

# Financing the Nuclear Renaissance

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New Nuclear Power Financing Roundtable

Kansas Corporation Commission

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## Concentric Energy Advisors

Concentric Energy Advisors is a leading management and financial advisory firm focused on the North American energy industry. We are staffed and led by senior industry professionals who have widely-recognized expertise in:

- Financial advisory assignments
- Market assessment and strategy development
- Litigation support
- Ratemaking and utility regulation
- Management and operations consulting

Concentric's principals and affiliates have held executive positions in management consulting firms, utility companies, regulatory agencies, competitive energy suppliers, and investment banks. Our extensive industry experience combined with rigorous analysis and a highly collaborative approach to working with clients enables us to deliver pragmatic strategic insights and innovative solutions that help ensure client success.



## Agenda

- I. Picking up the Pieces from the Last Wave of Nuclear Construction
- II. Federal and State Responses
- III. New Challenges
- IV. Technological Landscape, Sponsor Landscape, Cost Estimates
- V. DOE Loan Guarantee Process
- VI. Other Sources of Debt and Equity
- VII. Enexus Case Study
- VIII. Life After the DOE LGA Process



## Nuclear Plant Development: Picking up the Pieces from the Last Wave

- The events at Three Mile Island in 1979 led to numerous delays and additional costs to nuclear plants under construction at the time
- Retrospective policymaking by state regulators facing public outcry over rising costs crippled many utilities involved in nuclear development:
  - ❑ Over \$18 billion in construction costs were disallowed;
  - ❑ Several utilities were forced into bankruptcy;
  - ❑ Decades of contention led to more than \$100 million spent on litigation
- Changing policies re: cost-recovery, aggressive use of prudence reviews, and hindsight-guided regulatory practices
- *Example: Kansas Corporation Commission treatment of Wolf Creek costs:*

	(\$ Million)
Total Plant Cost	\$2,904.00
Imprudence Disallowance	\$256.10
Excess Capacity Disallowance	\$1,524.10
Economic Value Disallowance	\$411.20
Total Disallowance	\$2,192.30
Fully Recoverable Costs	\$711.70



## Federal Response

### ➤ Nuclear Regulatory Commission

- ❑ Combined Construction & Operating License (COL) designed to significantly reduce delays

### ➤ Department of Energy

- ❑ Loan Guarantee Program: guarantees project debt up to 80% of total project cost (program maximum of \$18.5 billion)
- ❑ Particularly attractive for unregulated generating companies that require higher leverage

### ➤ Production Tax Credits

- ❑ The Energy Policy Act of 2005 provides a production tax credit of 1.8 cents per kilowatt-hour for 6,000 megawatts (MW) of capacity from new nuclear power plants for the first eight years of operation
- ❑ If more than 6,000 MW of new nuclear capacity are online and eligible for the PTC, the credits will be allocated on a pro rata basis among the plants in operation
- ❑ A qualifying advanced nuclear facility is one for which a company (or companies) has received an allocation of megawatt capacity and which is placed in service before 2021

### ➤ Insurance

- ❑ Designed to mitigate the risk of delay
- ❑ The federal government will cover debt service for the first six plants if commercial operation is delayed.
- ❑ 100% coverage (capped at \$500 million) for the first two reactors, 50% coverage (capped at \$250 million) for the next four.
- ❑ Delays include those related to litigation and failure of the NRC to meet established schedules



## State Response

- **Regulatory policy at the state level will have a substantial effect on the prospects for (and pace of) nuclear development.**
- **Case Study: Florida P.S.C.**
  - ❑ Costs are segregated into three buckets: site selection; pre-construction; construction
  - ❑ May 1 filings each year for recovery in rates of prospective site selection, pre-construction, and AFUDC on construction
  - ❑ March 1 filings to true up costs for prior years
  - ❑ Prudence determined each year; can't be revisited
  - ❑ Need and cost-effectiveness re-evaluated each year
  - ❑ All unrecovered costs for cancelled plant are recovered; no used and useful standard



