



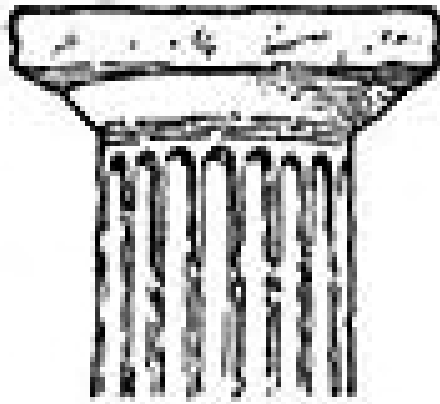
CoalFleet for Tomorrow: **An Industry Initiative to Secure America's Energy Future**

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Background: Deployment of New Technologies Needed for America's Future Electricity System

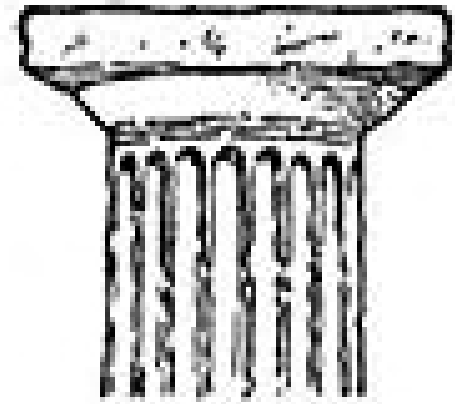
Electric System of the Future



Grid Modernization



Global Climate Change



Infrastructure Security

Electricity System Needs to Utilize a Portfolio of Technologies to Address Carbon Emissions



Carbon Management

Efficiency

$$\leftarrow \frac{\text{Btu}}{\text{GDP}}$$

Decarbonization

$$\leftarrow \frac{\text{CO}_2}{\text{Btu}}$$

Sequestration

$$\leftarrow \frac{\text{CO}_2 \text{ (atm)}}{\text{CO}_2 \text{ (emitted)}}$$

Electricity System Must Also Utilize Domestic Resources in the Interests of National Security

- ~~Petroleum~~
- ~~Liquefied~~ Natural Gas
- Uranium (?)
- Renewables
- End-Use Efficiency
- COAL

Uncertainty Impedes Advances: System Owners Must Make Long-term Financial Commitments in an Uncertain Business Environment

- Ownership issues
- Regulation / deregulation
- Financial community wariness
- Environment / permitting issues

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Current Situation for Advanced Coal

- High perceived risk given limited commercial history
 - No current market for IGCC, USC PC, SC CFBC
 - Costs and reliability less predictable
 - Extent/timing of new environmental regulations uncertain
 - New cost/risk sharing incentives required
- Advanced coal versus conventional coal
 - >40 GW of U.S. planned additions have been announced; at present, nearly all conventional coal
 - At ~\$1000/kW, this represents >\$40 billion in new investment in coal technology
 - Advanced technologies not being selected
 - OEM, A/E, O&M, and regulatory infrastructure not robust
 - Technology selection and design guidance needed

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What Technologies Will Generators Choose for the Next Plant?

- Natural Gas Combined Cycle
- Pulverized Coal
- Circulating Fluid Bed
- Integrated Gasification Combined Cycle

	PC Subcritical	PC Supercritical	CFB	IGCC	NGCC
Total Plant Cost, \$/kW	1,250	1,300	1,300	1,300	440
Ave. Heat Rate Btu/kWh (HHV)	9,300	8,700	9,800	8,650	7,200
Levelized Total COE, \$MWh	46.4	46.6	45.9	48.3	46.4

