

# Regulatory and Security of Supply Challenges of an Integrated Grid

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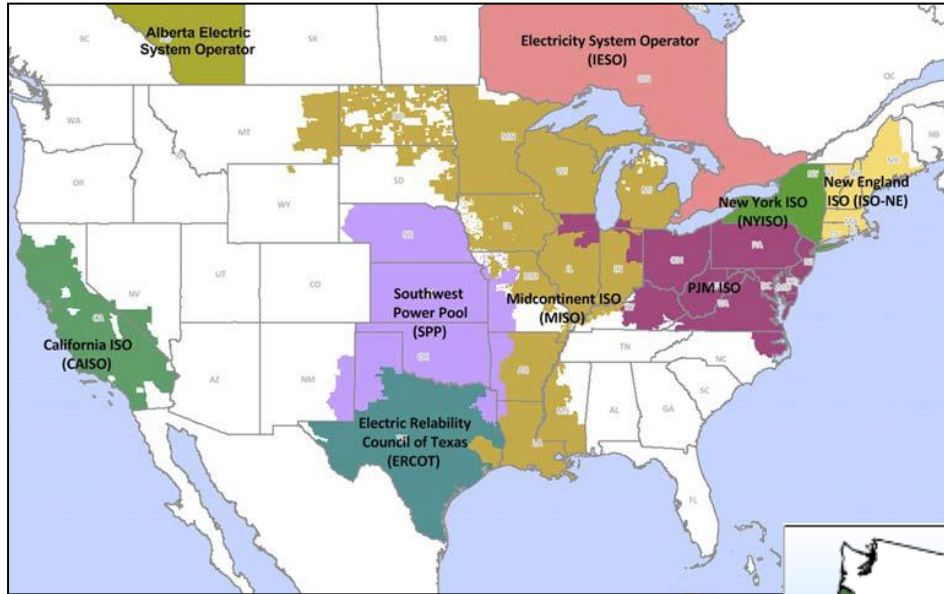


# Electric Power Research Institute

- Founded in 1972 by the electricity industry and regulatory community.
- 450+ members from more than 30 countries collaborate with an annual funding of ~\$390M USD.
- Public service R&D mission to ensure reliable, affordable, clean and safe electricity.
- Research spans across generation, delivery and use of electricity.



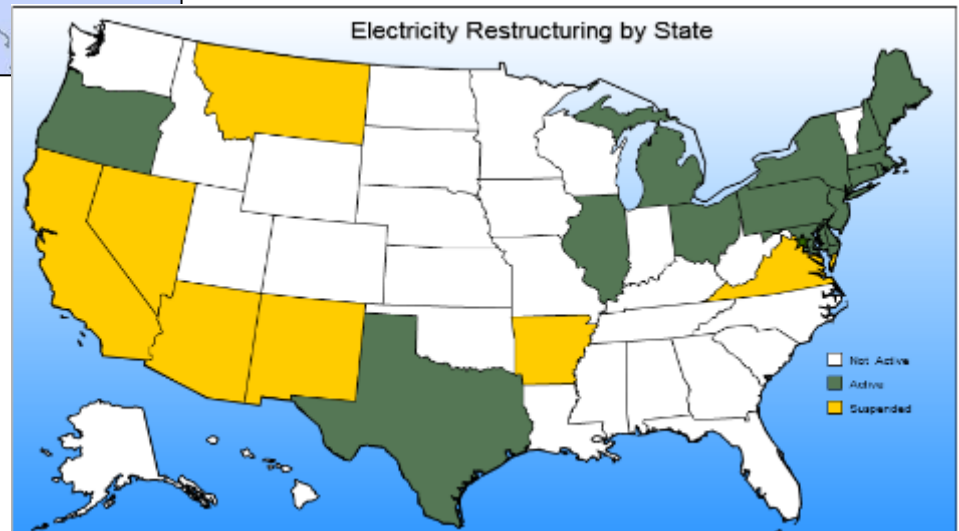
# A Living Laboratory of Regulatory and Market Construct



