

**Nuclear Industry Conference And Trade
Show 2009
Canadian Nuclear Association**

***Assessing The Credit Risks For New
Nuclear Power Plants***

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Agenda

- Credit Risks Of Competing Technologies
- Credit Risks Posed By Elevated Construction Costs
- An Untested NRC Supervision Process

- Supportive Actions By States

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Utility Ratings In The Late 1970's

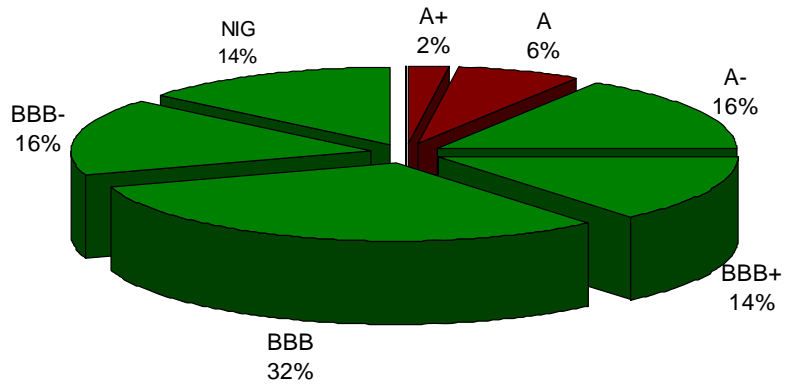
At The Beginning Of The Last Major Generation Construction Cycle In Which Utilities Were The Principal Participants, The Senior Debt Ratings Of Utilities Were In The **AA And High **A** Category. They Were Well Positioned For The Major Financial Pressures To Come. Today, In Advance of A Major Capital Expenditure Period, Ratings Are Much Lower...**

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U.S. Utility/Power Industry Ratings Distribution



***Includes merchant generation companies (e.g. PPL Energy, PSEG Power, AES)

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Credit Issues Posed By Technologies

Sponsors Have Focused On One Or More Of The Following Factors In Selecting A Technology:

- Time To Market: Commercial Track Record, Design Certified; Relative “Ease” In NRC Approval
- Evolutionary Versus Revolutionary: Incremental Advances Versus Relatively “Innovative”
- Passive Versus Active Systems (See Evolutionary Versus Revolutionary): Lower Capital Costs And Potential Lower Theoretical Lifetime Costs
- Capital Costs And Variable Costs

Credit Issues:

Will The Units Operate At The Levels And Costs Expected?

Are These Costs Known And Will Cash Flow Cover Them?

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The ABWR has been commissioned and operating in japan..has some US IP issues. The EPR has international approvals and is under construction.. AP 1000 has been design certified but has a significant Revision (rev 17)

The EPR has a higher design margin, and safety margin but it is likely to be expensive.

The rate based utilities vs the merchants. No actual data from commercial scale reactors at full power to validate simulations using computer models

2 loop, 3 loop to 4 loop....Konvoi and N4 technologies.

Natural processes such as gravity, condensation, compressed gases,

Technology Comparison

	Pressurized Water Reactors			Boiling Water Reactors	
	EPR	AP 1000	APWR	ABWR	ESBWR
Design certification status with the NRC	Not yet certified; submitted in Dec. 2007	Yes, but planned design will differ from the approved design and require NRC approval	Not yet certified; submitted in Dec. 2007	Yes, but planned design may differ from the approved design and could require NRC approval	Not yet certified; submitted in August 2005
Design (net) MW	1,625	1,187	1,650	1,370	1,520
Thermal output	4,500	3,415	4,450	3,925	4,275
Thermal efficiency (%)	36.1%	34.8%	37.1%	34.90%	35.60%
Capital costs	High	Low	Medium	Low	Low
Reactor coolant system	Four-loop	Two-loop	Four-loop	Not applicable	Not applicable
Safety systems	Active	Passive	Active	Active	Passive
Reactor coolant pumps (safety trains)	Four trains	Two trains	Four trains	Three trains	Two trains
O&M costs per kW	Medium	Medium	Medium	High	Low
Fuel efficiency	High	Medium	Medium	Low	High
CDF per year*	5.8×10^{-7}	5×10^{-7}	N.A.	1.6×10^{-7}	3×10^{-8}
Aircraft hazard protection in original design	Yes	No	No	No	No

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Efficiency Factors:

Increase capacity of steam generator and LP turbine

Core: fuel active height (10 feet to 14 feet) and quantity, number of assemblies.....core refueling

Neutron reflector

At what variable costs will the unit generate?

