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Energy Technology

Jane Allen, moderator
National Power & Utilities Leader
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Energy Technology

Susan Tomasky
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Power Company, Inc.





Strategic Challenges Facing Utilities

Navigating Solutions for Today and Tomorrow

Susan Tomasky
President - AEP Transmission
American Electric Power

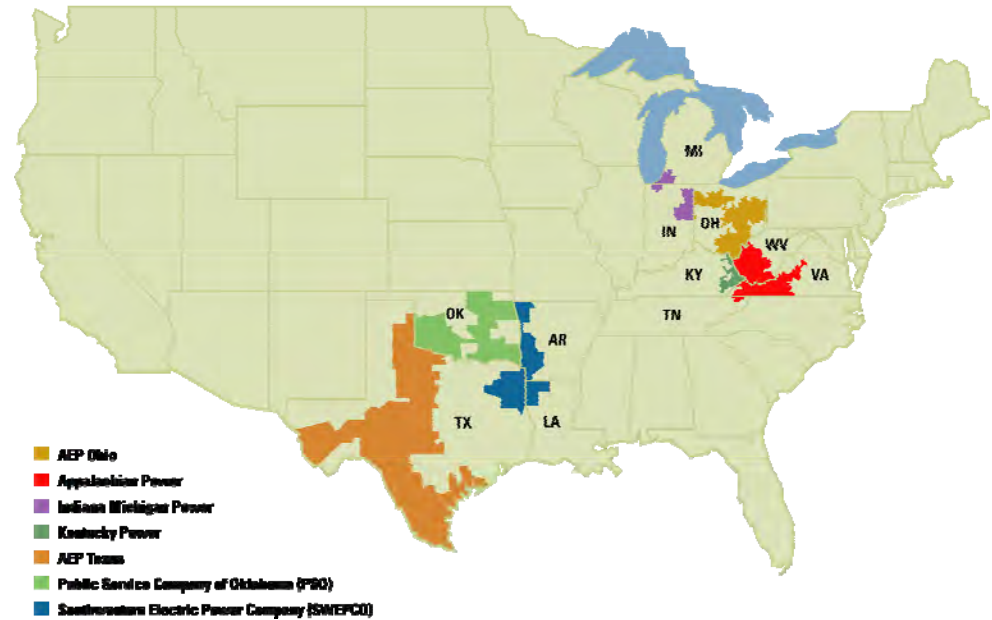
June 2010



American Electric Power

Company Overview

Revenues (in billions)	\$13.5
Net Income (in millions)	\$1,357 ¹
Earnings Per Share	\$2.96 ¹
Cash Dividends Per Share ²	\$1.64
Service Territory	197,500 mi ²
Transmission	39,000 miles
Distribution	215,800 miles
Generating Capacity	38,988 MW ²
Generating Stations	More than 80
Renewable Portfolio (hydro)	364 MW ³
Pumped Storage	586 MW
Renewable Portfolio (wind, solar)	1,406 MW ⁴
Total Kilowatt-hour Sales (in millions)	195,312
Total Assets (in billions)	\$48.3
U.S. Customers (year-end, in thousands)	5,220



1. Generally Accepted Accounting Principles.

2. Represents nominal capacity; includes 270 MW of mothballed / decommissioned generation, AEP's interest in Ohio Valley Electric Corp., purchased power agreements and renewables.

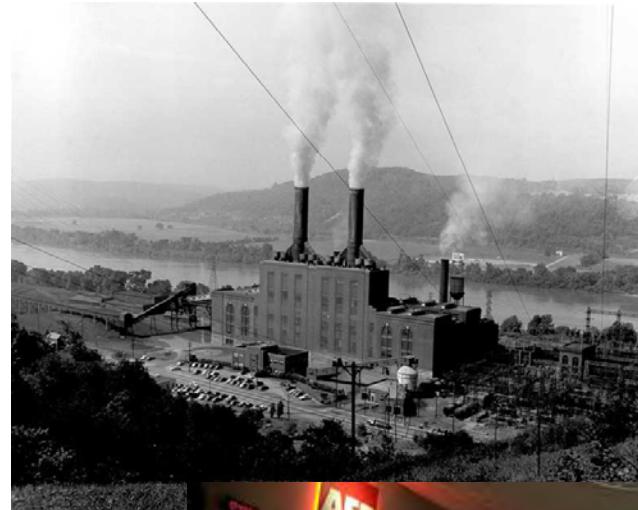
3. Excludes pumped storage; includes owned capacity and purchased power.

4. Regulated wind and solar capacity on line or under contract.



Industry Transition

- **Traditional Utility Model**
 - Vertically integrated
 - Generation, transmission, & distribution combined
 - Serving local customer base
 - Bundled retail rates regulated on cost of service basis
- **Today's Paradigm: Varies by State**
 - Vertically integrated model in some states
 - regional markets in other areas, with market rates
 - complex rules governing markets, with a wide variety of stakeholders
 - complex, highly varied regional transmission organizations



The Utility Business



Off-System Sales



Bundled Retail



**Wholesale
Transmission**








Major Challenges

- Generation
 - Increasing electricity demand
 - Climate change and drive to reduce CO₂ emissions: role of fossil fuels and nuclear
 - Development of renewables
 - Increased investment costs
 - Re-emergence of market-based supply
- Transmission
 - Aging and stressed infrastructure in need of renewal to maintain reliability and reduce congestion
 - Expansion to provide access to renewable resources
 - Changes in planning, cost allocation, and siting required
- Distribution
 - Managing continued increase in demand
 - Integrating Smart Grid technologies
 - Improving quality of service
 - Aging infrastructure
 - Consumer resistance to rate increases opportunities for efficiency
- Potential for Disruptive Technologies in all sectors