## State of Regulatory Restructuring

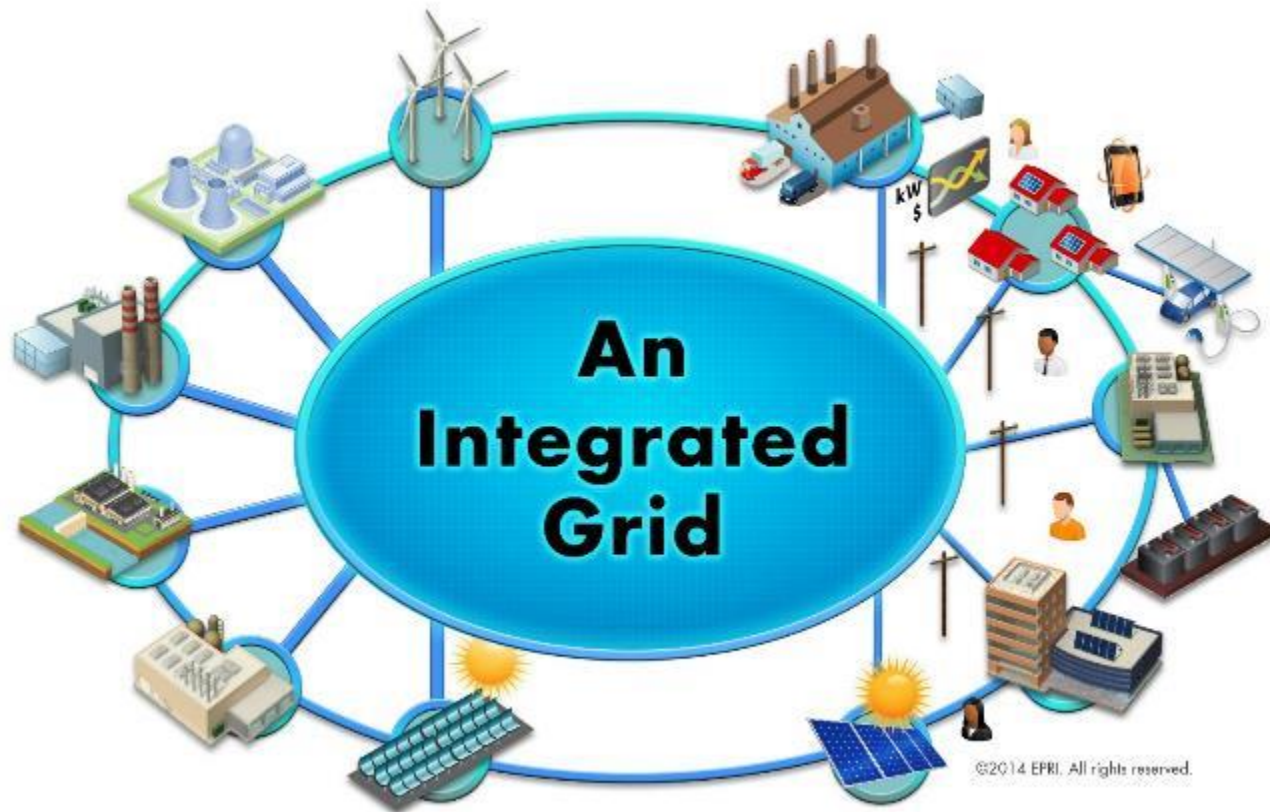
## Power Markets in U.S.

Restructuring means that a monopoly system of electric utilities has been replaced with competing sellers.



