

Welcome



**THE 3RD
RESILIENT VIRGINIA &
LEADERS IN ENERGY
EDUCATIONAL
FORUM**

**UTILITIES ^{OF}
THE FUTURE**

HOW TO MODERNIZE THE GRID AND DECARBONIZE OUR ENERGY SYSTEM

REGISTER AT LEADERSINENERGY.ORG

THURSDAY, OCTOBER 4TH • 6:00–8:30PM
US NAVY MEMORIAL
701 PENNSYLVANIA AVE NW • WASHINGTON, DC

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Transactive Energy in the Current Grid and Grid of the Future



Dr. John Caldwell, Ph.D.
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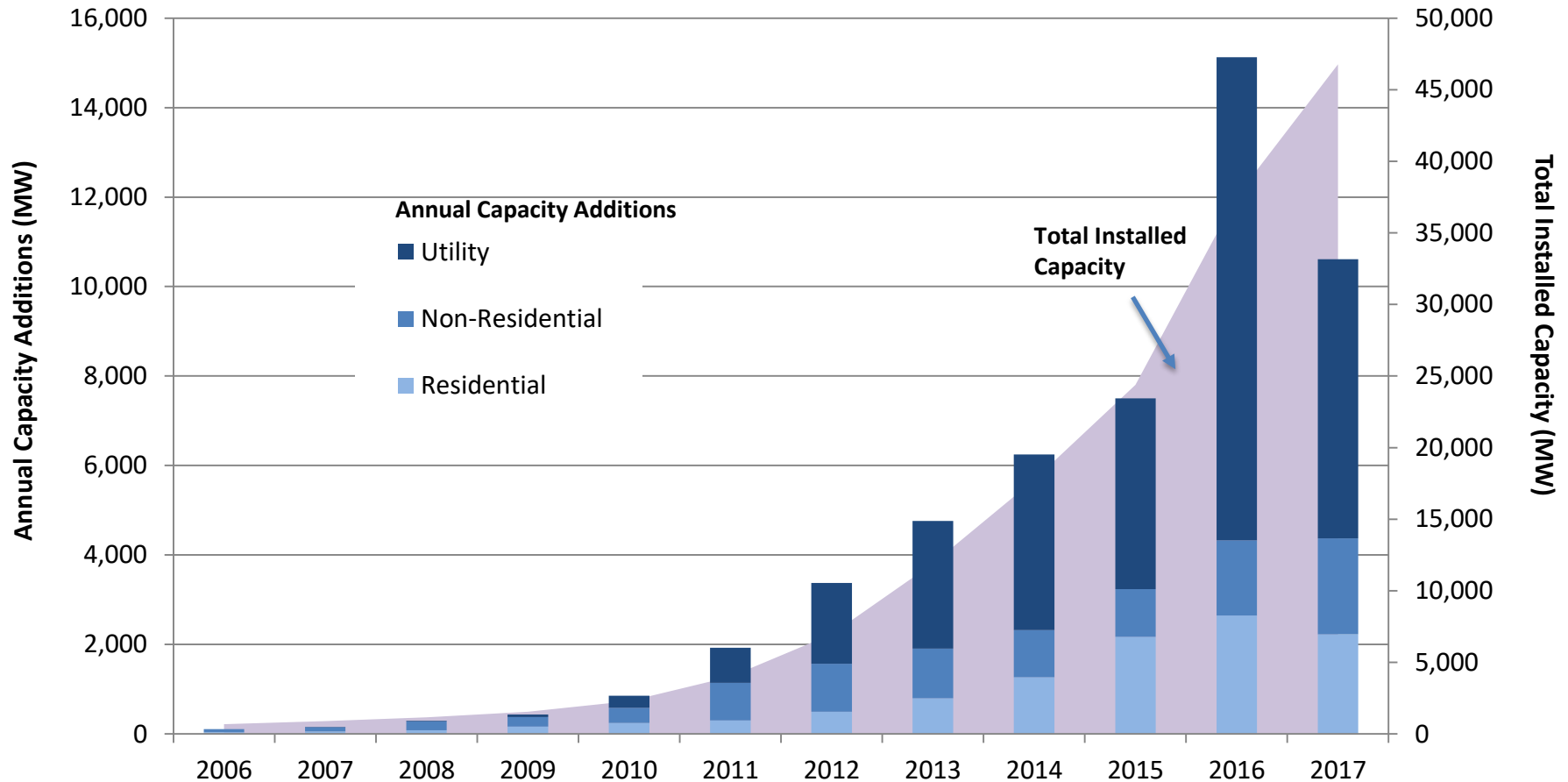


