



power generation group

## ***Utility MACT Regulation Briefing***

***November 10, 2011***

**Rich Killion**  
***B&W Power Generation Group***  
***President and Chief Operating Officer***

a Babcock & Wilcox company



thebabcock&wilcoxcompany

**BWC**  
**LISTED**  
**NYSE**

*B&W is Technically, Financially and Strategically  
Positioned to Support its Customers  
through our Nation's Energy Transformation*

**Company Profile**

**Headquarters:** Charlotte, NC  
**Incorporation:** Delaware  
**CEO:** Brandon C. Bethards  
**Employees:** 13,000 plus 10,000  
joint venture employees  
**Ticker Symbol:** NYSE: BWC

*A leader in clean energy  
technology and services,  
primarily for the fossil,  
nuclear and renewable  
power markets, as well as  
premier advance  
technology and mission  
critical defense contractor.*

# *The Babcock & Wilcox Company*



## ***B&W Technical Services Group, Inc.***

- Nuclear material handling, storage and security
- Nuclear laboratories
- Weapons complex
- Decontamination and decommissioning
- Strategic Petroleum Reserve



## ***B&W Nuclear Operations Group, Inc.***

- Virginia-Class submarine program
- Ford-Class carrier program
- Refueling
- Fuel processing and fabrication



## ***B&W Power Generation Group, Inc.***

- Environmental systems (FGD, SCR, Hg, Particulate, Carbon)
- Coal-fired power generation
- Service, operation and maintenance
- Construction and EPC
- Renewables (Biomass, solar, waste-to-energy)



## ***B&W Nuclear Energy, Inc.***

- Field services
- Plant modifications
- Component manufacturing and installation
- Fuel design, enrichment and fabrication
- B&W mPower™



# B&W Power Generation Group (B&W PGG)

## Business Footprint



- \$1.4 B Revenue in 2010
- \$1.5 B Backlog as of 6/30/11
- Headquartered in Barberton, OH
- Approximately 8,270 employees (including JVs) as of August 2011

Location	Employees
USA	4,464
Canada	573
Mexico	199
Europe	434
Asia	2,374
Australia	226
<b>Total</b>	<b>8,270</b>

## Product Line Portfolio



**Utility and industrial boilers**  
*Firing fossil fuels*



**Environmental products**  
*Control regulated emissions*



**Boiler cleaning and auxiliaries**



**Field services**  
*Upgrade, replace equipment*



**Construction**  
*Install all B&W supplied scope*



**O&M services**  
*Operate, maintain power plants*

# B&W PGG Global Operations



## Legend

- B&W PGG Operations
- ◆ Diamond Power Operations
- B&W Licensee
- ★ B&W Sales Rep
- ★ Diamond Sales Rep

*Extensive experience in manufacturing and sourcing worldwide*



# Developing and Delivering Technology Solutions

## Environmental

- NO<sub>x</sub> reduction
- SO<sub>2</sub> control
- Particulate control
- Acid gas reduction
- Mercury removal
- Ash management

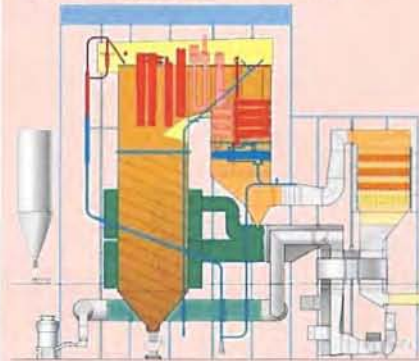


Total Environmental Solutions

## Ultra Supercritical

- Highest efficiency coal-fired design
- 133 Supercritical Boilers
- Largest supercritical boilers in world (9 x 1,300 MW)
- Base-loaded and Full-cycling designs
- Preferred technology for India and China

Ultra-Supercritical Boiler



## Renewables

- Biomass
- Waste-to-Energy
- Concentrated Solar Power (CSP)
- Operate and Maintain



