

# GridWorks: An Overview

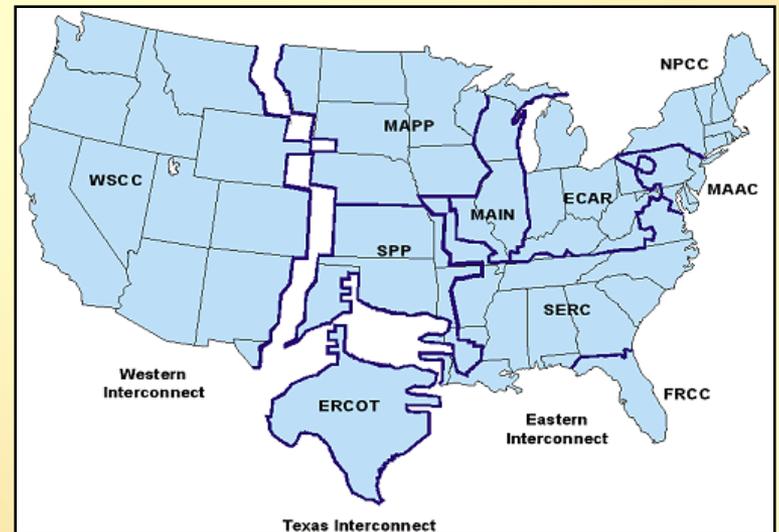
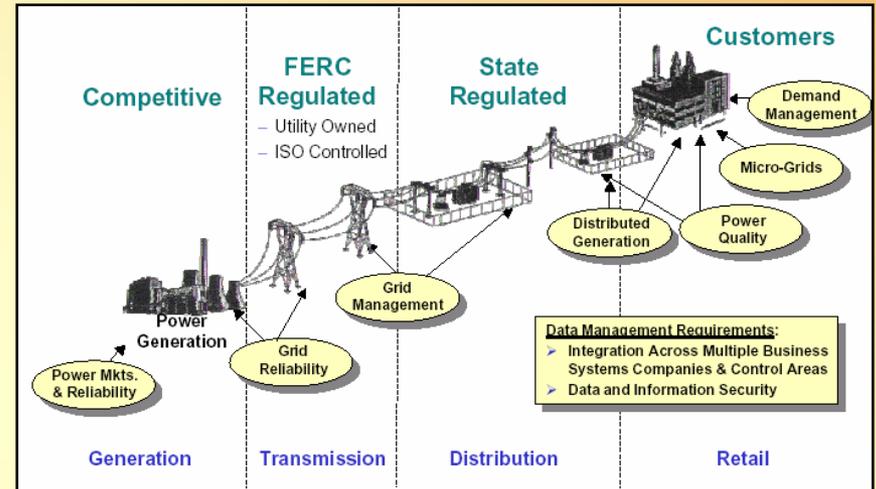