The Transactive Electricity Grid

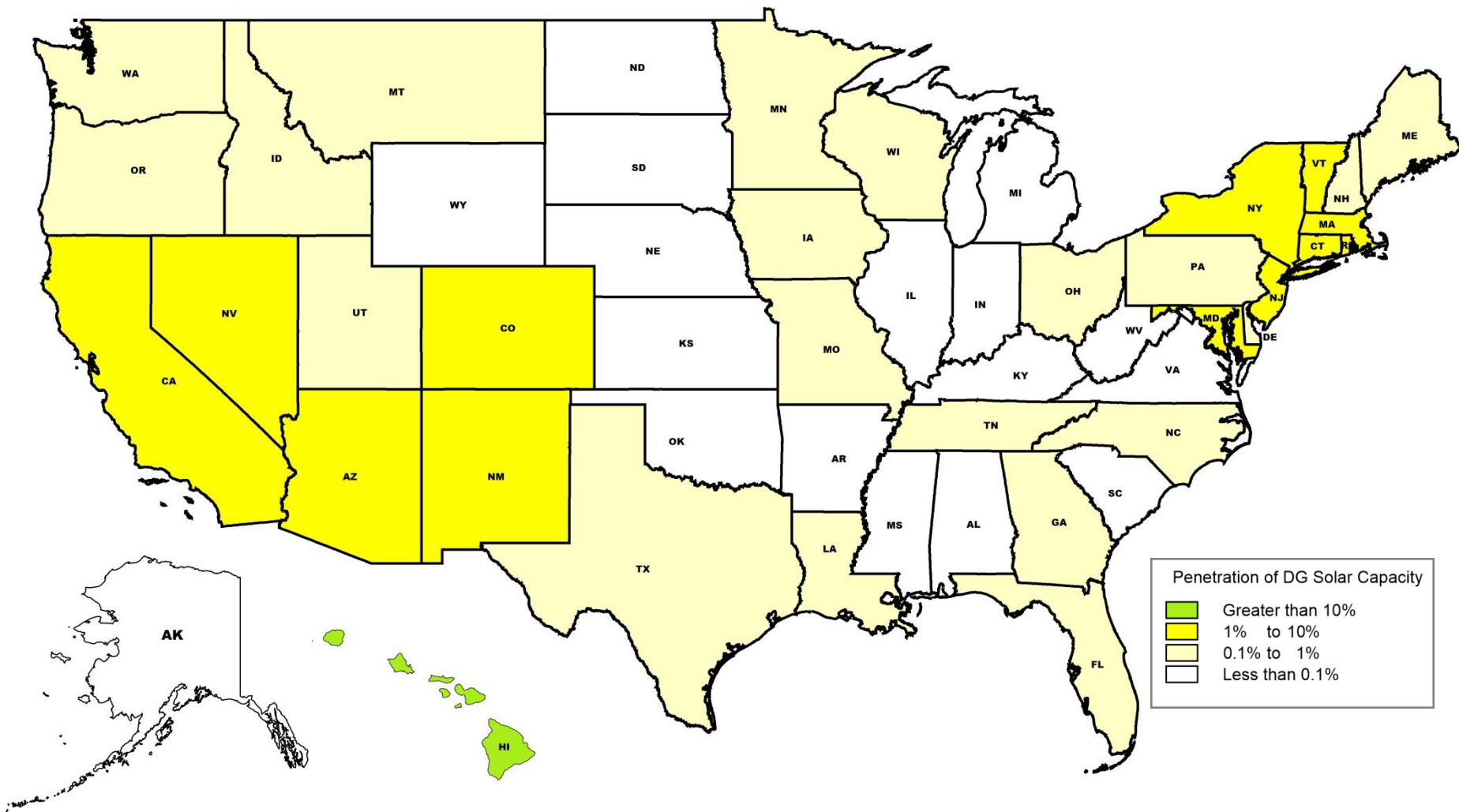


John Caldwell
Edison Electric Institute