## New Challenges

- **Unregulated merchant power markets**
  - ❑ Of 20 new nuclear projects, 7 are planned for unregulated markets
- **Capital market conditions**
  - ❑ Higher debt costs increase AFUDC and long-term costs in rates
  - ❑ Rating agencies have indicated that commitments to regulated or unregulated nuclear construction will increase risk, liquidity requirements, and the need for higher levels of equity
  - ❑ Project financing for new nuclear simply isn't feasible without loan guarantees
- **Cost escalation**
  - ❑ New plant costs have almost tripled since 2000 due to world-wide demand
- **Atrophy of nuclear development capabilities**
  - ❑ The US created the international market; it now needs to import components and skilled labor



## Technological Landscape

### ➤ **EPR**

- Pressurized water reactor jointly developed by Areva, EDF, and Siemens AG (1600 MW)
- Application for design certification has been submitted to the NRC, certification expected in mid-2011
- EPR units are under construction in Finland and France

### ➤ **AP1000**

- Two-loop PWR developed by Westinghouse, with output of 1117 MW
- Original design approved by the NRC in 2006 – an amended DC is expected in March, 2010
- One AP1000 plant is under construction in China and is expected to begin operation in 2013

### ➤ **APWR**

- Advanced PWR developed by Mitsubishi Heavy Industries (1700 MW)
- Design certification is expected in late 2011

### ➤ **ABWR**

- Developed by General Electric/Toshiba; has a net output of approximately 1350 MW
- The NRC approved the ABWR design in 1997
- Four ABWR plants are operational in Japan, with three plants under construction in Japan and Taiwan

### ➤ **ESBWR**

- Economic Simplified Boiling Water Reactor developed by General Electric/Hitachi with an estimated output of 1520 MW
- A review schedule for design certification has not yet been published by the NRC



## Sponsor Landscape

- **Developers have proposed construction of thirty new reactors at twenty sites throughout the United States**

Majority Owner	Unit(s)	Technology	# Units	Loan Guarantee Application
Ameren	Callaway 2	US-EPR	1	Yes
Constellation	Calvert Cliffs 3	US-EPR	1	Yes
Constellation	Nine Mile Point 3	US-EPR	1	Yes
Dominion	North Ana 3	ESBWR	1	Yes
Duke	W.S. Lee III Nuclear Station	AP1000	2	Yes
Entergy	Grand Gulf 3	ESBWR	1	Yes
Entergy	River Bend 2	ESBWR	1	Yes
Exelon	Victoria County Station	TBA	2	Yes
Luminant	Comanche Peak Units 3 & 4	APWR	2	Yes
NRG	South Texas Units 3 & 4	ABWR	2	Yes
PPL	Bell Bend	US-EPR	1	Yes
Progress Energy	Levy 1 & 2	AP1000	2	Yes
Scana	Summer 2 & 3	AP1000	2	Yes
Southern Company	Vogtle 3 & 4	AP1000	2	Yes
Alternate Energy Holdings	Idaho Energy Complex	US-EPR	1	No
Amarillo Power	Amarillo, TX	US-EPR	1	No
Detroit Edison	Fermi 3	ESBWR	1	No
FPL	Turkey Point 3 & 4	AP1000	2	No
Progress Energy	Harris 2 & 3	AP1000	2	No
TVA	Bellefonte 3 & 4	AP1000	2	No



## Construction Cost Estimates

- **Costs have risen considerably over the last several years.**
  - ❑ Commodity Prices
  - ❑ Exchange rates
  
- **Most recent estimates for 2018 COD:**

Technology	Project Sponsor	All-In Cost \$ Billion	All-In Cost \$/kW	Notes
AP1000	Duke	17	\$7,580	All-in cost based on a 2-unit project
EPR	Unistar	7.0	\$4,375	All-in cost, 1 unit
ESBWR	FPL	24.3	\$8,005	All-in cost based on a 2-unit project



## Loan Guarantee Application Process, Indications

- **EPAAct 2005 authorized the DOE to provide up to \$18.5 billion in loan guarantees to new nuclear development projects in the United States.**
- **Timing:**
  - ❑ Part I Applications were due September 29, 2008
  - ❑ Part II is due December 19, 2008
  - ❑ DOE plans to begin negotiation of loan guarantee term sheets with selected project sponsors in April, 2009
  - ❑ The negotiation phase is expected to last into 2010, well beyond September 30, 2009, which marks the close of the program's statutory authority

*DOE received 19 loan guarantee applications from 17 different companies. The applications covered 14 projects totaling 21 units, and represented 28.8 GW of proposed development. The requests totaled \$188 billion, which amounts to an average all-in cost of \$6,528/kW. The requests averaged 64.9% of total estimated construction costs .*



