NUCLEAR POWER PLANT FINANCING
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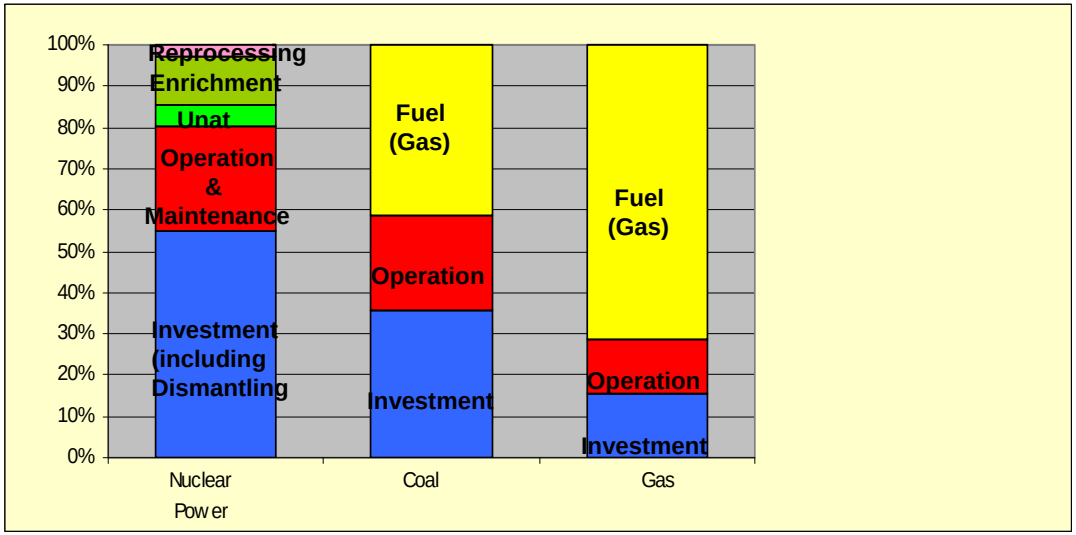
Fanny Bazile
Forecast Director
Nuclear Energy Division
French Atomic Energy Division

Costs structure : nuclear power vs fossil fuels

Investment costs (Kwe installed) : including decommissioning
Production costs (Kwh produced) : operation and maintenance
Fuel costs (Kwh produced) : raw material, enrichment, reprocessing, final waste management



- Nuclear is capital - intensive
- Fuel costs are low (10 % to 20 %) and depend very little on Uranium price
- Steady Return on investment
- Very Long Term liabilities (waste management)

	Investment ($/kwe)	Maintenance ($/kwe)	Fuel ($/Kwh)
Nuclear Power	**1000 - 2000**	**66** (46-107)	**5** (3 - 12)
Coal	**1000 - 1500**	**48** (10 - 110)	**16** (1 – 30)
Gas	**400 - 800**	**25** (5 – 39)	**36** (28 – 45)

NB : CO_2 capture increases production costs, between 30 to 60 % for coal and around 40 % for gas (MIT, The Future of Coal, 2007

Financing a nuclear programme is **a long-term commitment**

- ***Launching a nuclear programme requires a long term public investment in national infrastructure cf. doc IAEA « Milestones… » NG G 3.1 :***

  - ***Training*** *and* ***education*** *investments*
  - *« Funding the creation of* ***legal framework*** *and* ***regulatory body***
  - *Creating the expertise for* ***competent project management*** *for nuclear facility construction*
  - *Financing the creation of* ***competent operating staff*** *to safely manage, operate and maintain nuclear facilities*
  - *Financing* ***security and safeguards arrangements for the protection of nuclear facilities and materials***
  - ***Long term financing to ensure safe and secure handling of spent fuel****,* ***radioactive waste****,* ***plant decommissioning****, and the options for* ***disposal****,*
  - *Realistically financing a nuclear power project,* ***given the overall national economic and social policies and conditions****. »*