Current



Addition

Solid Waste Authority  
West Palm Beach, FL

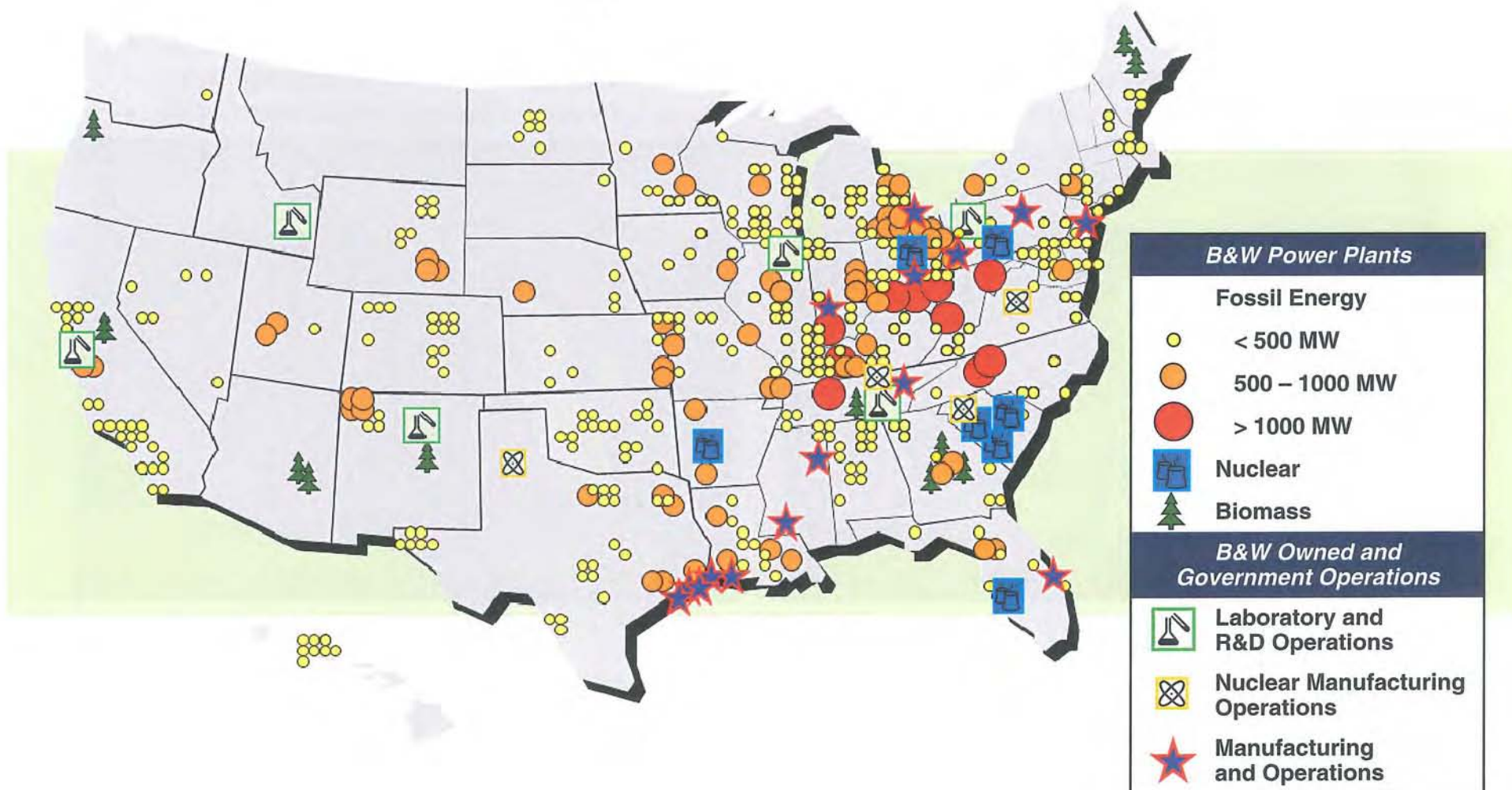
## CO<sub>2</sub> Capture

- Oxy-Coal Combustion
- Regenerable Solvent Absorption Technology (RSAT™)
- Extensive commitment to R&D
  - Wide variety of programs
  - Oxy-coal combustion project, FutureGen 2.0