## Loan Guarantee Program: Indications from DOE

### Applications are Strengthened by Certain Advantages:

- Higher equity levels
- Signed EPC contract
- Strong credit ratings
- Regulated or contracted plant as opposed to merchant
- Smaller, manageable projects
- Ability to fund cost overruns

### Challenges Confronting the Program's Future:

- The DOE Loan Guarantee Program mandate is currently scheduled to expire Sep. 30, 2009. DOE has indicated that no commitments will be made by that time
- Hard limit of \$18.5 billion, with no additional appropriations on the horizon
- Coordination of debt superiority with foreign ECAs and other lenders may be contentious

*DOE/OMB has made clear that limiting financial risk to taxpayers is the paramount factor in their decision making.*



## Other Sources of Debt and Financing Support

### ➤ **Export Credit Agencies**

- NEXI: Nippon Export and Investment Insurance
- JFC: Japan Financing Corporation (JBIC)
- COFACE: Compagnie Française d'Assurance pour le Commerce Extérieur

### ➤ **Municipal Power Authorities**

- Tax-advantaged debt

### ➤ **G&T Coops, RECs**

### ➤ **Vendors**

### ➤ **Host states**

*Achieving maximum leverage will require governmental guarantees*



## Likely Equity Investors

1. **Investor Owned Utilities (IOU)**
2. **Merchant Generators**
3. **International Energy Companies**
4. **Private Equity**
5. **Vendors**
6. **Sovereign Funds**

*It is currently doubtful that any single participant other than a regulated IOU will be willing to fund more than 20% of equity level.*



## Case Study: Entergy Nuclear to be Spun-Off as Enexus

### ➤ Overview

- ❑ November, 2007: Entergy announced its intention to separate its non-utility nuclear business into a new entity: Enexus Energy
  - Tax-free spin-off of 100% of Enexus's common shares to Entergy shareholders
- ❑ Entergy and Enexus intend to enter into a nuclear joint venture, EquaGen, with equal ownership

### ➤ Financing Overview

- ❑ Enexus anticipates being capitalized with approximately \$4.5 billion of high-yield debt.
- ❑ Senior secured revolving credit facility, cash and other credit support mechanisms expected to support liquidity requirements



## Case Study: Entergy Nuclear to be Spun-Off as Enexus (cont'd)

- **Market for high yield debt has sharply deteriorated**
- **Debt Entergy would have to issue would be below investment grade, and would cost the company a substantial premium.**
- **Once regulatory approval is secured from Vermont (the last state where a decision is pending), Entergy will assume a readiness posture and await favorable market indications before proceeding**
- **Takeaways:**
  - ❑ Enexus represents the most favorable scenario for stand-alone nuclear financing (operational fleet with geographic and technological diversity, partially contracted)
  - ❑ Leverage can't exceed 30%
  - ❑ Debt is significantly below investment grade
  - ❑ Equity returns need to be  $\approx 15\%$  or more



## Life After the DOE LGA Process

- **Current level of funding authorized for the DOE Loan Guarantee Program will support 2-3 projects if the program is extended**
- **For those that do not receive guarantees:**
  - ❑ Consolidation, deferral, and cancellation of projects is likely
  - ❑ Regulated plants:
    - Reassessment of need & economics of nuclear development
    - Efforts to develop regulatory compact, legislative support
    - Reconsideration of technology: focus will shift to vendors with aggressive financial packages and EPC terms
  - ❑ Merchant plants:
    - Search for international capital (from ECAs, private equity, sovereign funds, host states)
    - Reconsideration of merchant power market structure
    - Reconsideration of technology selection (focus on low-cost, low-risk options)



## Future Landscape (cont'd)

- **Key determinants that will drive expansion of the US nuclear fleet:**
  - Capital markets
    - Recovery of credit market: availability of affordable debt
  - Fossil fuel prices
    - High cost of alternatives makes economics of nuclear power more compelling
  - Carbon policy
    - Market-oriented carbon policy will enhance the case for building new nuclear
  - Better cost estimates
    - More refined estimates based on construction experience of L.G. winners
  - Power market needs
  - Public support for first-movers
  - State policies
    - Receptive state policies and regulatory compact are essential

SETTING HIGHER STANDARDS FOR  
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## Questions and Follow Up:

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