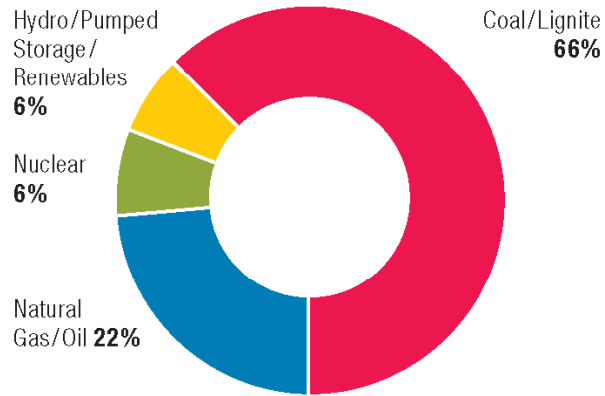
Current Initiatives at AEP

Generation	Transmission	Distribution		Customers
				
<ul style="list-style-type: none"> • Environmental Projects • Wind • IGCC • Carbon Capture & Storage 	<ul style="list-style-type: none"> • I-765™ • Electric Transmission Texas JV • Electric Transmission America JV • AEP-ABB Alliance 	<ul style="list-style-type: none"> • Distribution automation • Self-healing distribution circuits • Advanced metering • Communications infrastructure • Mobile workforce • Internal energy efficiency • Integration platform for advanced visualization and analytics • Distributed generation and energy storage 		<ul style="list-style-type: none"> • Customer programs and incentives <ul style="list-style-type: none"> • Energy efficiency • Direct load control • Peak demand reduction • Energy storage • PHEVs
<p>Generation and transmission control systems</p>		<p>gridSMARTSM: bridging the gap to provide integrated two-way communications & control across the electricity value chain</p>		<p>Home energy automation</p>

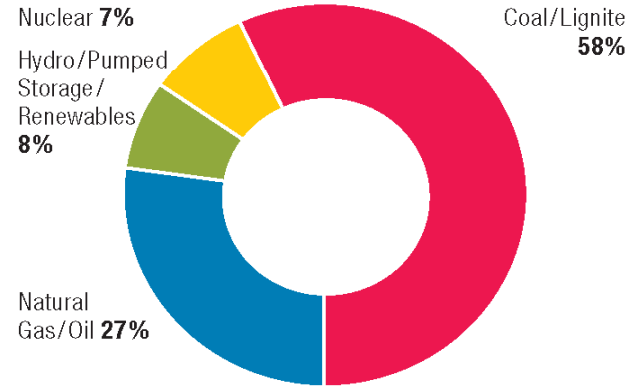


AEP Generation Trends

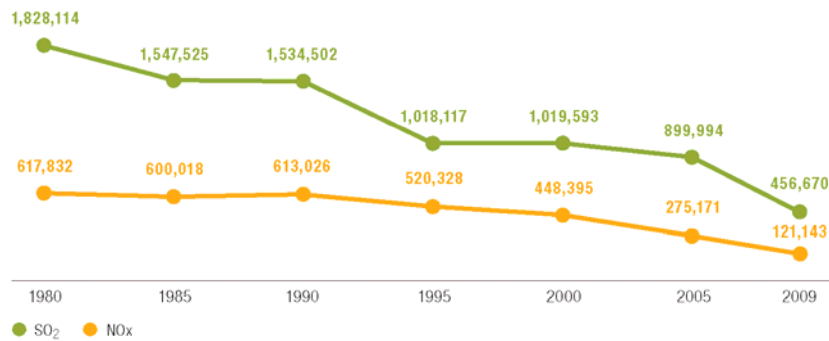
2009 AEP GENERATION CAPACITY BY FUEL



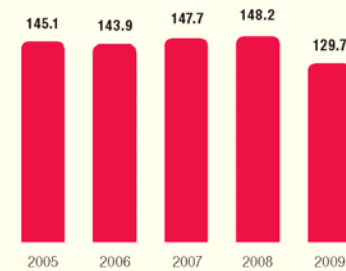
2017 PROJECTED AEP GENERATION CAPACITY BY FUEL



SO₂ & NO_x EMISSION TRENDS AT AEP-OWNED PLANTS (measured in U.S. tons)



TOTAL SYSTEM – ANNUAL CO₂ EMISSIONS (in million metric tons)



In 2009, AEP's CO₂ emissions decreased 12.5 percent. The decline in SO₂ and NO_x emissions reflects, in part, the success of our environmental programs.



New Generation Projects



J. Lamar Stall Combined-Cycle Gas Plant

- ❑ J. Lamar Stall Combined-Cycle gas plant is a 508-MW unit scheduled for commercial operation in June 2010.
 - ❑ Total projected cost \$380 million.
 - ❑ Located in AEP's SWEPCo region at its existing Arsenal Hill Power Plant in Shreveport, Louisiana.
 - ❑ Will be used to service the needs of customers in the Arkansas, Louisiana and Texas service territories.

- ❑ John W. Turk Jr. Ultra-Supercritical Coal Plant is a base load 600-MW advanced coal combustion plant. Located in AEP's SWEPCo region. AEP owns 73 percent or roughly 440 megawatts of the total unit.
 - ❑ Cost of the plant is anticipated at \$1.7 billion with AEP's share approximately \$1.3 billion and will begin commercial operation in 2012.
 - ❑ Will use low-sulfur coal and state-of-the art emission control technologies, including a design that allows for the retrofit of carbon dioxide controls.
 - ❑ Various legal challenges are on-going related to the air permit, the Corps of Engineers permit and the Arkansas Certificate of Environmental Compatibility and Public Need.



John W. Turk Jr. Ultra-Supercritical Coal Plant



A Portfolio Approach: AEP's Long-Term CO₂ Reduction Commitment

Existing Programs

- Existing Plant Efficiency Gains
- Renewable Energy
 - 1400 MW wind
 - 300+ MW hydro
- Domestic Offsets
 - Over 63MM trees planted = 1.2MM tons of CO₂ uptake
- International Offsets
 - 1MM tons of forest carbon sequestered through 2009
- Chicago Climate Exchange

AEP's reductions/offsets of CO₂:

— 2003-2010: 50 MMT+ Total

New Additions (by 2012)

- 2000 MW Wind PPAs
- Domestic Offsets
 - Methane, Forestry
- Fleet Vehicle/Aviation Offsets
- Energy Efficiency & DSM
- Biomass Co-firing
- New Technology
 - New Generation: Ultra Super Critical Coal
 - Carbon Capture and Storage (CCS) for existing fleet
 - Chilled Ammonia

AEP's reductions/offsets of CO₂:

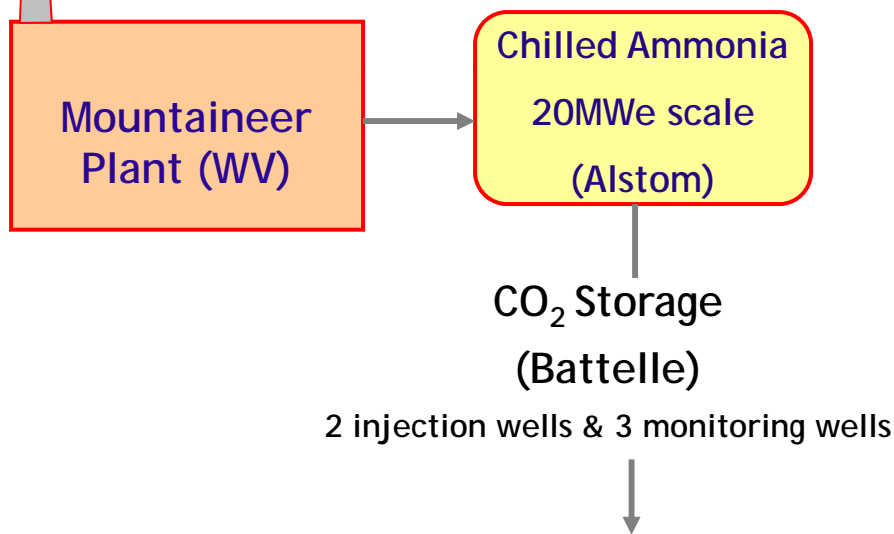
— 2011+: 5 MMT/yr



AEP Leadership in New Technology: Chilled Ammonia CCS

Phase 1

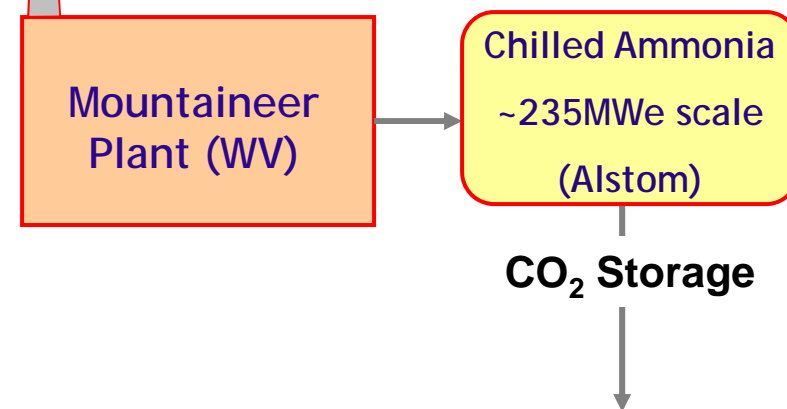
Captured CO₂ first time on 09/01/09; Injected CO₂ first time on 10/1/2009