Source: EPRI

“CoalFleet for Tomorrow” Objectives

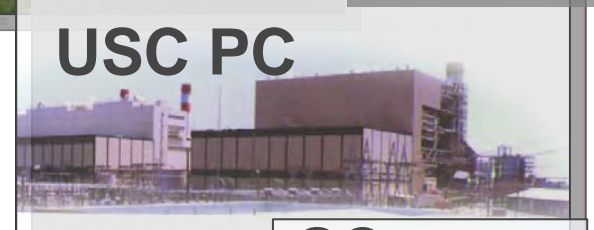
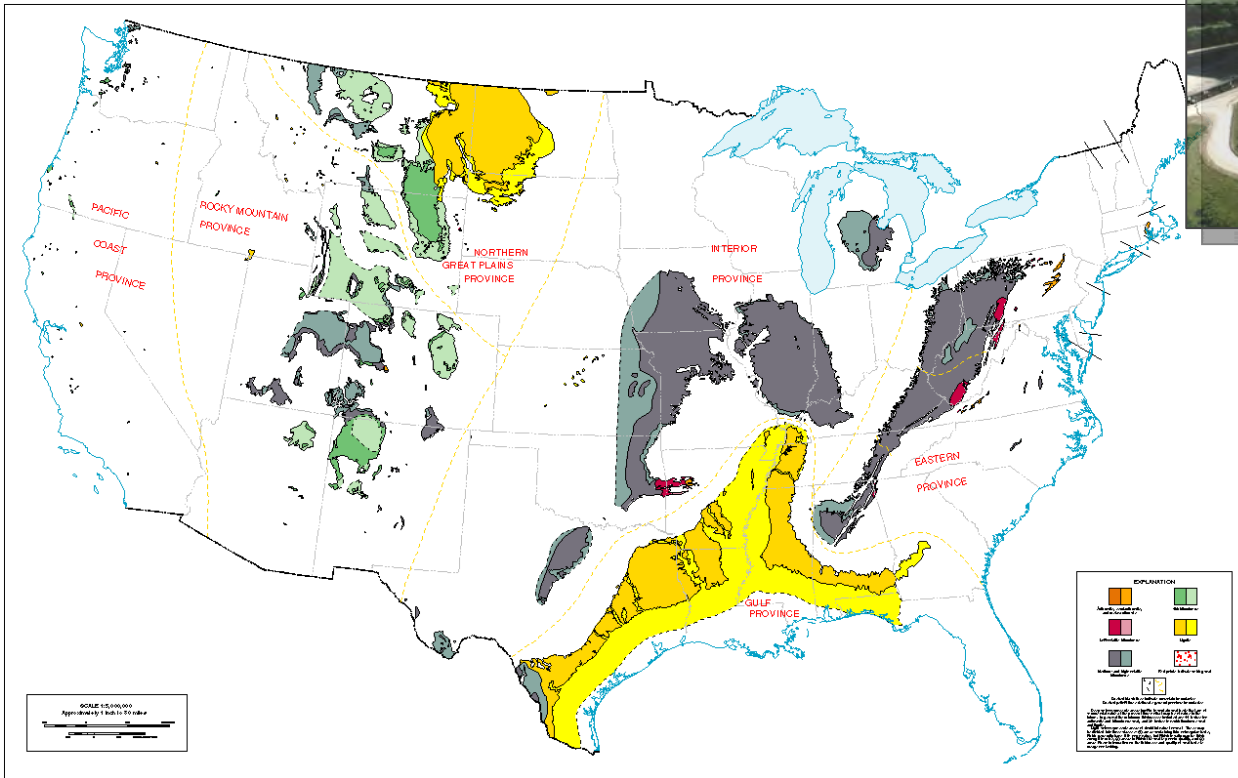
- To accelerate early deployment of 3 to 5 full-scale advanced coal plants
 - To be operating in 5 to 10 years
 - With consideration for later CO₂ capture retrofit
- To ensure availability of Next Generation advanced coal plants
 - Competitive commercial market in 2015-2020
 - With CO₂ capture adaptability
 - Meets DOE/CURC/EPRI roadmap goals
- Take advantage of current window of opportunity to ensure the cost-effective and timely transition to advanced coal technology

“CoalFleet for Tomorrow” Approach

- Initiate an industry-driven collaborative:
 - Leadership by major coal-based generation owners intending to build advanced coal plants
 - Focused on accelerating deployment of new full-scale plants
- Involve other key stakeholders (e.g., equipment manufacturers, A/Es, constructors, DOE) in a supporting and funding role to ensure commercial viability of advanced coal plants
- Support the development of standardized plant designs to reduce technology, performance, and financial risks
- Accelerate and augment RD&D for advanced coal technology and CO₂ capture and sequestration

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Regional Coal Differences Compel Multiple Advanced Coal Options



For IGCC, We Must Utilize Opportunities to Accentuate the “Good,” Minimize the “Bad” & Eliminate the “Ugly”*

- **The Good**

- Superior efficiency on Eastern Bituminous Coal
- Superior environmental performance
- Flexible byproduct processing: Hydrogen production
- Conducive to carbon capture & disposal