Capital costs

Fewer pumps and rotors, fewer steel piping and control systems.

4 active trains...(50% or 100% redundancy)

What capital recovery will the unit need?

Safety margin :Linear power density (Kw/ft on the fuel rods)

Double containment ;Aircraft protection; Pumps and motors requiring offsite power.....% of design completion (not a minimum required)

What kind of outage level?

Construction Poses The Greatest Credit Risk

Construction Risks Arise From The Following:

- Cost Inflation In Input Materials: Somewhat Down Recently, But Still Volatile
- Supply Chain Bottlenecks
- Unavailability Of EPC Contracts; Uncertain Labor Cost
- A Limited Construction Record
- NRC Supervision Process

Credit Issues: How Much Risk Will The Project/Developer Retain?

Nature Of EPC Contracts? Liquidated Damages, Guarantees, Warranties, Aggregate Liability

What Level Of Cost Escalations Could Occur? Are Contingencies Appropriate?

Are Schedules Adequate?

7.

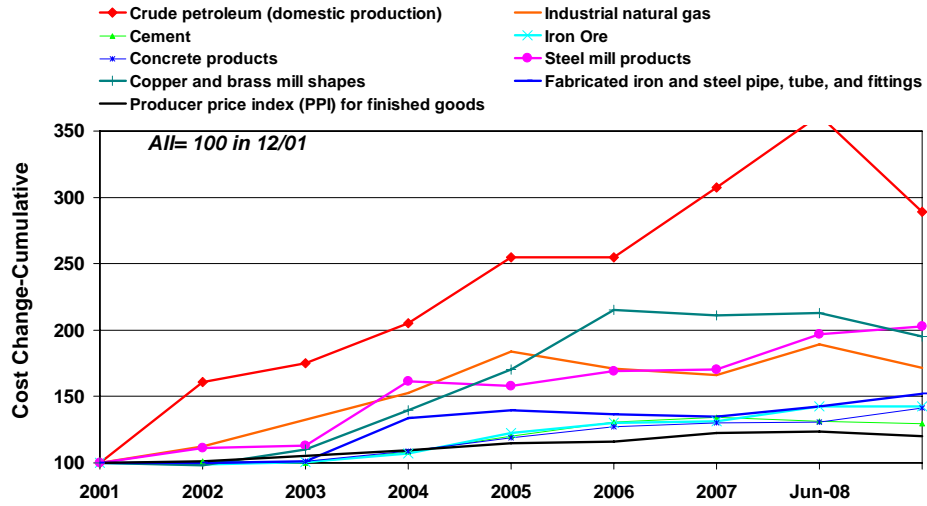
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Current build coincides head-on with unprecedented run-up in prices.
Worldwide demand and erratic supply growth
45 MT of steel per MW compared to about 15-20 MT

Little overlap between specialist metal and equipment required to residential construction

Construction Cost Growth Still Above General PPI Growth



Source: The Associated General Contractors of America, July 2008

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A Tight Supply Chain Complicates Procurement

- Long Lead Items Such As Ultra-Heavy 600-Ton Forgings (JSW)
- Low Pressure Turbine Forgings, Circulating Water Pumps, Reactor Coolant Pumps, And Commissioning Of The First Simulator
- Contractors Unwilling To Commit Because Of Supply Chain Risk

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Forging of the weld eliminates 30% of reactor pressure welds
Hitachi-Babcock, Toshiba-IHI, Areva, Mitsubishi, Areva GE are Vertical

ABWR: apart from toshiba: Fluor, Sargent & Lundy, Kajima
APWR: Mitsubishi, Obayashi, URS, Black & Veatch (Takasago)