**Gil Bindewald, P.E**  
**Office of Electric Transmission and Distribution**  
**U.S. Department of Energy**

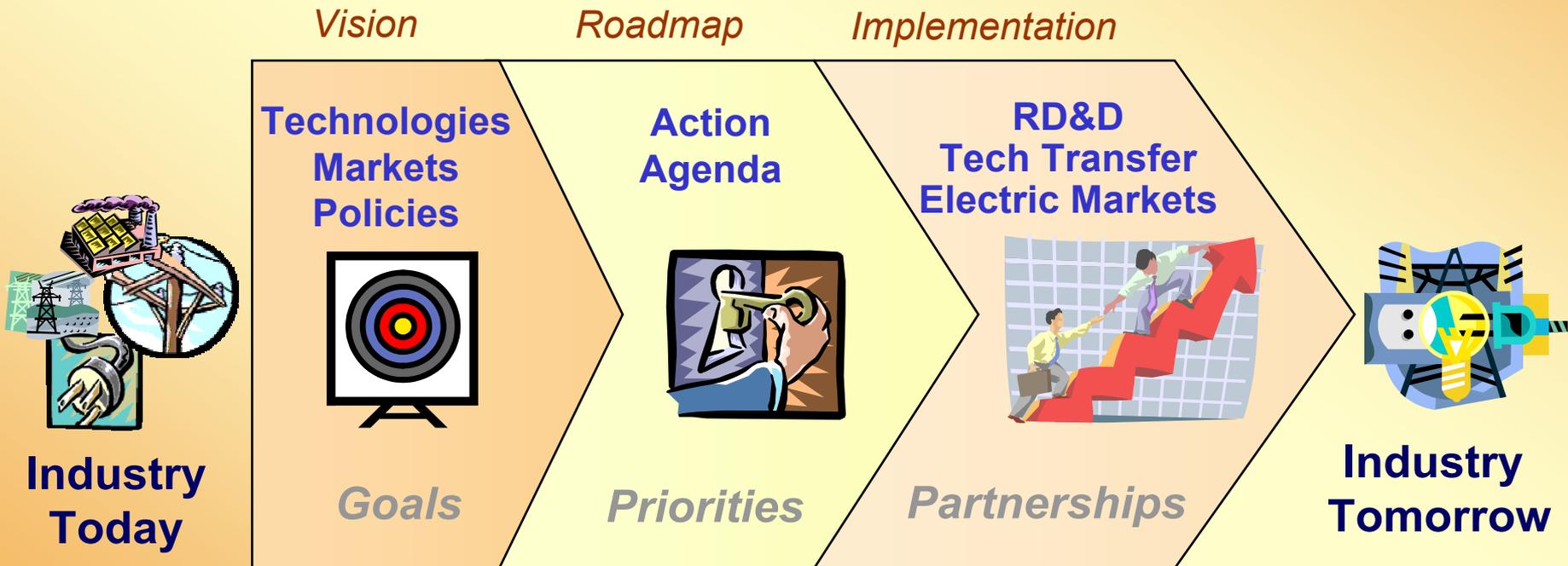


# Today's Electric System

- Not Fully Integrated
- Aging
- Stressed
- Vulnerable



# National Electric Vision and Technology Roadmap





# The Vision ... “Grid 2030”

*Grid 2030 energizes a competitive North American marketplace for electricity. It connects everyone to abundant, affordable, clean, efficient, and reliable electric power anytime, anywhere. It provides the best and most secure electric services available in the world.*



# How do you see the future?



## *Renewables ...*







# How do you see the future?

***... Central Generation ...***

***... or Distributed Generation***



**Our future is  
dependent on a  
secure and reliable  
electric grid.**

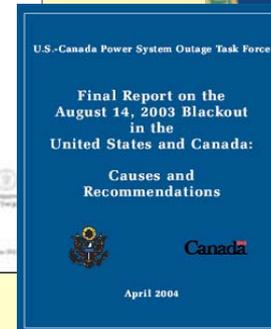
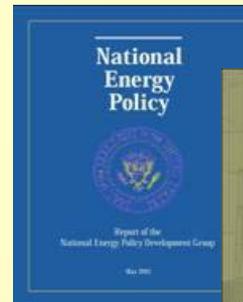


# Leadership from all Levels



“...it's clear that the power grid needs an overhaul. It needs to be modernized. As we go into an exciting new period of American history, we want the most modern electricity grid for our people... we need more investment; we need research and development...”