Recently Expanded  
R&D Facility

# B&W is Providing Power for the United States





## ***B&W is a Major Supplier of Utility Power Plant Equipment***



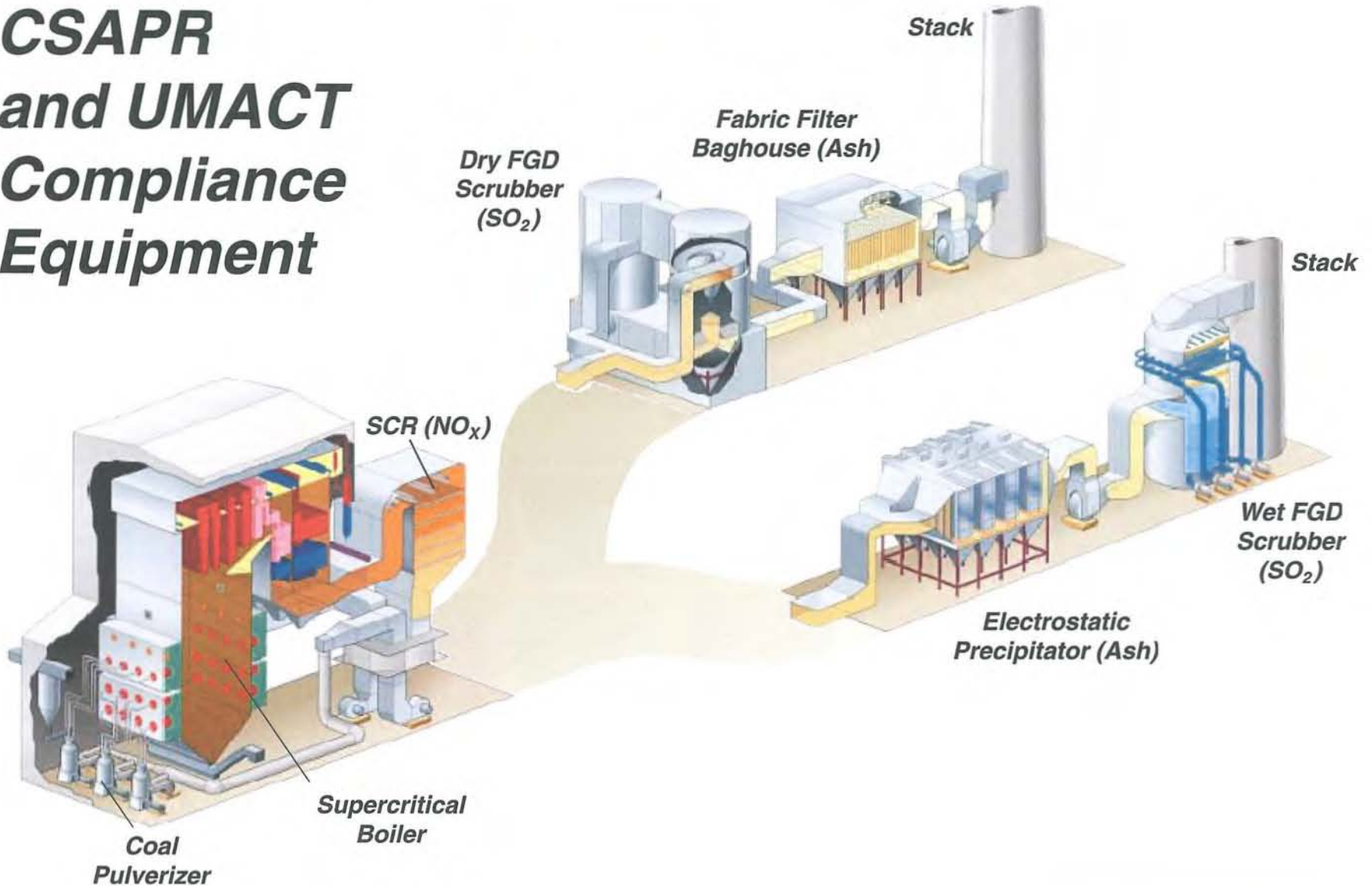
- Wisconsin Public Service – Weston 4
- B&W 530 MW Supercritical Boiler
- SCR, Dry Scrubber and Baghouse