**Captures and Stores
~100,000 metric tons of CO₂ /yr.**

Phase 2

Awarded \$334MM DOE Funding; Expected Commercial Operation: 2015

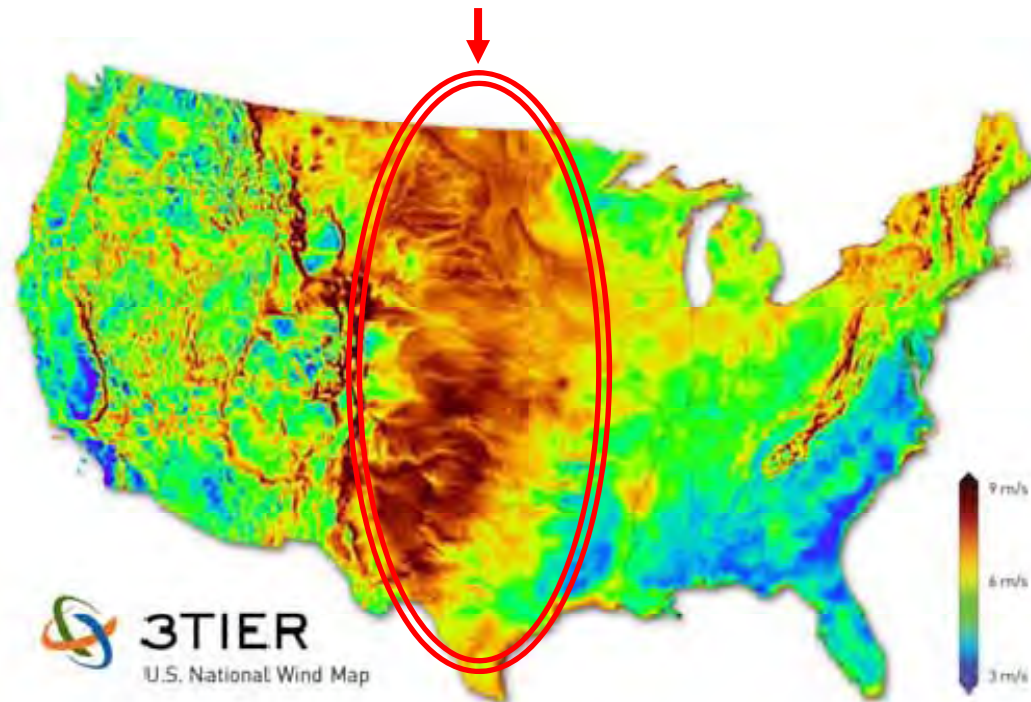


**Captures and Stores
1.5 Million metric tons of CO₂/yr,
1.5 miles below the surface**



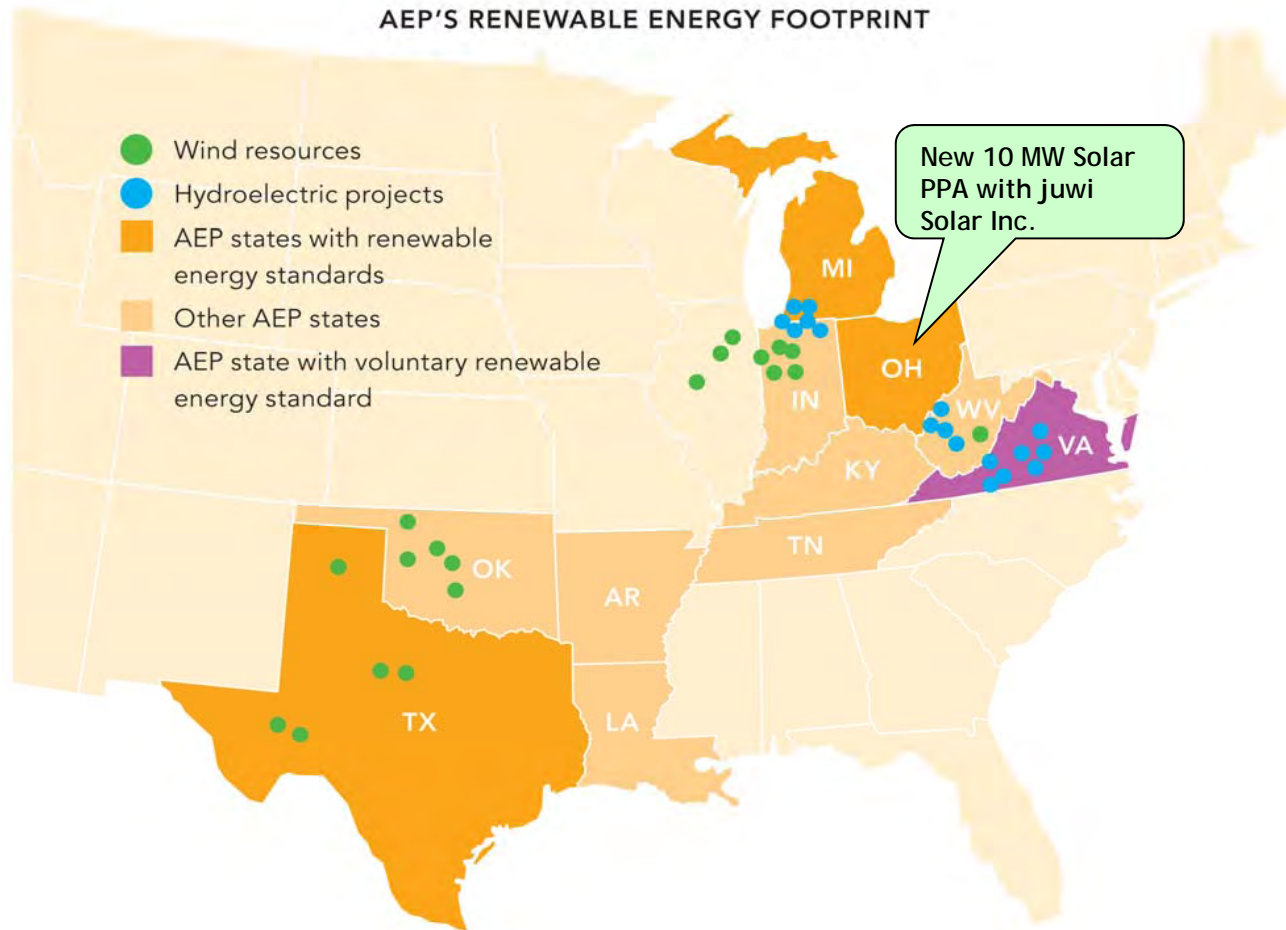
Renewable Energy Development

47% of Nation's Generation
Interconnection Queue



AEP Renewable Footprint

AEP'S RENEWABLE ENERGY FOOTPRINT

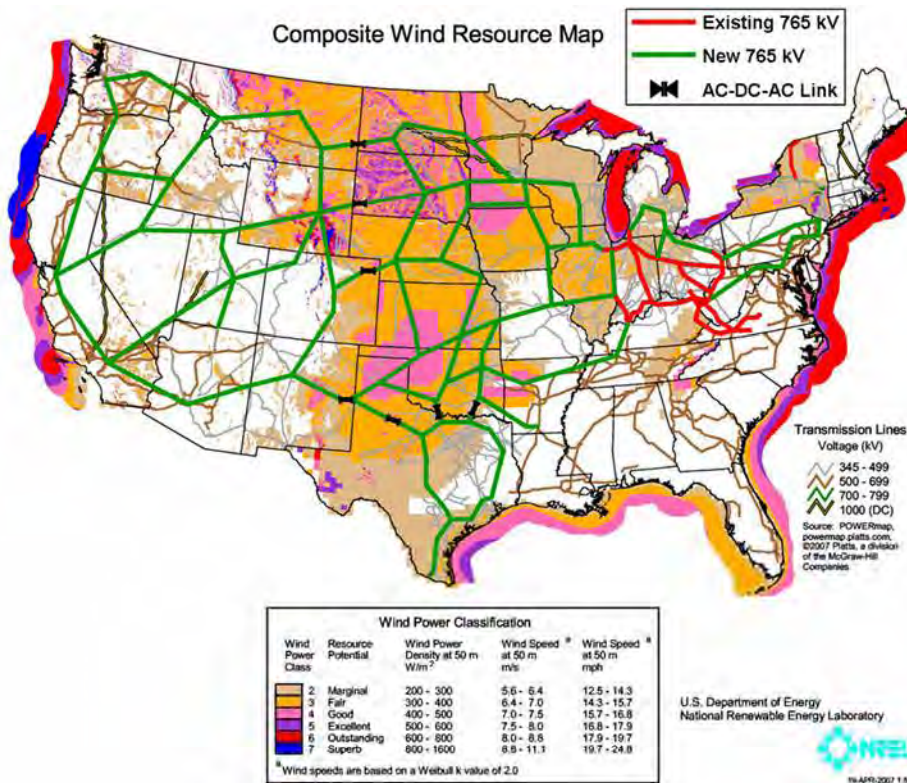


Renewables Portfolio*		
Wind		
PSO - 5 PPAs		591MW
SWEPCo - 1 PPA		79MW
APCo - 4 PPAs		376MW
I&M - 2 PPAs		150MW
KPCo - 1 PPA		100MW
AEP Ohio - 2 PPAs		<u>110MW</u>
Total Regulated		1406MW
AEPEP - owned		
AEPEP - 2 PPAs		<u>177MW</u>
Non-regulated		487 MW
Hydro (run-of-river)		
Regulated - owned / PPA		364MW
Solar		
Regulated - PPA		10MW

* Includes owned assets and long-term purchased power agreements (PPA)



Interstate EHV Transmission



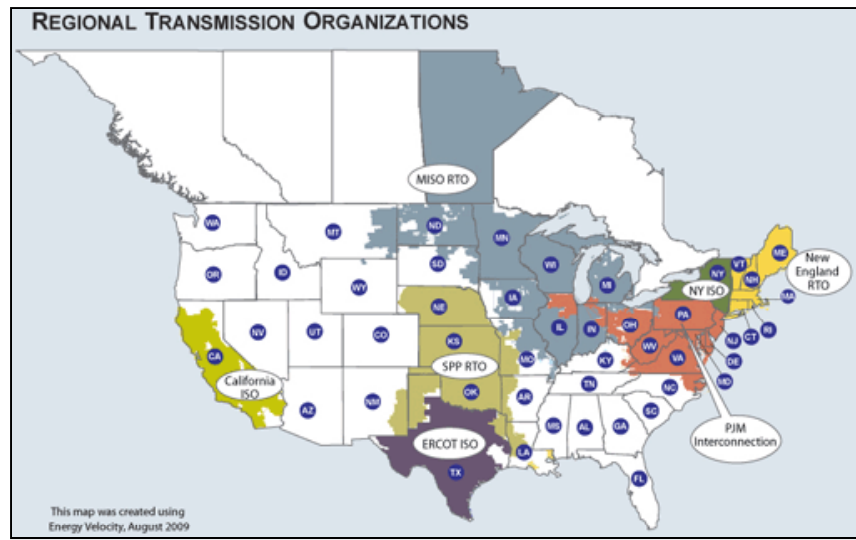
AEP is leading efforts to develop a new, extra-high voltage interstate transmission system.