**President George W. Bush, September 2003**

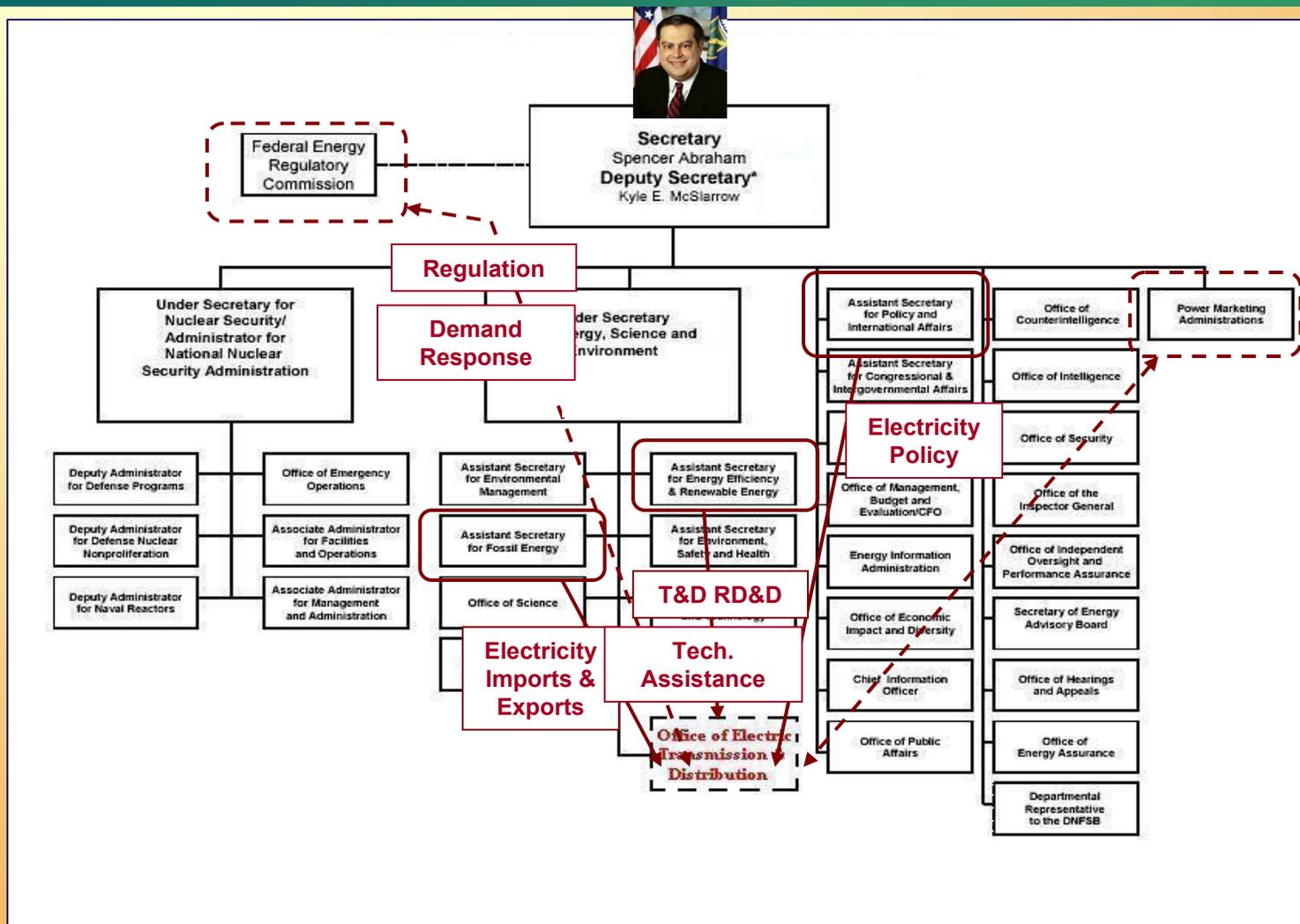


“**When the lights go out, modern life as we know it grinds to a sudden halt.** Transportation is interrupted, communications fail, water systems shut down, factory work is disrupted, food spoils, businesses lose money, and people are inconvenienced and even endangered.”

**Secretary of Energy Spencer Abraham, September 3, 2003**



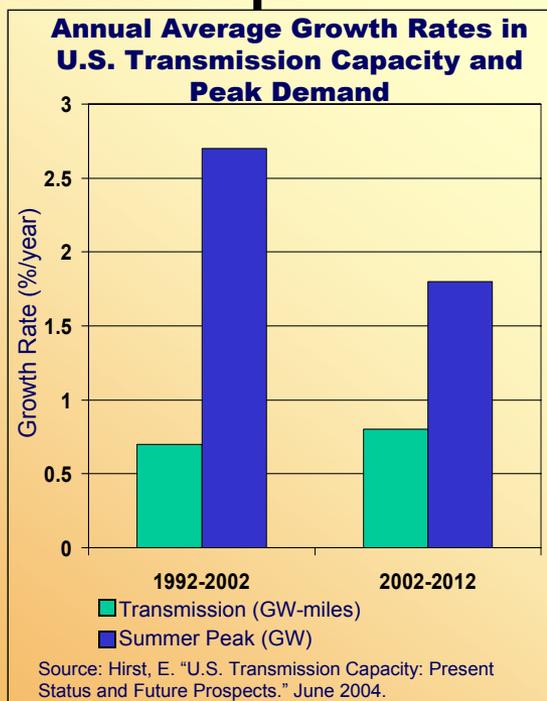
# Electric Grid is a Priority... OETD Formed to Address Needs





# Rationale for Federal Leadership

## Under-Investment in T&D



## No Forcing Function for Change

- **Financial risks and uncertainties**
- **States - "Patchwork quilt"**
- **Siting and permitting logjams**
- **Industry fragmentation**
- **Utility RD&D spending in decline**