- ▶ AEP – Mitchell 1 and 2
- ▶ 2 x 800 MW Wet Scrubber Systems



# CSAPR and UMACT Compliance Equipment



# A Complete Environmental Technology Portfolio

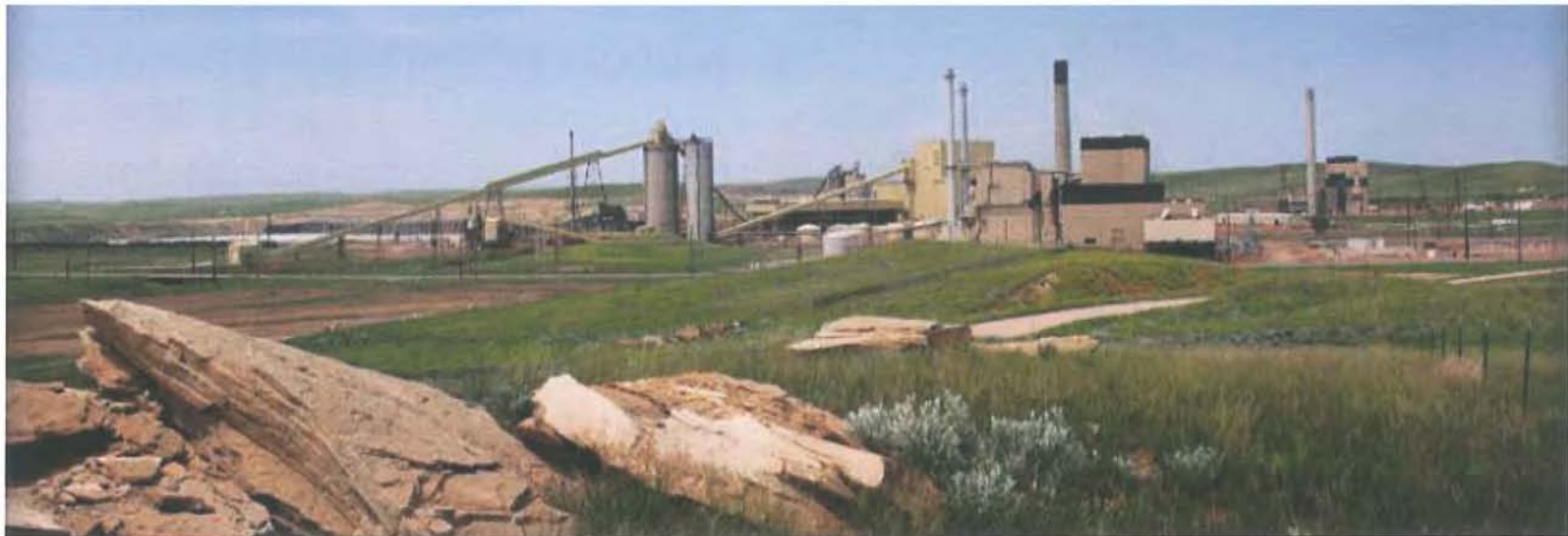


## Total Solutions Provider



# U.S. B&W Installed Capacity and Market Share

	<b>Wet FGD</b>	<b>Dry FGD</b>	<b>Fabric Filter</b>	<b>SCR</b>	<b>Wet ESP</b>
<b>B&amp;W Installed Capacity (MW)</b>	<b>19,966</b>	<b>10,023</b>	<b>8,717</b>	<b>46,607</b>	<b>2,710</b>
<b>Market Share</b>	<b>28%</b>	<b>49%</b>	<b>21%</b>	<b>32%</b>	<b>35%</b>



## ***Environmental Equipment Forecast for U.S. Power Companies***

<b><i>Capacity in Gigawatts (GW)</i></b>	<b><i>Industry Sources</i></b>	
	<b><i>Low</i></b>	<b><i>High</i></b>
<b>Scrubbers (FGD)</b>	<b>25</b>	<b>45</b>
<b>SCR (De-NO<sub>x</sub>)</b>	<b>15</b>	<b>25</b>
<b>Direct Sorbent Injection (DSI) of PAC, Trona, etc.</b>	<b>100</b>	<b>200</b>
<b>Fabric Filter (FF)</b>	<b>75</b>	<b>175</b>
<b>Total in GW</b>	<b>215</b>	<b>445</b>

<b><i>Billions of Dollars \$</i></b>	<b><i>Industry Sources</i></b>	
	<b><i>Low</i></b>	<b><i>High</i></b>
<b>Total in \$</b>	<b>\$12</b>	<b>\$25</b>

***EPC value = \$24 – 48 B***

***B&W core scope (furnish and install) is \$12 – 24 B***



## ***Policy Goals for Environmental Compliance***

- **Achieve environmental compliance**
- **Increase number of U.S. jobs**
- **Minimize economic impact to rate payers**
- **Maintain reliability of electricity supply**

***Longer compliance schedule  
maximizes U.S. jobs  
and still supports  
environmental stewardship***



# Timeline for Project Execution

## Permitting, RFQ and Contracting Phase



Takes one to two years before Engineer-Procure-Construct (EPC) project begins

## Project Execution Phase



**EPC Scope: Fabric Filter (30-35 Months) Startup & Testing**



**EPC Scope: Dry FGD (30-36 Months) Startup & Testing**



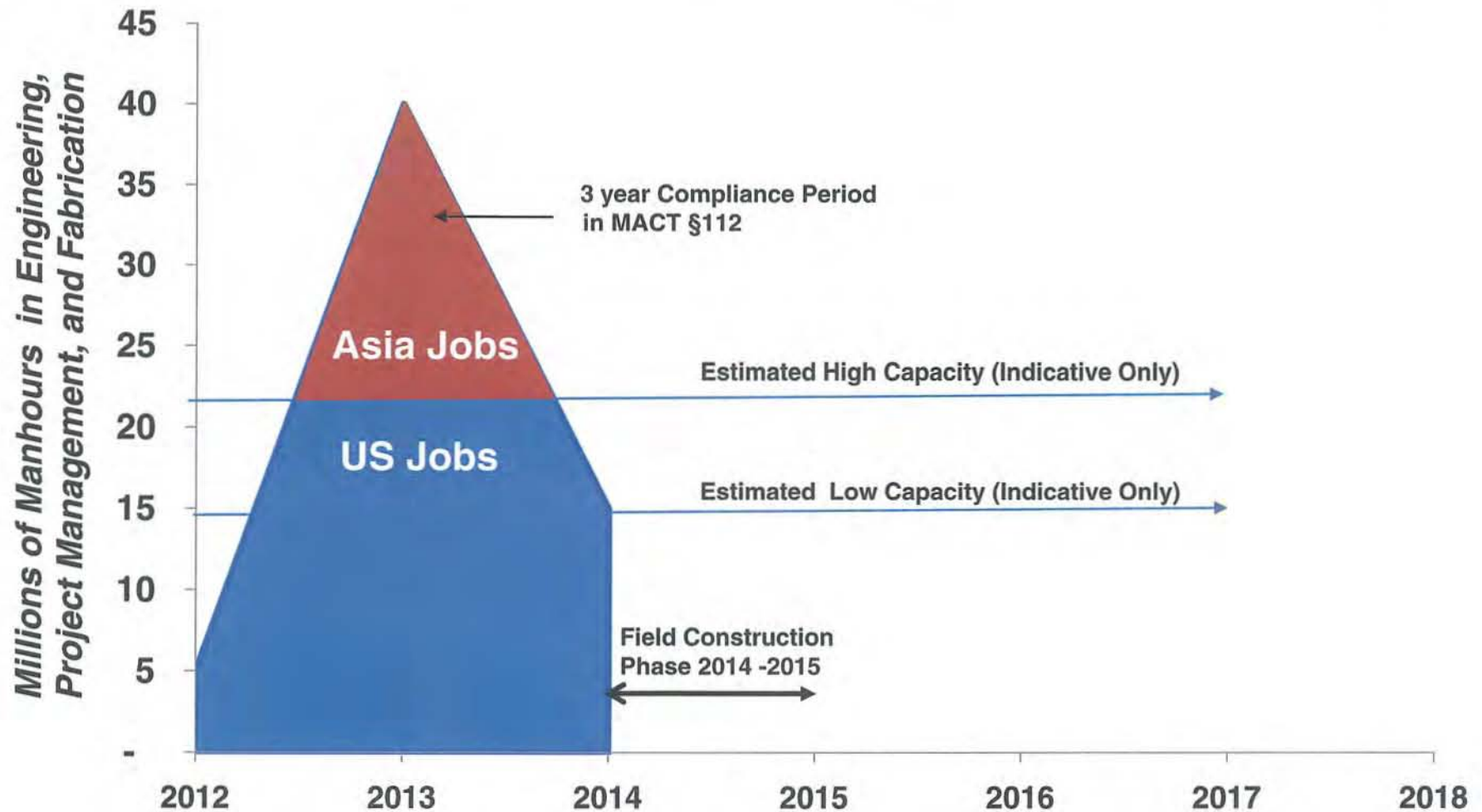
**EPC Scope: SCR (35-36 Months) Startup & Testing**