JV Strategy – Nationwide Grid Expansion

SPP		ERCOT		PJM		PJM/MISO	
Prairie Wind	COD: 2013-14	ETT	COD: 2010-2017	PATH-WV	COD: 2014	Pioneer	COD: 2015
<ul style="list-style-type: none"> 110 miles of 765 kV Partners: Westar (50%) & Electric Transmission America (50%) Estimated Cost: \$400 million ROE: 12.8% 		<ul style="list-style-type: none"> 345 kV ERCOT Expansion Partner: MidAmerican Energy (50%) Estimated Cost: \$1.4 billion ROE: 9.96% 		<ul style="list-style-type: none"> 275 miles of 765 kV Partner: Allegheny Energy (50%) Estimated Cost: \$1.2 billion ROE: 14.3% 		<ul style="list-style-type: none"> 240 miles of 765 kV Partner: Duke Energy (50%) Estimated Cost: \$1 billion ROE: 12.54% 	
Tallgrass	COD: 2013-14						
<ul style="list-style-type: none"> 170 miles of 765 kV Partners: OG&E (50%) & Electric Transmission America (50%) Estimated Cost: \$500 million ROE: 12.8% 							


ACTIVE PROJECTS



FUTURE DEVELOPMENT



SMARTransmission Study
<ul style="list-style-type: none"> Interregional EHV & Wind Integration Study Study Sponsors: ETA, ATC, Exelon, MidAmerican Energy, Northwestern Energy, Xcel Energy

SPP EHV Overlay <ul style="list-style-type: none"> Regional Expansion of 765 kV Backbone 	ETT <ul style="list-style-type: none"> Additional CREZ spend of ~ \$1.1 billion (COD 2012-2013, subject to a 6-month routing approval) Other Projects Pending Transfer of ~ \$600 million (COD 2010-2013) 	PJM Expansion <ul style="list-style-type: none"> Regional Expansion of 765 kV, 500 kV and 345 kV systems 	EHV Michigan/Ohio <ul style="list-style-type: none"> 700 miles of Proposed 765 kV
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SPP
ERCOT
PJM
PJM/MISO

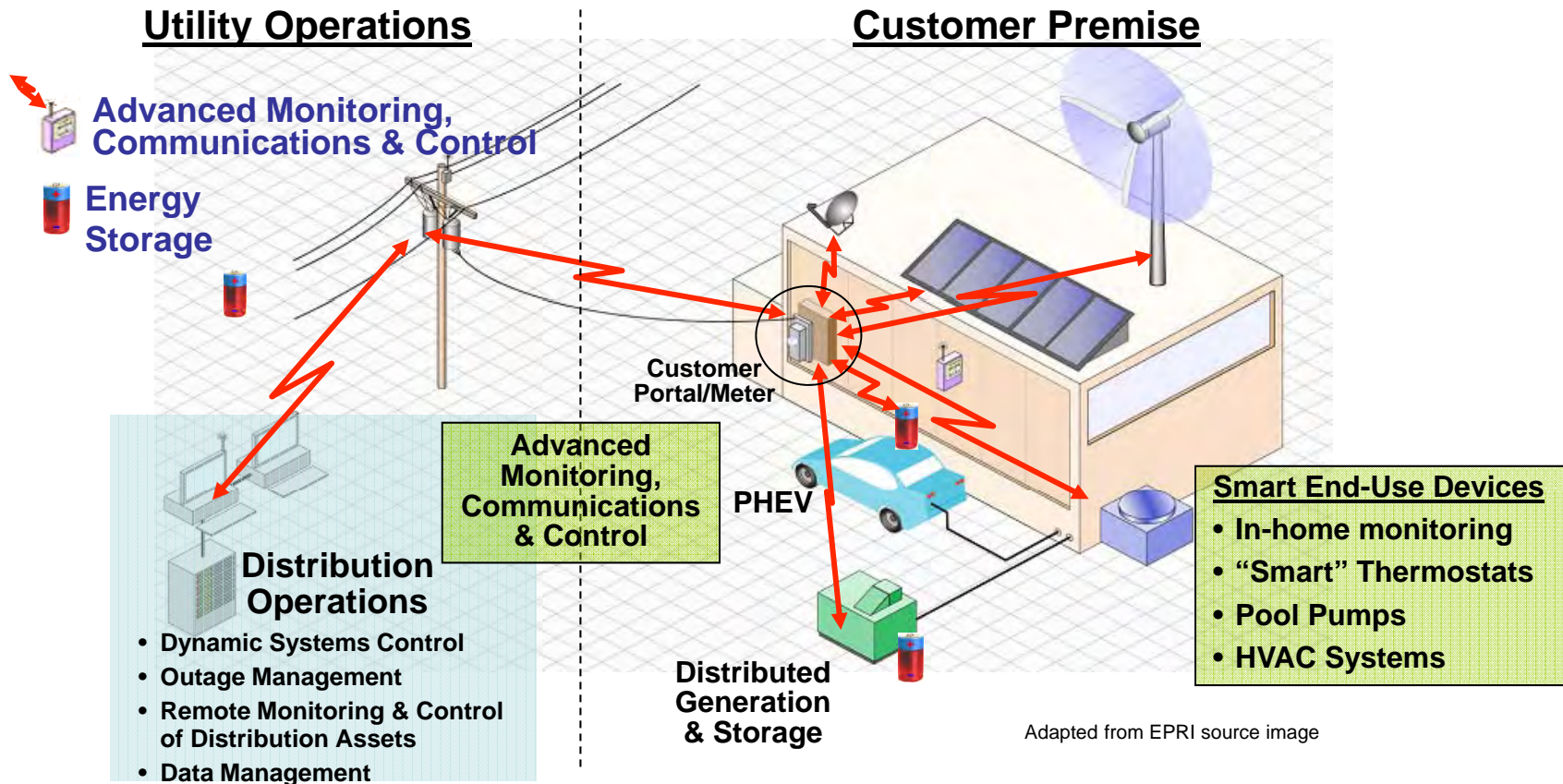


Transmission Challenges

- PATH project is 275 miles of 765-kV transmission line from WV to MD.
 - \$1.8 billion total cost.
 - AEP 50/50 JV with Allegheny for WV portion.
- PJM “Bright Line” tests creating uncertainty.
 - Reliability and economic benefits are separated.
 - “Need” has not changed, however reliability “Need Date” is a moving target.
- CPCN applications in West Virginia and Maryland are delayed.
 - Procedural schedule allows consideration of 2010 RTEP, which may again move “Need Date.”
- Total project cost may increase due to delays and changes in in-service dates.