- ***Whatever the financing mechanisms for the plant itself, there must be a strong and permanent public commitment before, during and after operation of a nuclear programme.***

Financing a nuclear project

- In previous financing models, governments initiated projects and took the great majority of risks
- Today private sector seems to be willing to increase its involvement leading to more innovative financing structures
- Risk allocation will, therefore, be critical to enable new NPPs to be financed

Risk allocation

- There are risks that are specific to NPP at each stage of the power plant's life

Pre-manufacturing period →

Construction period →

Operation period →

Back - ended period →

- **Question : What are the main risks and how to allocate them ?**

Risk Allocation

	Tentative Risk allocation		
	Public Government	Private Contractor/Utility	To be Shared
Pre Manufacturing Period			
Energy policy including nuclear	X		
Public acceptance	X		
Licensing process (permits and sites)	X		
Construction Period			
Technology, Design		X	
Manufacturing completion including commissioning		X	
Delays			?
Cost overruns			?
Legal (Force Majeure, insurances, etc…)			?
Financial (funding / Equity/Debts, interest rates, etc…)		X	
Nuclear incident	X		
Environmental	X		
Political	X		
Operation Period			
Operation		X	
Fuel Supply		X	
Electricity sales (Prices and Quantities)			?
Legal		X	?
Insurance (Nuclear civil liability)			?
Financial (Debt Services…etc…)			
Nuclear incident	X		
Environmental	X		
Political	X		
Back-End Period			
Spent Fuel treatment and waste management	X US	X European	?
Decommissioning	X Case	X Case	?
Nuclear incident	X		?
Environmental	X		
Political	X		