## Public Interest at Risk

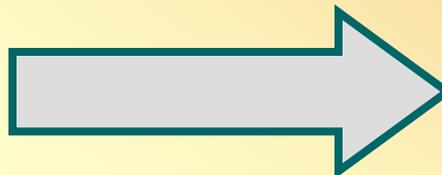
- **Economic growth and jobs creation**
- **Consumer electricity bills**
- **Public health and safety**
- **Environmental protection**
- **Energy security and reliability**

***When will the "tipping point" be reached when industry investment triggers itself and includes new technologies and approaches?***



# OETD's Role within DOE

Transmission & Distribution Technology RD&D



**Energy Strategic Goal**

*To protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy*

## *Transmission Reliability*



Reliability Tools

Composite Core Conductor

## *Superconductivity*



HTS Wire

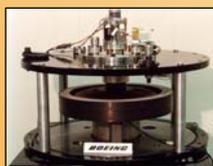


FCL



Motor

## *Energy Storage*

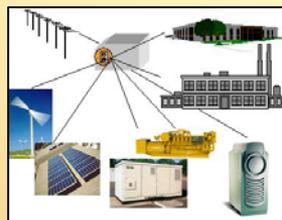


Flywheel



ZnBr Batteries

## *Distribution Technologies*



DG Interconnection



# National Roadmap



## National Concerns

*Reliability*

*Efficiency*

*Affordability*

## “Critical Technologies”

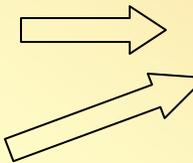
*Advanced Conductors*

*Power Electronics*

*High Temperature  
Superconductors*

*Electric Storage*

*Distributed Intelligence  
and Smart Controls*



**GridWorks**



**GridWise**

# GridWorks



**GridWorks takes an integrated perspective of the entire electric system. It is organized to create a cohesive, comprehensive portfolio of equipment that will be introduced into the electric system in a manner that will ensure safe, reliable, and efficient operation.**

## Cables and Conductors

*Advanced Conductors*

*Next-Generation Cables*

*Cable Diagnostics*

*High-Voltage Testing*



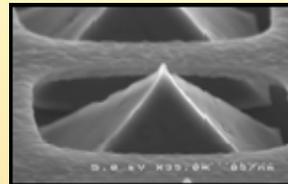
## Power Electronics (Advanced Materials)