**EPC Scope: Wet FGD (40-42 Months) Startup & Testing**

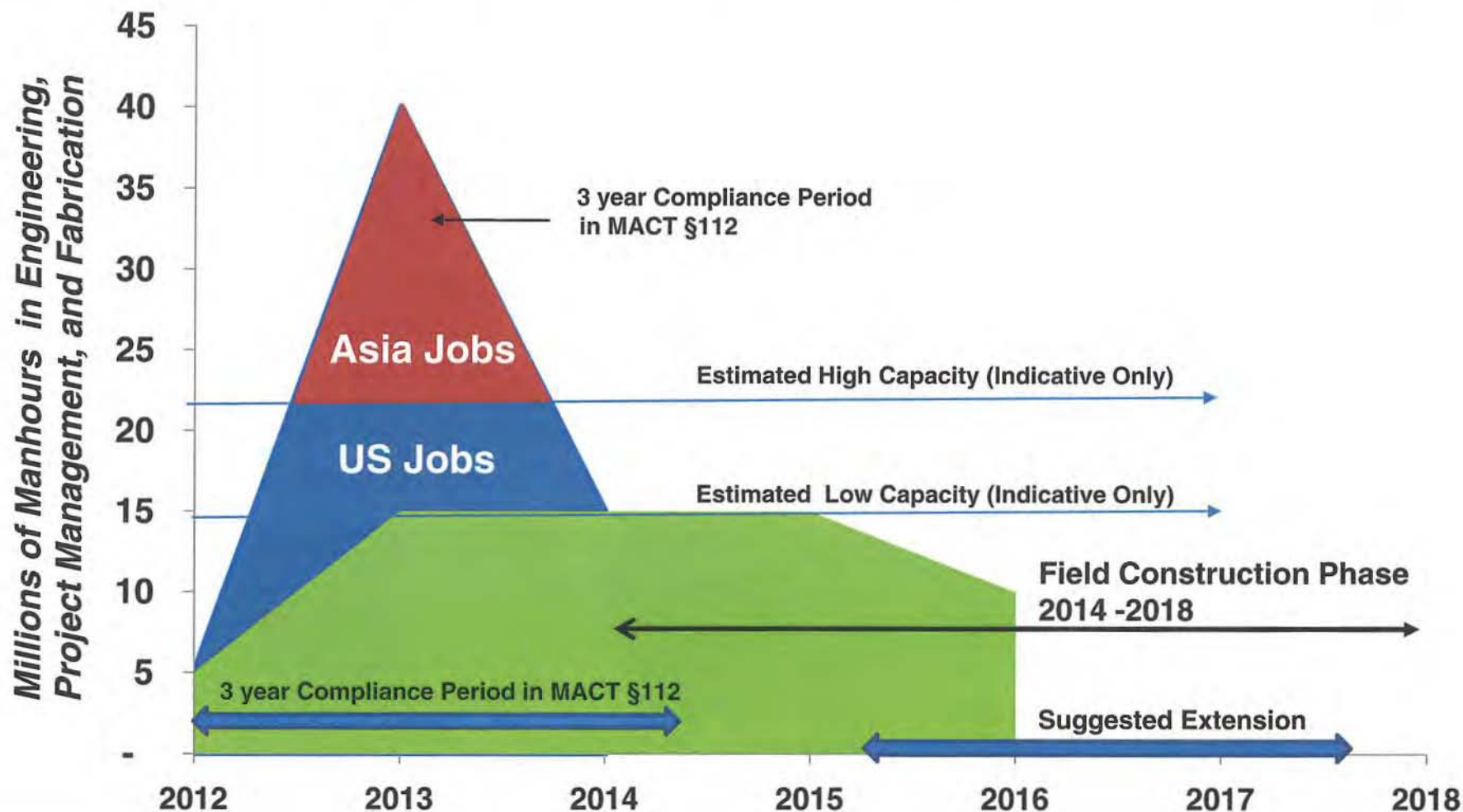


## Short Compliance Deadlines Will Lead to Significant Challenges for Engineering, PM and U.S. Suppliers



Source: estimate by M. W. O'Donnell, B&W

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# ***Economic Impact of Major AQCS Project***

