF, or other constraints on the distribution grid
- Market Interaction - Facilitating the exchange of DER information with third parties and markets



The Transition to a DER Centric Utility

Generation	Planning	Operations	Customer Programs

▪ Traditional Approach
  ▪ IRP focus on generation with some DSM
  ▪ Generation mix purely based on economics
▪ DER-Centric Approach
  ▪ DERs support of carbon goals part of IRP
  ▪ Generation mix optimized to leverage DERs cost effectively
	▪ Traditional Approach
	  ▪ Focus on safety, reliability, cost effectiveness
	  ▪ Top down load forecasting
	▪ DER-Centric Approach
	  ▪ Focus on safety, reliability, cost effectiveness and resilience, carbon free, flexibility, and equity
	  ▪ Incorporation of DER based non-wires alternatives
		▪ Traditional Approach
		  ▪ Dispatch generation to match load
		  ▪ Focus on reliability and operational efficiency
		▪ DER-Centric Approach
		  ▪ Shape consumer load to match renewable generation
		  ▪ Focus on reliability and operational flexibility as well as DER integration and optimization
			▪ Traditional Approach
			  ▪ Flat rates
			  ▪ Involvement in generation limited to onsite back-up
			▪ DER-Centric Approach
			  ▪ Variable, flexible, incentive-based rates designed to engage customers
			  ▪ Customer assets part of the reliability solution

Information and Operational Technology

Legal, Regulatory, State and Federal Affairs

Why is this complicated?

Factors

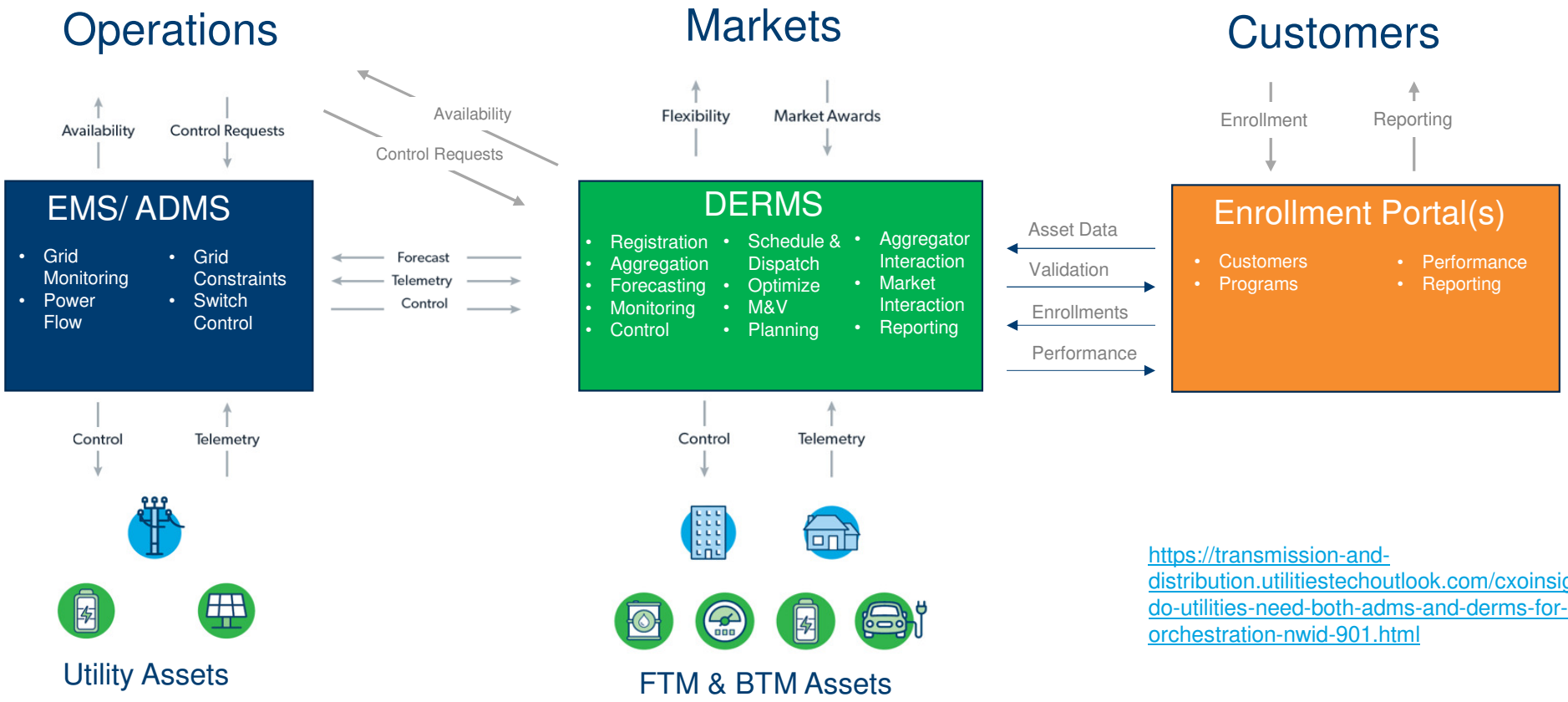
- Ownership – who owns the asset or device (utility, customer, aggregator)
- Location – is device located behind-the-meter (BTM) or in front-of-the-meter (FTM)
- Control – who can control the device (utility, customer, aggregator)
- DER Capability – what capability can the device provide (increase/ decrease power/ load, accept a set point, change status, provide reactive power)
- Organization/ Processes – is organization set up to leverage these devices
- Legacy Systems – will new solutions complement or replace

Implications

- Ownership – visibility may be limited to utility owned assets and aggregations of all others
- Location – impacts to what extent devices can be modeled as part of the network
- Control – device may not be available when most needed
- DER Capability – systems, regulations, standards, and the grid not able to support all functions
- Organization/ Process – involves core operational and customer processes that are difficult to change
- Legacy systems – integrations, data, transparency, privacy must all be in place

* Hard to value/ calculate

Business Models/ Systems/ Data Change



https://transmission-and-distribution.utilitiestechoutlook.com/cxoinsight/do-utilities-need-both-adms-and-derms-for-der-orchestration-nwid-901.html

Thank You

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