Source: Energy Information Administration

# Transforming the Power System



**Distributed and Central Energy Resources are integrated with a Dynamic T&D System and Markets to Contribute Towards Grid Reliability and Security of Supply**

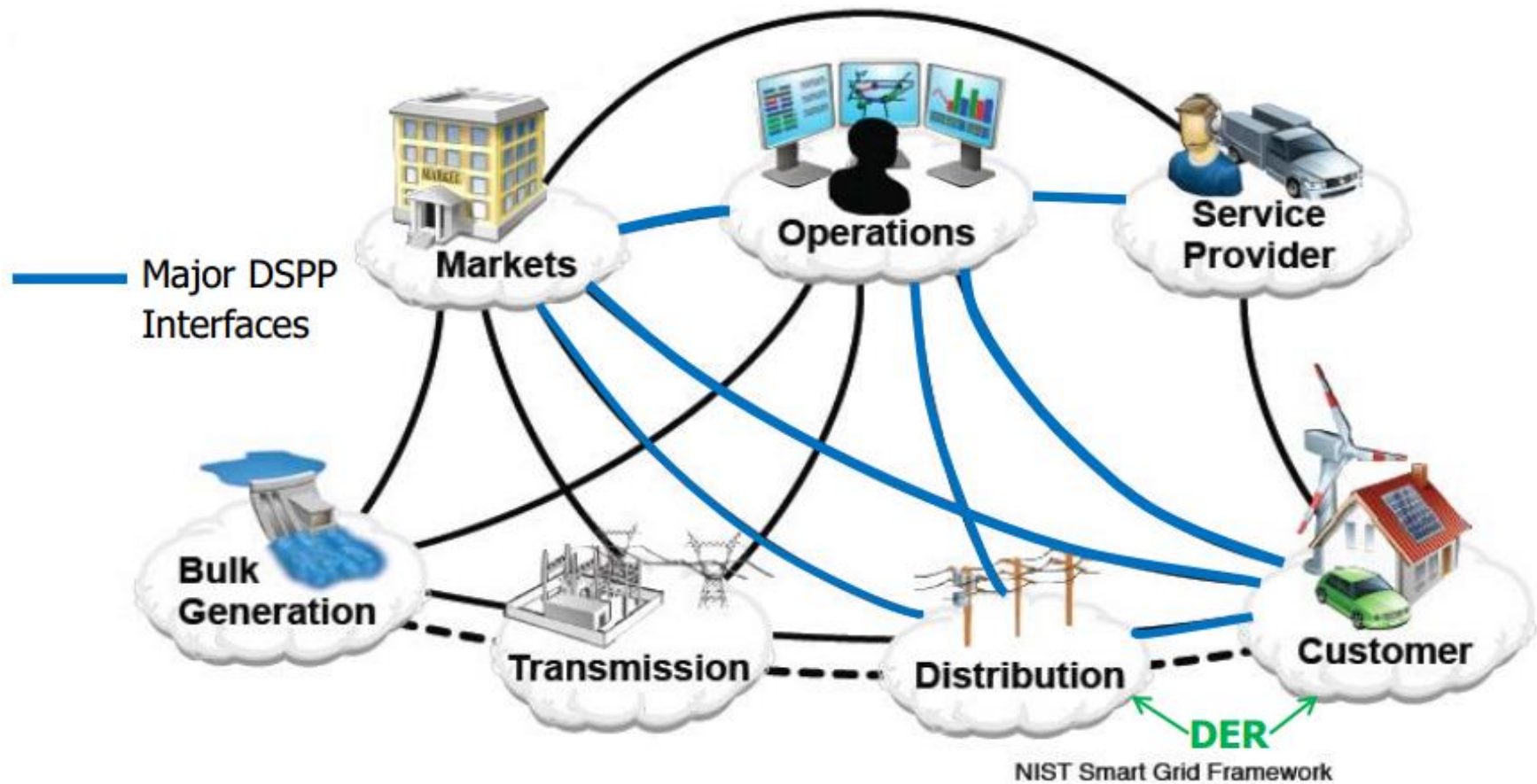
**<http://integratedgrid.epri.com/>**

# Key Regulatory and Security of Supply Challenges

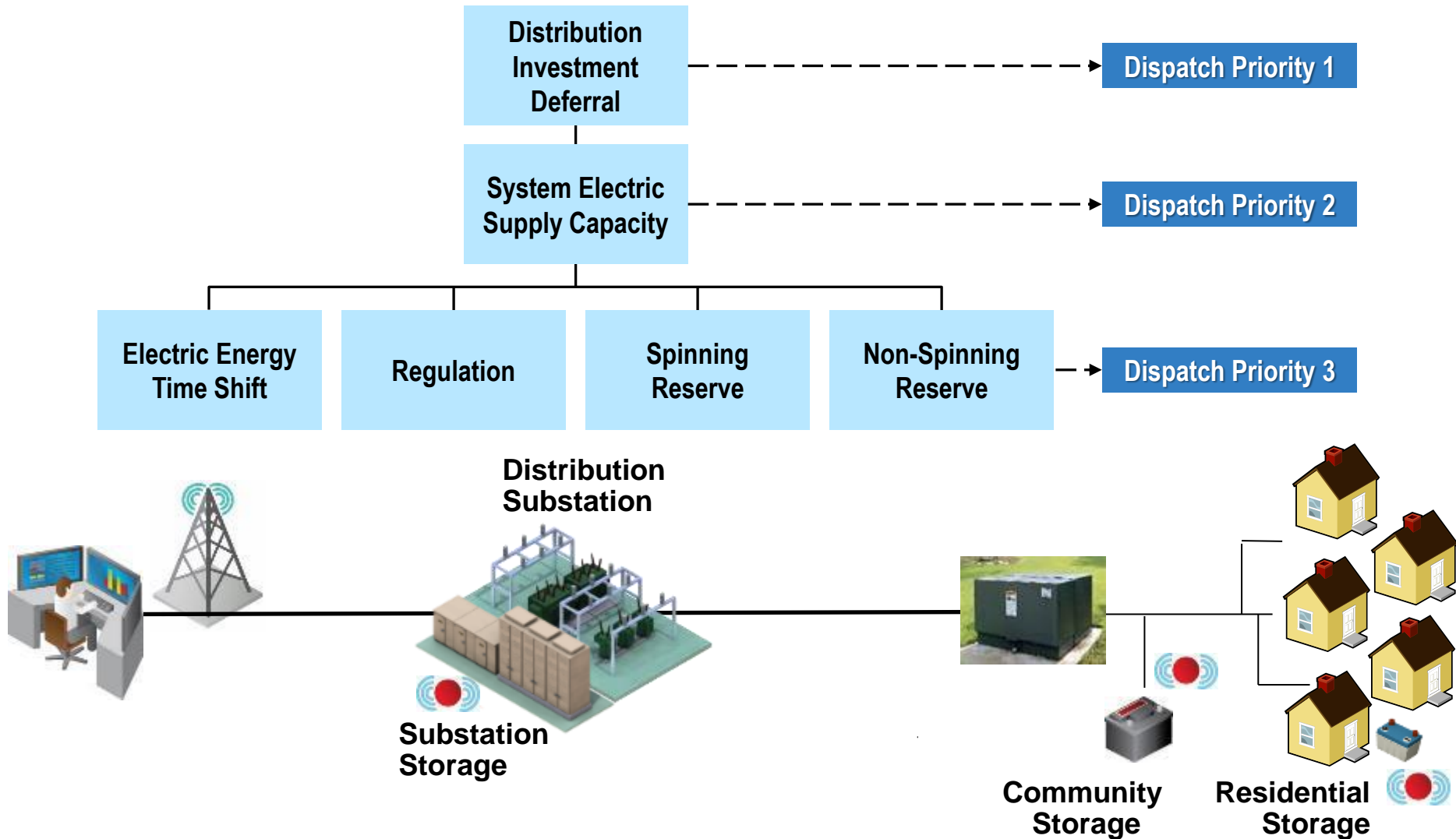
- **Information Flow Across Disintegrated Businesses**
  - What, When and How
- **New Technologies with Value Stream Across Businesses**
  - Who Owns Energy Storage?
- **Market Construct and Customer Resource Contribution to Ensure Adequate Energy AND Capacity**
  - Energy Rich but Capacity Poor
- **Role of DSO in DER Integration**
  - Market Construct or Integrated Resource Planning