Distributed Energy Resources (DERs) are Growing



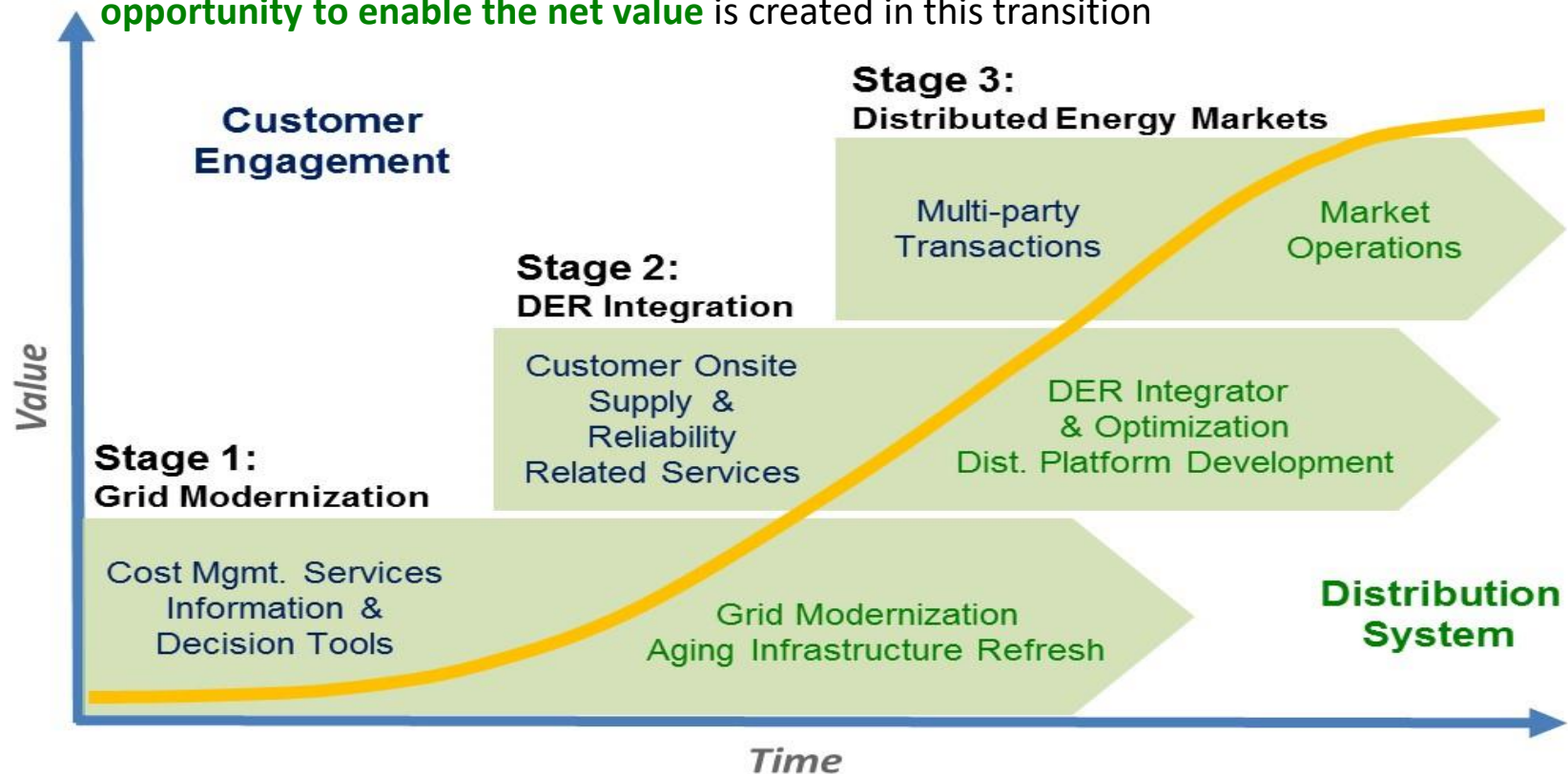
Penetration of Distributed Generation (DG) Solar Capacity