- **The Bad**

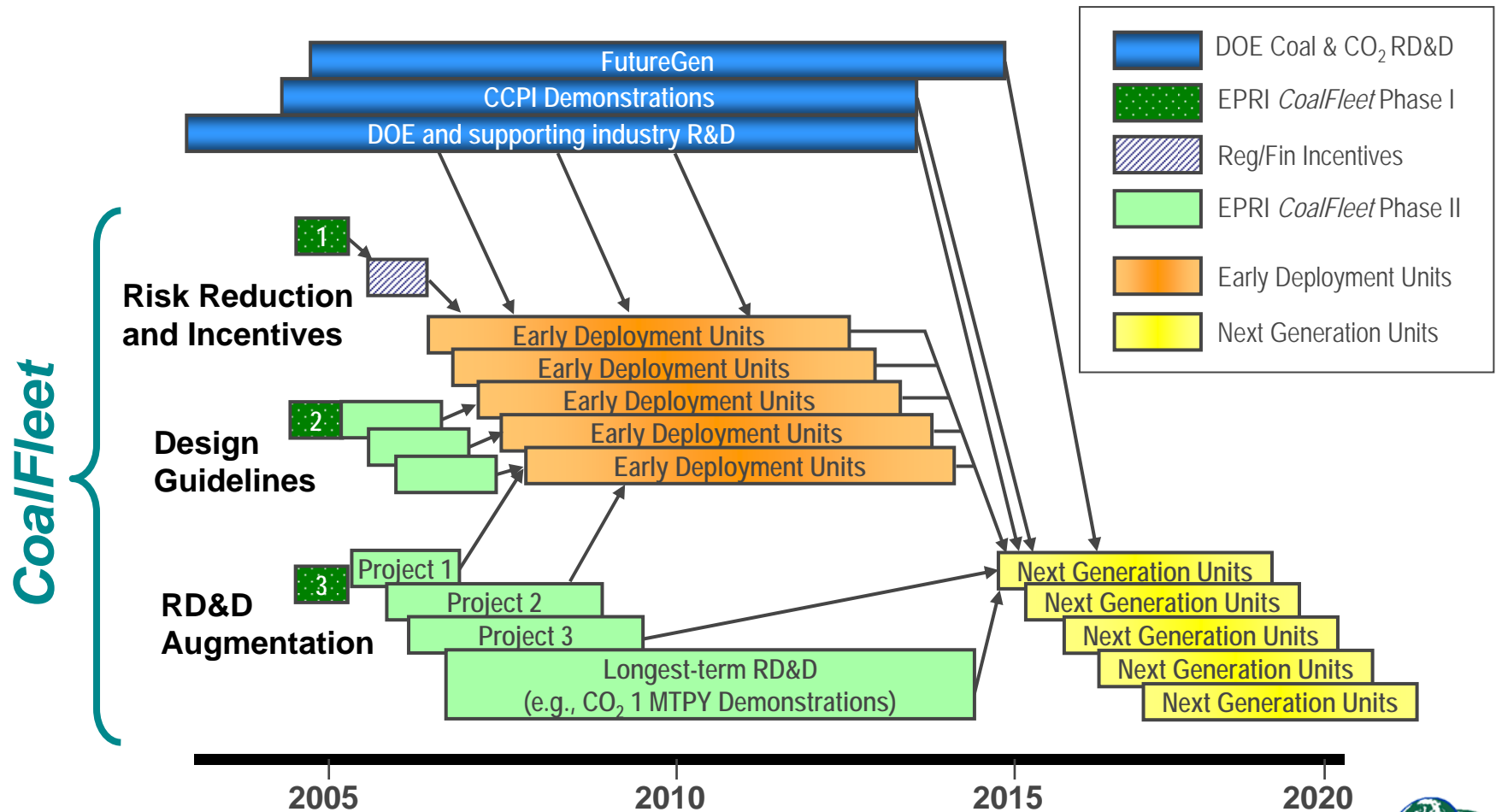
- High capital cost
- More IGCC plants must be built to reduce cost and improve availability
- Currently not economical for low-BTU coals
- New type of operating expertise must be developed
- Reliability track record of existing IGCC plants

- **The Ugly**

- Until recently, there were not equipment suppliers, only technology licensors
- Virtually all of the technology and performance risk is on the plant owner
- **But – GE recently purchased Chevron Texaco’s gasification business**

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CoalFleet Integration and Deployment Support



Opportunities for Collaboration Are Critical for Future of Coal Use

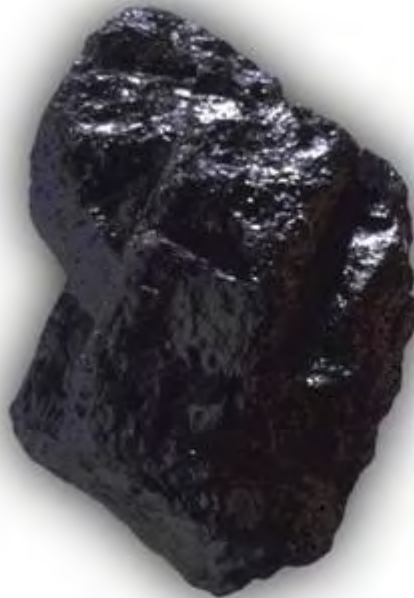
- Industry focused R&D collaborative programs
 - Partnerships between utilities and DOE, EPRI & OEMs to develop & execute technical strategy
 - Accelerate cost reductions through standardization
 - Uniform training and standards
- Obtain support from Federal government
 - Meaningful federal incentives
 - Streamlined permitting
 - Collaborative funding to accelerate R&D
- Obtain support from Utility Commissions and state legislators
 - Supportive regulatory and legislative treatment
 - Meaningful state incentives

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Vision Allows for Coal to Have a Viable Economic and Environmental Future

- An **industry-led collaboration** can coalesce the market for advanced coal power systems
- Industry can determine **appropriate incentives** to spur early plant deployment, drawing on EPRI data
- **Early deployment based on design standardization** will generate vital knowledge to reduce costs and risk and speed permitting
- **Options for potential CO₂ reduction** can be developed in time for application if needed
- **The strengths of Industry, EPRI, and Suppliers are leveraged for maximum value**

Let's Keep Coal in the Mix: *We Must Meet National Security and Climate Impact Challenges*



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