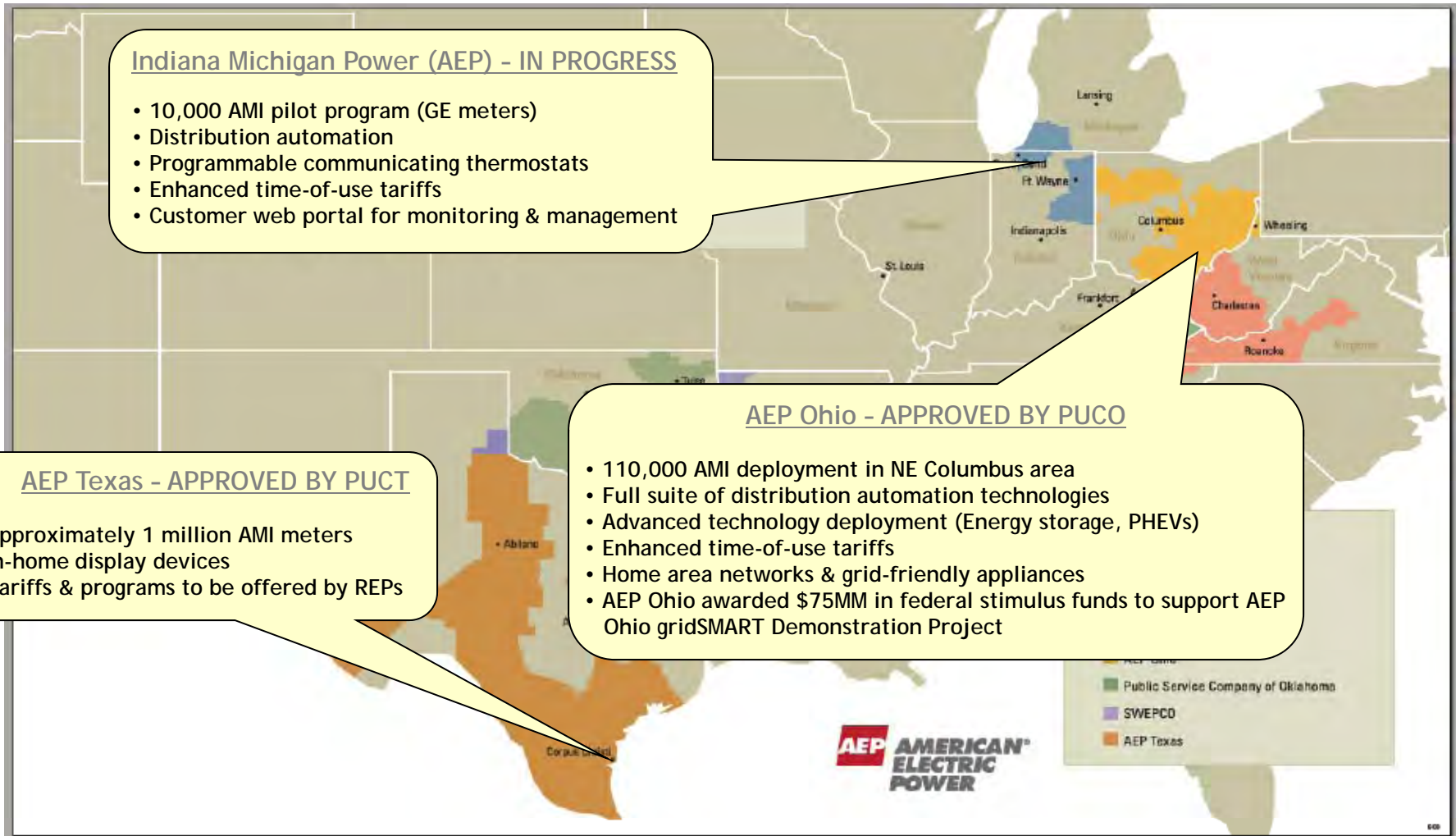
Role of Technology – Smart Grid



AEP believes that utilities must prepare for a future that integrates many technologies and requires a more advanced state of monitoring, communications & control.

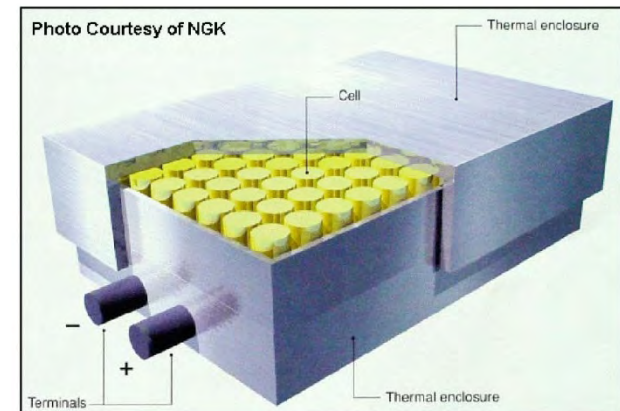


AEP gridSMART Deployment



Presidio, Texas NAS[®] Battery System

- In March 2010, Electric Transmission Texas, LLC (ETT) dedicated the installation of a state-of-the-art, sodium-sulfur 4-megawatt NAS[®] battery system, in Presidio, Texas.
- The NAS battery system is the first in Texas and the largest in the United States and represents part of an approximately \$70 million overall commitment by ETT to improve transmission reliability in Presidio and surrounding areas.
- The NAS battery system uses sodium-sulfur battery technology. This technology will provide the following benefits:
 - Quick response, addresses voltage fluctuations and momentary outages
 - In the event of an outage the battery system can supply four megawatts of uninterrupted power for up to eight hours
 - Allows Presidio's electrical load to receive uninterrupted power from Comisión Federal de Electricidad (CFE) during emergency situations
 - Allows for maintenance on the new transmission line being built to from Marfa to Presidio without loss of electric service



Transitioning the Industry

- Industry in need of significant capital investment.
 - Transmission expansion
 - New, low-emitting generation
 - Regional supply paradigm
- Today's economic realities challenge utilities' ability to raise sufficient capital.
- Change will be facilitated by a national energy policy that addresses:
 - Specific goals and guidelines, particularly related to renewables and CO₂.
 - Reforms in transmission planning, cost allocation, and siting.
 - Development of advanced technologies to improve energy management and efficiency.
- Electricity cost increases will be significant but ultimately prompt efficiency and innovation.