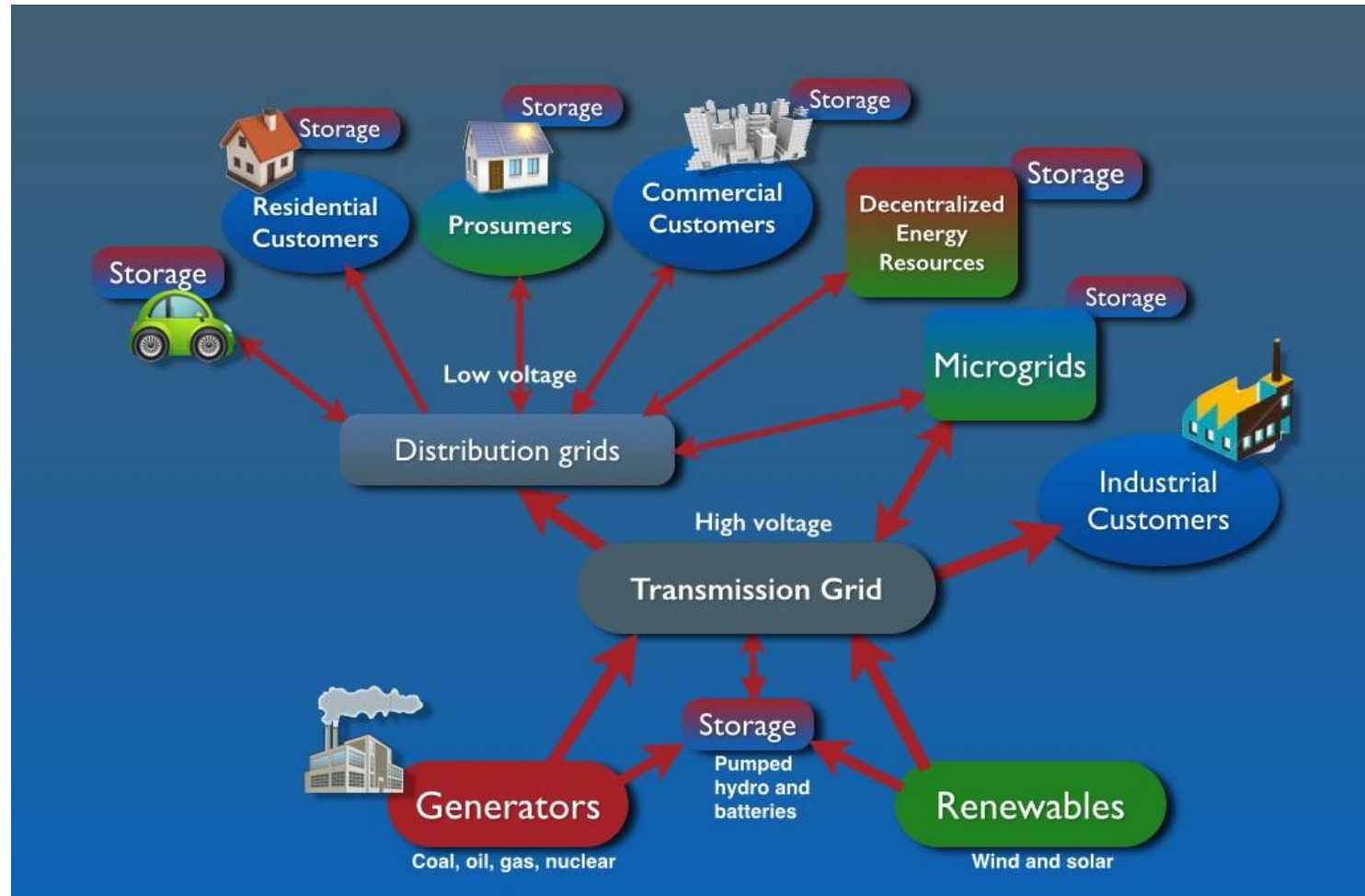
Electric Retail Evolution

3 Stages of Evolution as DER Adoption Grows & Market Opportunities Expand

Utility functions will evolve over time as customer adoption of DER grows and the opportunity to enable the net value is created in this transition



What is “Transactive Energy”?