***(Representative Sample of Large Project)***

***Total Customer  
Project Cost  
\$1.4 B***

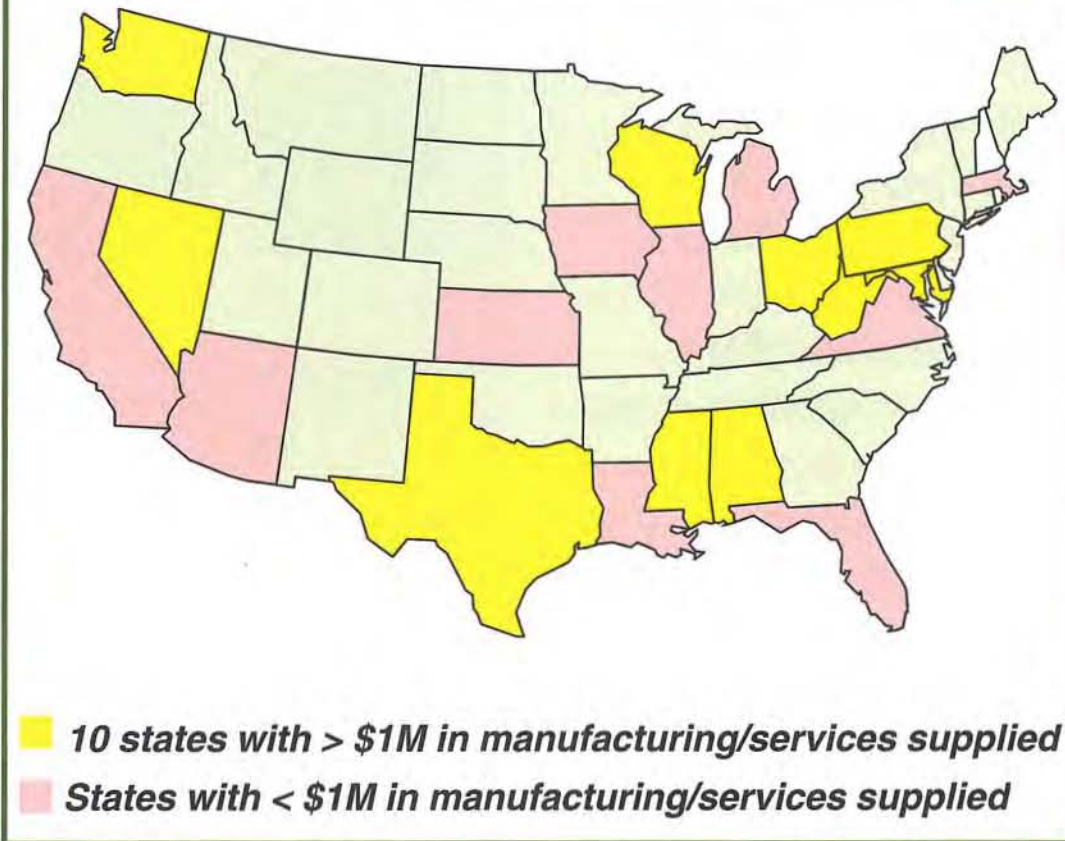
***Project Duration  
4+ years***



- **B&W Scope of Supply**
  - 3 X 800 MW Wet FGD (core scope erected)
  - 2 X 800 MW SCR retrofit (EPC)
- **B&W Supply = \$ 400 M**
  - Engineering – 270 engineering and material supply personnel
  - Procurement
    - \$ 81 M U.S. procurement
    - 10 states with > \$1M in manufacturing /services supplied
    - Supply chain spanned over 20 states
    - Equipment Supply
  - Construction
    - Core scope Wet FGD = 500,000 manhours
    - EPC SCR = 1,000,000 manhours

# ***Economic Impact of Major AQCS Project*** *(Representative Sample of Large Project)*

**Supply Chain Spanned Over 20 states**



- **Equipment supply**
  - Absorber trays
  - Agitators
  - Alloy headers
  - Bolts
  - Electrical wiring
  - Piping engineering
  - Gaskets
  - Monitors
  - Pressure transmitters
  - Pumps
  - Steel plate
  - Structural steel
  - Ball and plug valves