Our energy future is our economic future.

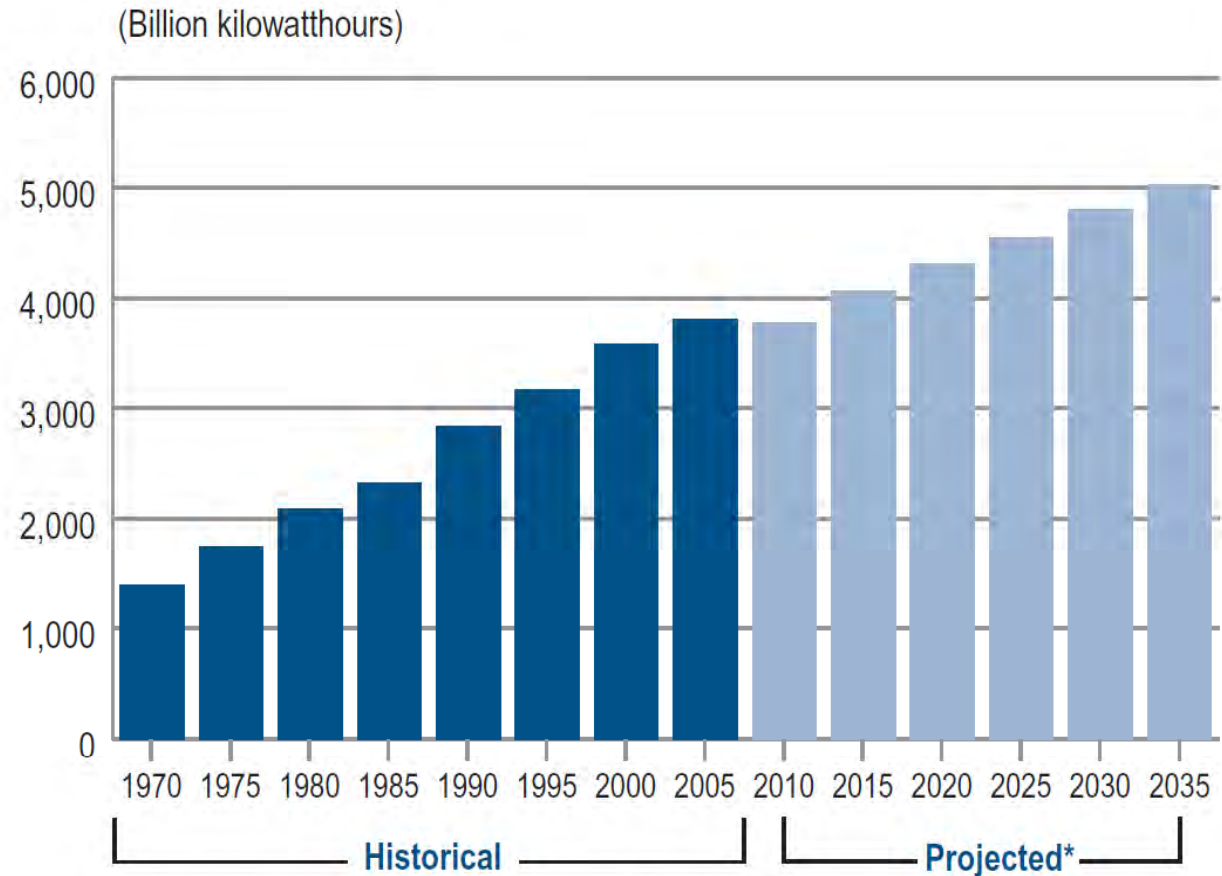




Appendix

Electricity Demand

Demand for electricity is projected to increase 28% by 2035



*Electricity demand projections based on expected growth between 2007 and 2035.

Source: U.S. Department of Energy, Energy Information Administration, Annual Energy Review 2008 and Annual Energy Outlook 2010, Early Release, December 2009.