Sumitomo, Sandvik, Valinox: SG tubes,
Doosan, ENSA: Steam gen

Unavailability Of Turnkey EPC...Cost Overrun Exposure

- Traditional EPC Unlikely Because Of Longer Development Phase, Sponsor/Contractors' Current View On Commodities, Shortage Of Labor, And Supply Chain Risk
- Negotiating Escalators Through Open Book Estimating Process
- EPC Contracts Will Still Differ

EPC Risks

Cost make-up	Risk/EPC category	Escalation
Major equipment (reactor vessel and turbine forgings etc)	Fixed with no adjustment	Fixed price
Turbine generator; instrumentation and controls	Firm with potential adjustment (fixed adjustment)	Firm price with or without fixed escalation
Miscellaneous balance of plant equipment, start-up, insurance, etc	Firm with indexed adjustment	Handy Whitman all steam and nuclear construction index
All site craft labor	Actual craft wages	Actual cost, escalated at Handy-Whitman all steam and nuclear construction index
Construction materials	Non-labor consumables	Actual cost, escalated at Handy-Whitman all steam construction Index
Start-up, detailed engineering, construction and operating license support	Time and materials	Actual cost, escalated at Handy-Whitman all steam and nuclear construction index

Source: Sponsor discussions.

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OBE :Review equipment bid price, labor hours and rates, G&A cost estimates

Contracts will still differ: Some will get fixed at close except for change orders for nuclear island labor productivity. Others may have escalators
Project contingencies can mitigate but we will view risk allocation to the vendor more favorably.

One stop or with consortium (LD's for schedule and performance; performance and schedule guarantees)
Aggregate liability, warranties.

Construction Track Record Is Limited

- Many Vendors Are Already Involved With Nuclear Retrofitting
- All Technologies Will Benefit From Uninterrupted Engineering, Manufacturing Base, And Supply Chain Logistics

YET

- Only The ABWR Has Been Built And Put Into Operation
- Modular, Open Top Construction Will Reduce Field Work, Reduce Rework, But Challenge Will Be To Successfully Train Technicians And Transfer Skilled Labor Productivity To The U.S
- Delays Can Happen For A Variety Of Reasons (Olkiluoto, Lungmen)

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On schedule and budget (40 to 43 months to fuel load; 65 to COD)

The EPR is a progression of Konvoi and N4 technologies

The ESBWR is an enhancement to the ABWR and the SBWR

The APWR is an enhancement of the 4 loop PWR (Steam generator transfer area ; turbine blade has increased from (44 inch in current 4 loop to 54 in the APWR to the 70 in the U.S APWR..52 for the ABWR,

Quality of concrete

Primary side piping

Reinforcing reactor building

The U.S EPR will have 4 units (Taishan 1-2) ahead of it and lessons learnt will be incorporated; The APWR will have lesson learnt from Tsuruga 3-4

But high level of detail design engineering completion should help

The Untested NRC Supervision Process

- NRC Personnel Have Limited Experience With Reviewing Construction And Operating Licenses Of New Nuclear Plants
- The NRC Will Allow Minor Design Changes During Construction But This Requires Specific Documentation. Procedures For Controlling, Documenting And Getting NRC Approval Is Untested
- Design Certification And COL Applications Are Proceeding In Parallel; Any NRC-Initiated Design Modification Will Require Changes To The COLA

- Appeals Are Limited To Compliance With ITAACs, But The NRC Has Not Specified Which Tasks It Considers Key And How It Would Observe These
- With Modular Construction, Many Tasks Could Be Completed Offsite, Months Before Granting Of The COL

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I believe the NEI publishes RAI (request for additional information) and the timely response.

The Influence Of State Regulatory Policies

➤ States' Policies Will Be Critical To The Decision By Utilities To Commit

➤ FLORIDA

- Annual Filings For Recovery In Rates Of Prospective Costs Associated With Site Selection, Pre-construction, And AFUDC
- Annual Prudence Review Of These Costs, Which Are Addressed Once And Only Once
- No Used And Useful Standard --- Regardless Of Whether Plant Goes In Service, Utility Will Recover Costs That Were Deemed To Be Prudently Incurred

➤ SOUTH CAROLINA AND GEORGIA

- Legislation Has Been Passed To All Utilities To Recover Construction Work In Progress

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