# Information & Communications Architecture

## *Defining Roles and Market Interfaces*



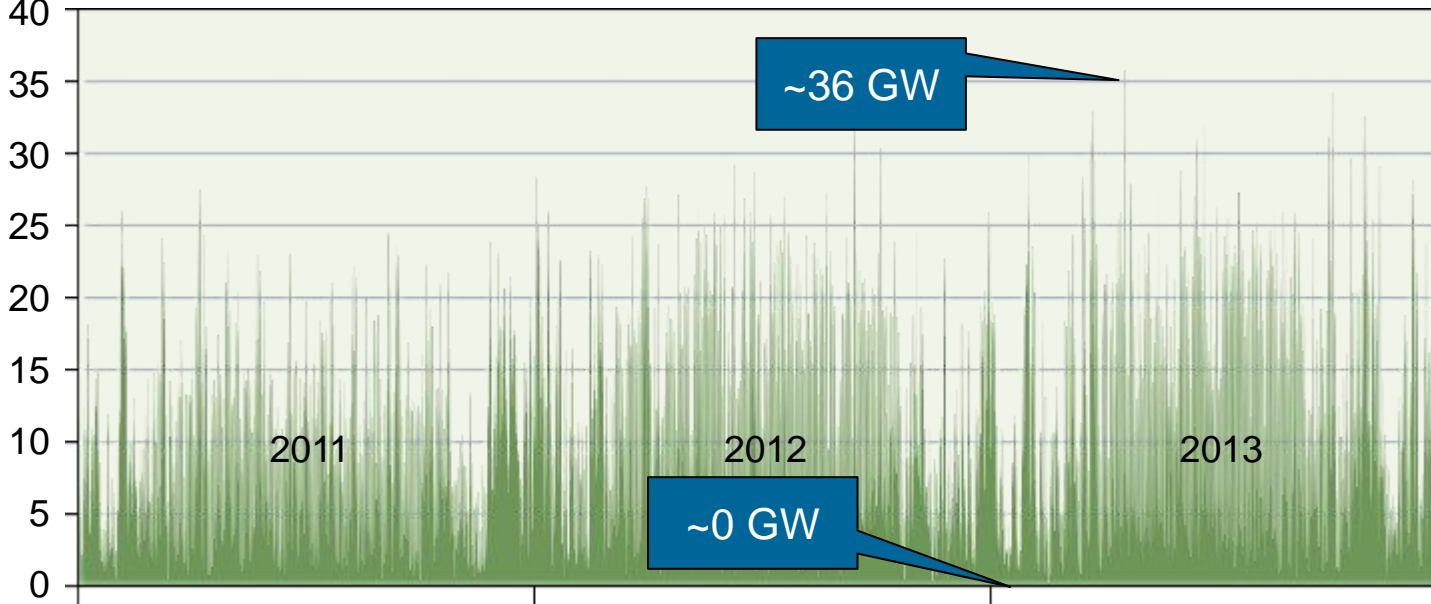
# Distributed Storage – Who Owns and Operates?



Value Across Generation, TSO/DSO and Customers

# Addressing Security of Supply Challenges

Hourly PV+Wind Generation (GW) – Germany



~ 80 days/year  
variable  
generation  
output is below  
5% of installed  
capacity

***Capacity Market? Integrating Balancing Authorities?  
Price Induced Customer Response? DER as a  
Balancing Resource***



# How to Ensure DER Supports the Grid?

*Three Options Explored by Utilities/Regulators*

## Arizona Solar Project

**Utility as DER  
Owner and  
Operator**

## California Distributed Resource Plan

**Utility as DER  
System  
Planner**

**Utility as  
Distribution System  
Operator (DSO)**

**New York  
Reforming the  
Energy Vision  
(REV)**

**EPRI**

ELECTRIC POWER  
RESEARCH INSTITUTE



**Together...Shaping the Future of Electricity**