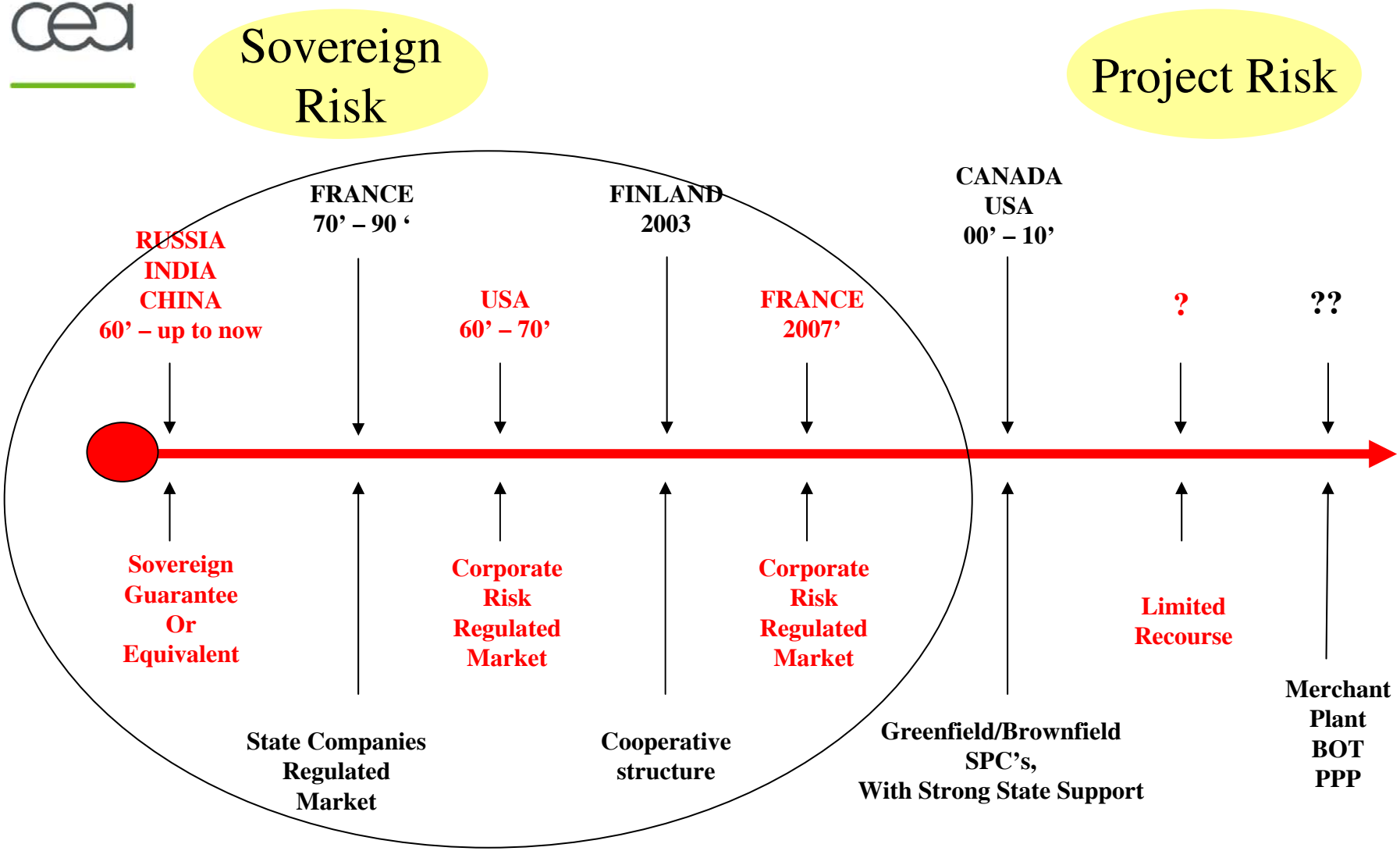
Different business model

- Based on above mentioned risk allocation New Nuclear Power Plant business models can be classified in 4 major categories :
  - Traditional State Business Model
  - Corporate Business Model
  - Hybrid Business Model
  - Pure Economic Business Model

Business Models

	Application
• **Traditional State model**	
– Government led and funded investment Projects	**France**
– Less compatible with free market structure	**India**
	China
	Russia
• **Corporate Model**	
– Corporate funds investment project	
– Economic return through long term power off take	**Finland**
– Government potentially « backstops » end-of-cycle liabilities and waste disposal	**France**
– NPP orders in 60’ and 70’ local monopolies and Corporate financing	**USA**
• **Hybrid Model**	
– Trend toward limited recourse financing structure	
– Bruce Power NPP (with strong government support)	**Canada**
• **Pure Economic Model**	
– Private sector financed, built and operated (BO)	
– Private Public Partnership (PPP)	
– Key risks to be addressed	
– But : US Energy Policy Act of 2005 defined :	
• Investment protection against delay	**USA**
• Loan guarantees (up to 80 % of project cost)	(not yet implemented)
• Production tax credit	