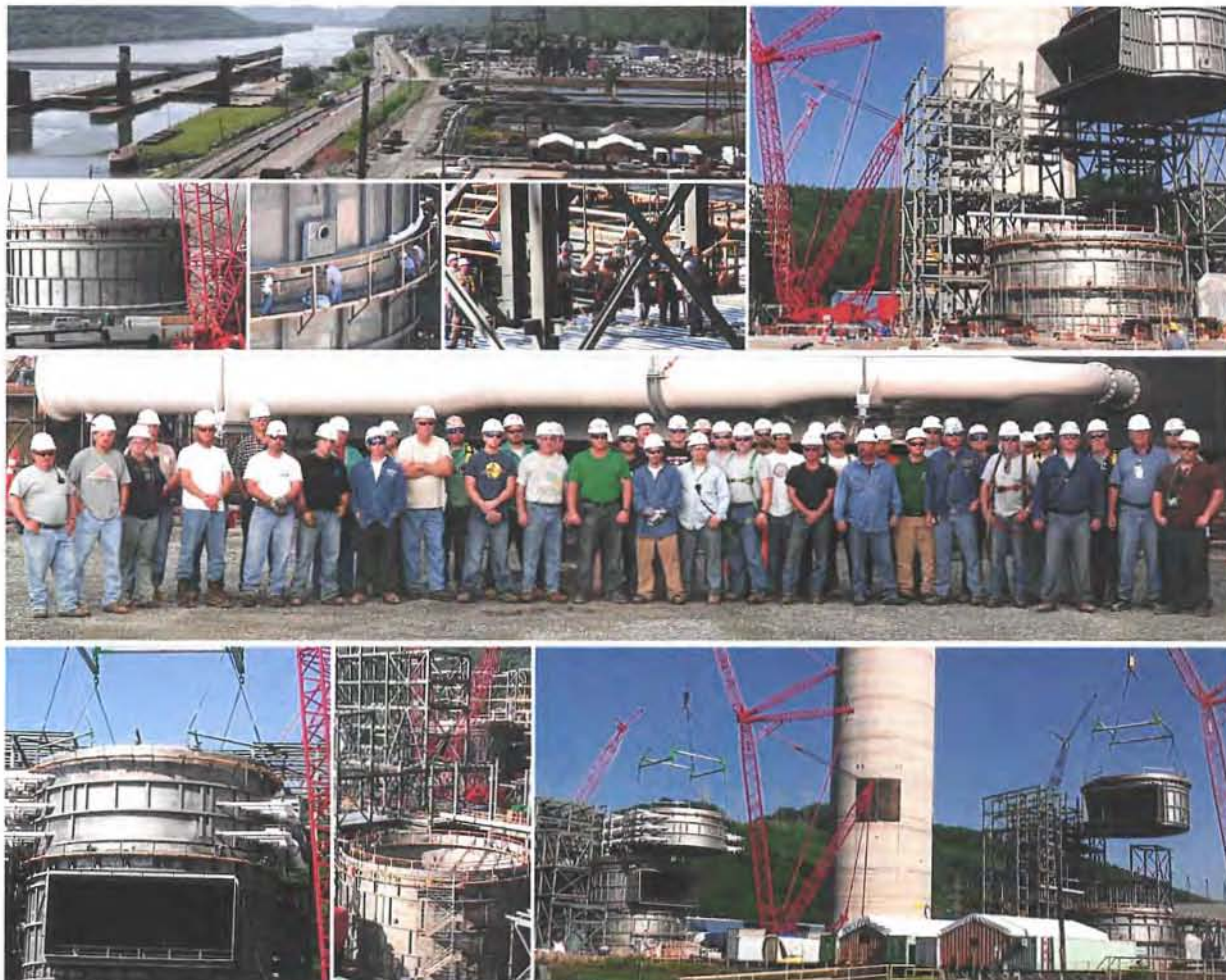


# ***Construction Installation Services to Meet Regulatory Demand***





## ***B&W is a Major U.S. Employer of Boilermaker Union Craft***



- One of top three boilermaker employers every year for last ten years
- Top tier power plant constructor