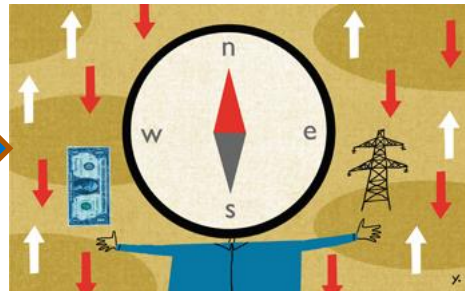
“Techniques for managing the generation, consumption or flow of electric power within an electric power system through the use of economic or market based constructs while considering grid reliability constraints.” (GridWise® Architecture Council)

Transactive Energy

Three Stages of Complexity



Stage 1:
Time-of-Use
or
Real-Time Pricing



Stage 2:
Locational-
Based
Pricing



Stage 3:
Peer-to-Peer
Transactions

Requirements of a TE System

A TE system **must** provide . . .

- A method for DER services to be sold into the grid
- A mechanism(s) for pricing grid services
- A system for communicating price and other information
- An efficient means of allocating electricity and other services
- A suitable set of incentives and delegation of responsibilities to ensure that necessary electricity service will continue to be delivered to all customers

Drivers of Transactive Energy

- Growing presence of distributed energy resources
- “Grid modernization”
 - Evolving Grid Operations (e.g., AMR/AMI, microgrids, advanced communication and control technologies)
 - Increasing Customer Engagement (through dynamic pricing tariffs, retail customer choice, and other programs)
 - State (and Federal) Support

Transactive Energy

But Will **Customers** Want It?

Tangible Benefits

- Energy Savings

Intangible Benefits

- Comfort / Security
- Civic Pride
- Joy of Use

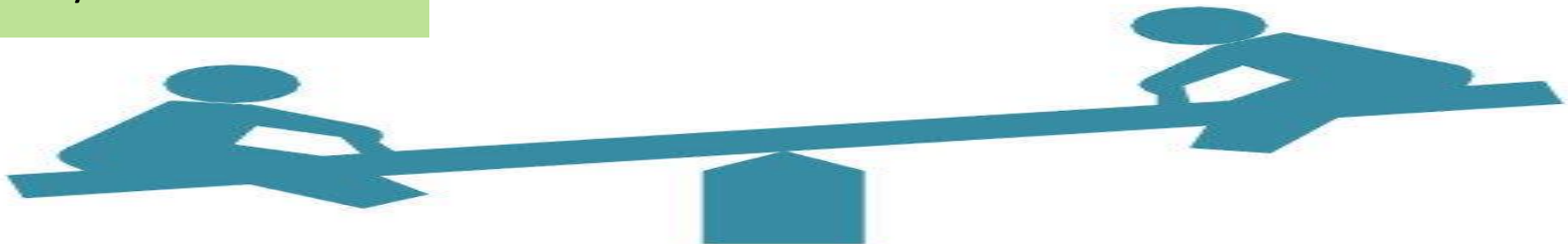


Tangible Costs

- Smart Appliances
- Enabling Energy Infrastructure (e.g., Smart Meters, DER)

Intangible Costs

- Time
- Risk



Transactive Energy:

Critical Issues for Utilities

The evolution to a transactive energy system presents four key issues for utilities to address:

- 1) What will be the **role of utilities** in the new system?
- 2) How will **long-term system planning** (capacity additions, T&D additions, etc.) be done?
- 3) How will distributed energy resources – and the grid itself – be **valued and priced**?
- 4) A more decentralized grid, with multiple communication interfaces, creates **increased cybersecurity risk** – how will this be managed?

Transactive Energy in Practice



ARIZONA CORPORATION COMMISSION

Powering Arizona's Future

Opened docket on July 16, 2018 to explore transactive energy:

- Internet of Things
- Cybersecurity
- Utility Accounting
- Tracking Renewable Energy Credits
- Applications for Distributed Ledger Technologies

nationalgrid

Launched Distributed System Platform pilot on Buffalo Niagara Medical Campus

- Part of NY's Reforming the Energy Vision (REV) initiative
- Will enable customers to sell energy resources onto the grid



The Edison Electric Institute (EEI) is the association that represents the U.S. investor-owned electric industry. Our members provide electricity for 220 million Americans, operate in all 50 states and the District of Columbia, and directly employ nearly 500,000 workers. Safe, reliable, affordable, and clean electricity powers the economy and enhances the lives of all Americans.

The EEI membership also includes dozens of international electric companies as International Members, and hundreds of industry suppliers and related organizations as Associate Members.

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