Overview of Financing Structures for NPPs

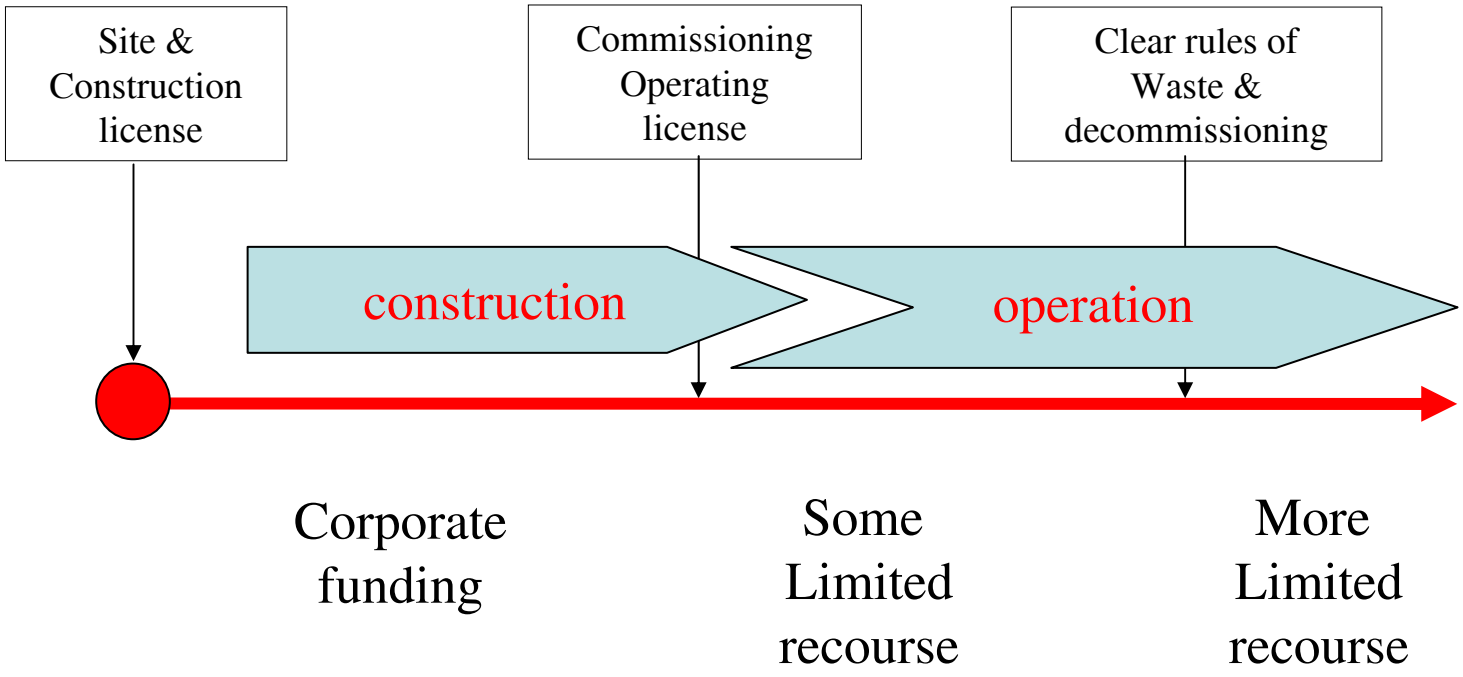


Utilities's perspectives

- RATING – Limited recourse financing vs corporate financing should have an equal impact on the Utility's ratings :
  - Limited recourse financing will have the same impact as corporate financing, as rating agencies will consolidate exposure in the debt, considering the "economic" reality of the transaction and the liability of Utility
- RISK PROFILE – The utility will try to limit as much as possible the risks associated to new nuclear builds
  - Risk sharing with the contractors, the government, the banks …

Sequential approach : from corporate to limited recourse

- At the start of project, especially for First of a Kind, and/or when adequate frameworks are not in place, financing could take place initially on a corporate basis. Limited recourse basis refinancing solution could be implemented at a later stage.



Equity / Debt Ratio

- Equity/Debt Ratio will depend on the structure of the utility and business model :
  - No officially published international benchmark for new NPP projects
  - Usually around 50/50 in energy projects possible to mitigate with a positive risk sharing

- Equity available sources :
  - Public funds
  - Own funds
  - Potential private investors (private equity funds looking for long term type of returns)

Equity / Debt Ratio

- Debts Available sources :
  - Corporate bank market
  - Bond issuance
  - Availability, rates and maturity on the utility rating, appetite and capacity of the financial market
  - Export Credit Agencies loans
  - International Financial Institutions (IFIs) Loans

Conclusion

- The private sector is likely to be able to pick up most “standard” risks (e.g. construction, operation, etc…)
- Governments are likely to need to have some involvement in most nuclear related risks
- Open questions remain as to how governments will participate to manage and mitigate such risks
- Government’s support is a pre-requisite to any NPP project and financing
- Government’s necessary level of involvement depends on local political and legal situation.