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Utility Service Territories



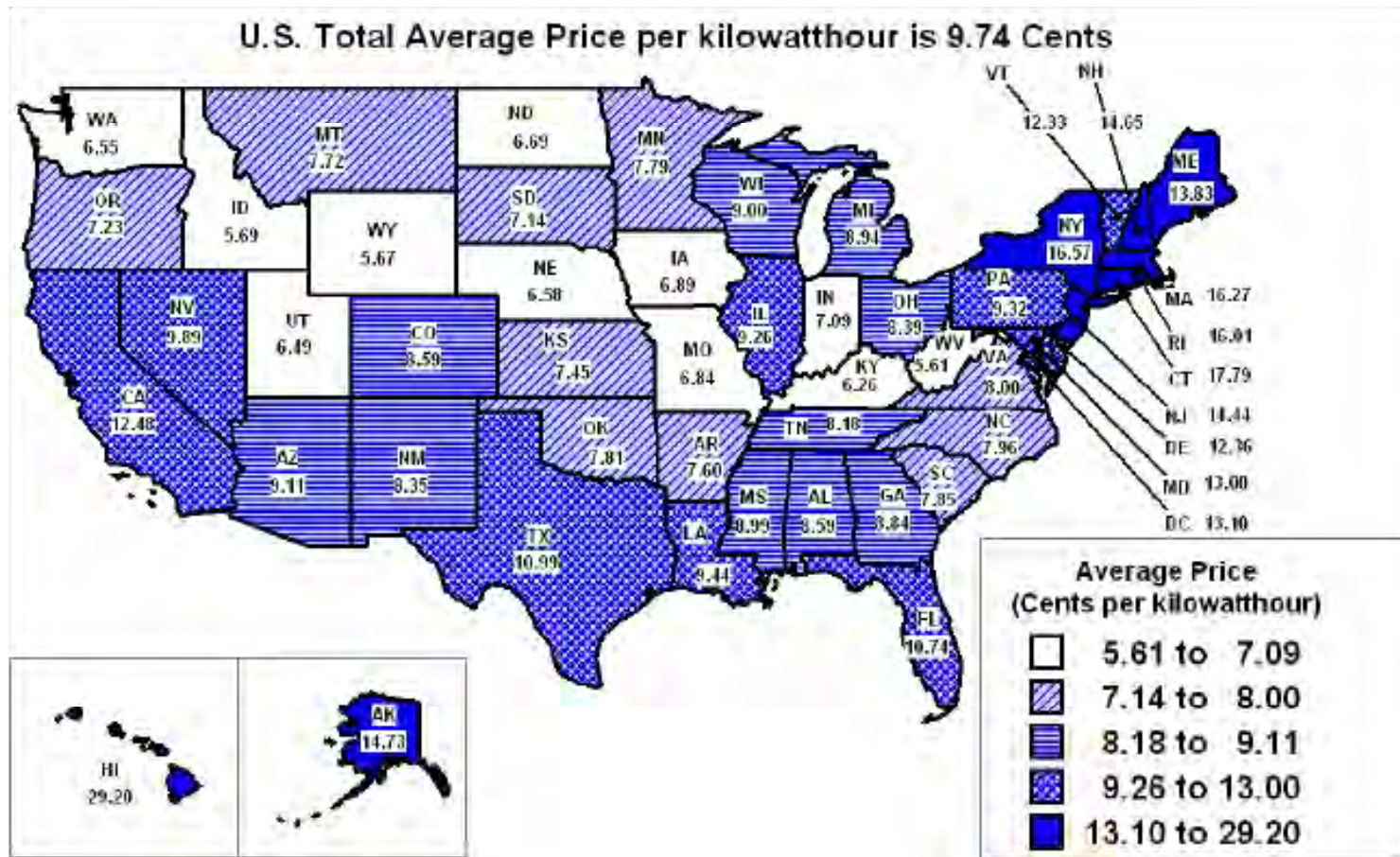
EEI U.S. Member Company Service Territories December 2009



Produced by Edison Electric Institute's Project Support Group. Data Source: Ventyx, Inc., The Velocity Suite 2009.



Electricity Rates Across the U.S.



Source: U.S. Energy Information Administration, Form EIA-861, "Annual Electric Power Industry Report."



A Practical, Scalable, Modular ALWR

Darren Gale
Vice President
Babcock & Wilcox
Nuclear Energy, Inc.



Leading the Energy Transformation

McDermott International

J. Ray
McDermott



The Babcock & Wilcox Company

B&W Technical
Services Group, Inc.



B&W Nuclear
Operations Group, Inc.



B&W Power
Generation Group, Inc.



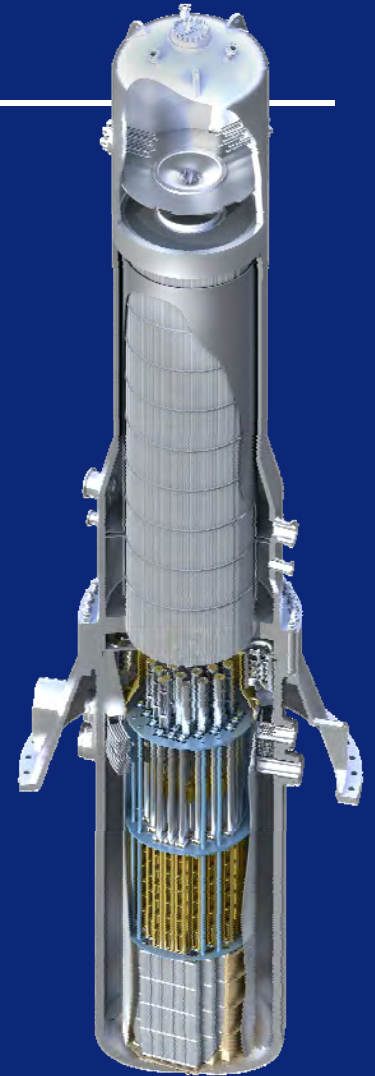
B&W Nuclear
Energy, Inc.



Clean Power Technologies
High-Consequence DOE Operations
Advanced Engineering and Manufacturing

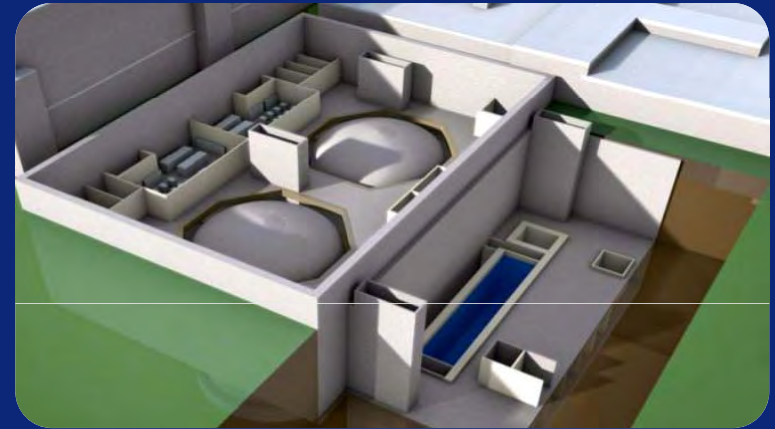
A Generation III++ Reactor

- Integral 125 MWe modular reactor
- Proven Advanced Light Water Reactor technology
- Simple, passively safe design
- Utilizes “industry standard” PWR fuel
- 4+ year operating cycle between refueling
- Built in North America, in B&W factories



Scalable Nuclear Plant: Practical, Affordable

- Fully independent reactor modules
- 1-8 modules per plant, 125-1,000 MWe
- Underground containment building
- Low-impact, air-cooled condenser
- Scalable to grid, site, load-growth
- Three-year construction schedule



Cost certainty ... Schedule certainty ... Capital efficient.

B&W

the habcock & wilcox company



Energy Technology in Modern Grids

Thomas Theisen
Head of Research
& Development
RWE AG



New Technologies in Energy Grids: Could We Expect a Revolution?

Why we need new technologies to prepare our energy system right for the future?

- Generators and TSO's have a clear power flow
- Customer get a simple commodity
- Customers are lazy / convenient

Why innovative technologies are needed?

- Generation mix is changing due to DER and RES
- ICT offers functionalities to handle grid and customer related data
- Role of customers will change from consumer to a prosumer thanks to intelligent application

Deloitte.

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