*Sensors*

*Solid-State Devices*

*SiC*

*Diamond*



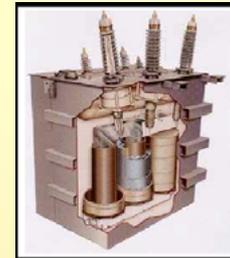
## Substations and Protective Systems

*Transformers*

*Circuit Breakers*

*Switchgear*

*Fault Current Limiters*

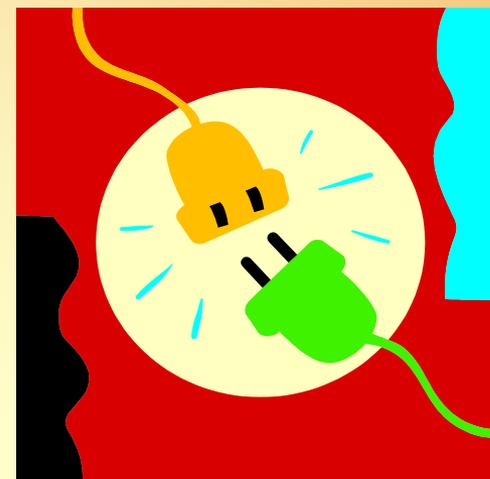
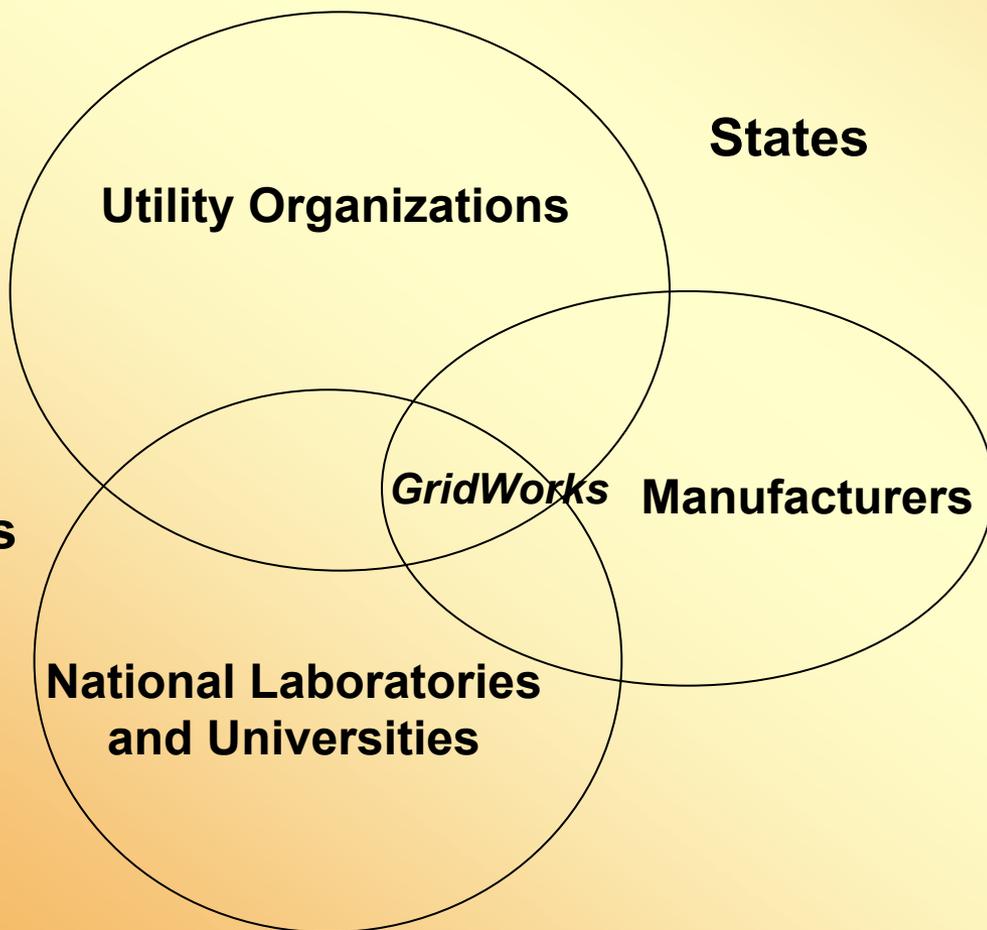


Courtesy Waukesha Electric Systems





# Partnerships are Critical to Success

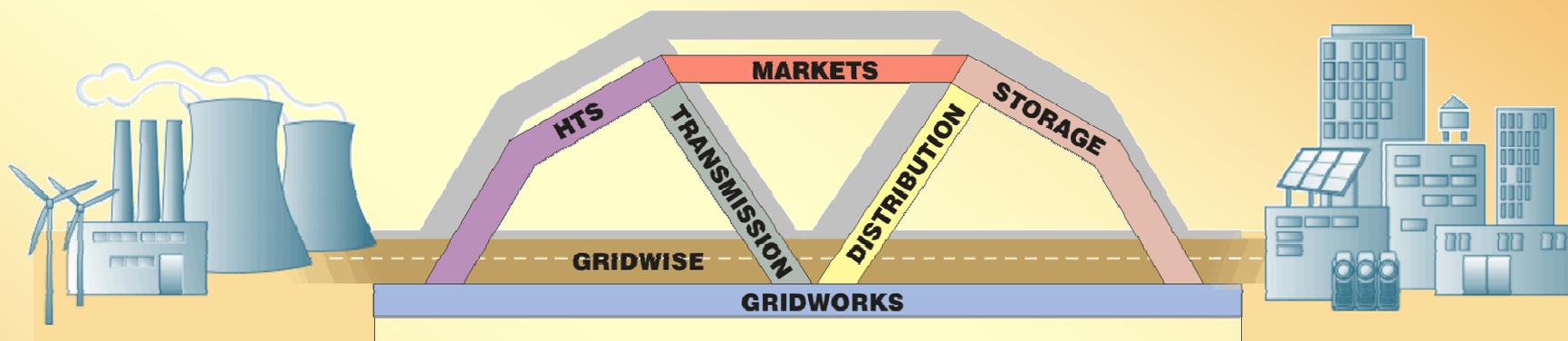


*OETD can't do it alone...*

*Making connections with partners is crucial for success*



# Opportunities for Collaboration



- “Groundfloor” chance to shape new GridWorks activity
- Seeking strong utility participation and leadership to guide developers and accelerate market acceptance
- Competitive solicitations to focus on top priority needs
- Fresh ideas and innovative approaches will be key to success