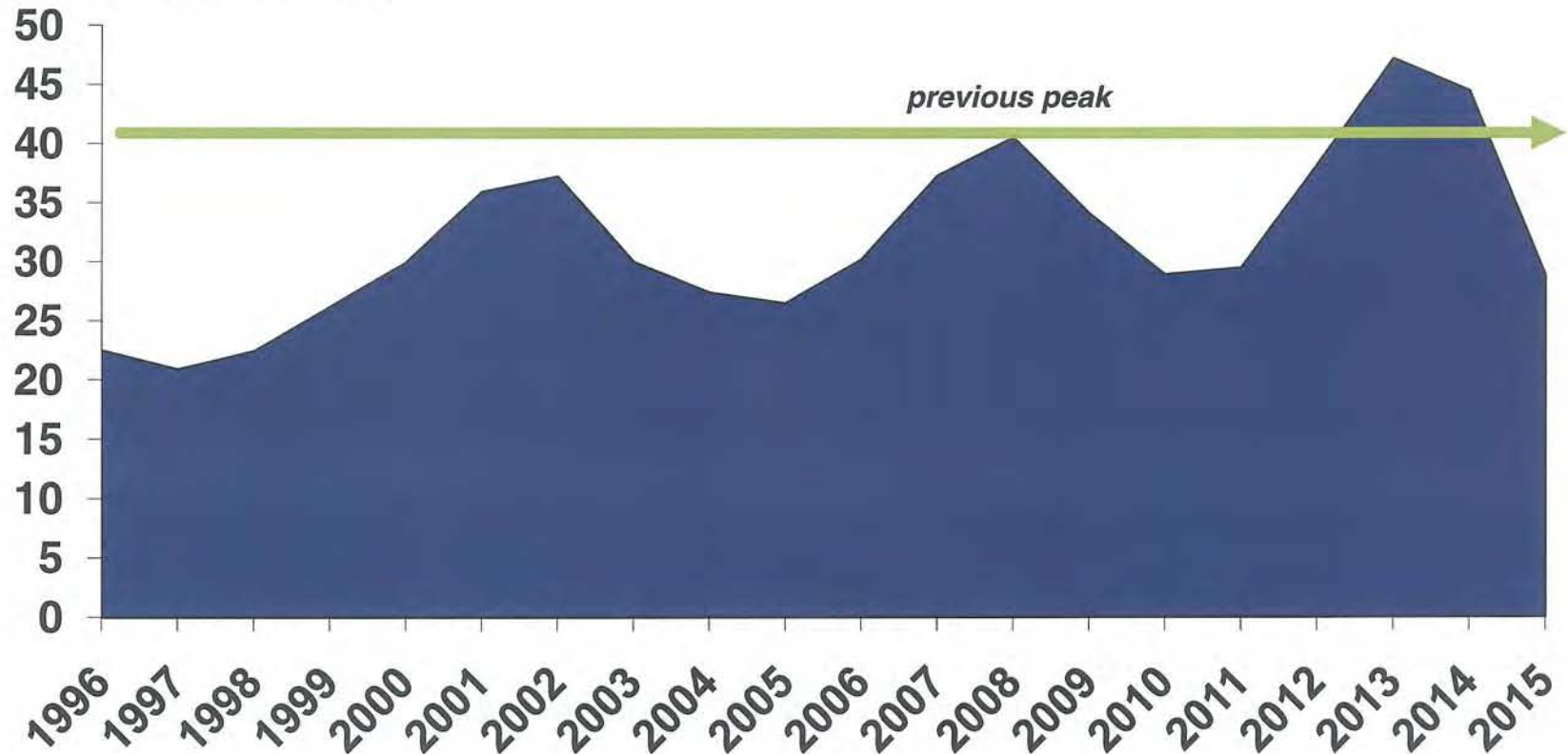
*Boilermaker union craft is the single largest union craft employed on power and emissions control projects nationwide*



## Total Boilermaker Man-Hour Forecast

3 year compliance schedule requires 16% more man-hours than highest recent peak

Man-hours (Millions)



# ***Construction Challenges in Meeting Regulatory Demand***

- **Demands on craft labor will be significant – particularly on a regional basis**
- **Time for implementation is too short**
- **Project execution risk increases – safety, quality, cost**
- **Although best practice mitigation strategies will be deployed, results are questionable in meeting cost and schedule requirements given current UMACT compressed timeframe**





# B&W Comments to EPA on Utility MACT



- B&W reviewed the proposed Utility MACT rule and provided detailed comments
- Proposed limits on new and reconstructed units too stringent
- Some proposed limits on new and reconstructed units lower than capabilities of reference test methods

## ***UMACT for New Units (NSPS)***

**45% of all US electricity is generated from coal  
from only 30% of installed U.S. generation capacity**

- **Competitively priced long term**
- **24/7 availability (baseload)**
- **Clean source of generation – virtually all plants will be clean by 2015-2018 because of Utility MACT/CSAPR**
- **Large jobs generator (mining, railroad, Boilermaker union construction, engineering, manufacturing, plant operations, etc.)**

**No new coal powered plants will be built in U.S.  
under proposed rule emission limits**

- **B&W knows of no technology or combination of technologies commercially available worldwide to achieve Total PM, Hg and HCl emission limits**
- **Proposed limits are approximately an order of magnitude lower than what can reliably be achieved by current technology**
- **Proposal is based on very low measured emissions at single units, which are believed to be the result of site-specific interactions of fuels, test equipment, and operations, not regularly reproducible. For example, proposed limits are near the limits of detection of the measurement methods.**



## ***Challenges to Achieve Environmental Compliance***

- ▶ **Three year UMACT compliance period cannot be fulfilled due to large number and duration of major projects**
- ▶ **Attempts to meet UMACT three year compliance**
  - ▶ **Will drive extensive U.S. manufacturing, engineering and project management jobs offshore**
  - ▶ **Will increase risk substantially for project cost, schedule completion, and safety**
- ▶ **There is insufficient experienced field craft to construct the required projects within three year period**
- ▶ **UMACT emissions requirements for new installations cannot be met with current technology – no new coal based power plant will be built in the US under the proposed emission limits**
- ▶ **As a major environmental system supplier, B&W urges consideration for a six year compliance period**