Financing of Nuclear Power

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Nuclear Infrastructure Milestones Workshop

November 2007 IAEA - Vienna

AECL EACL

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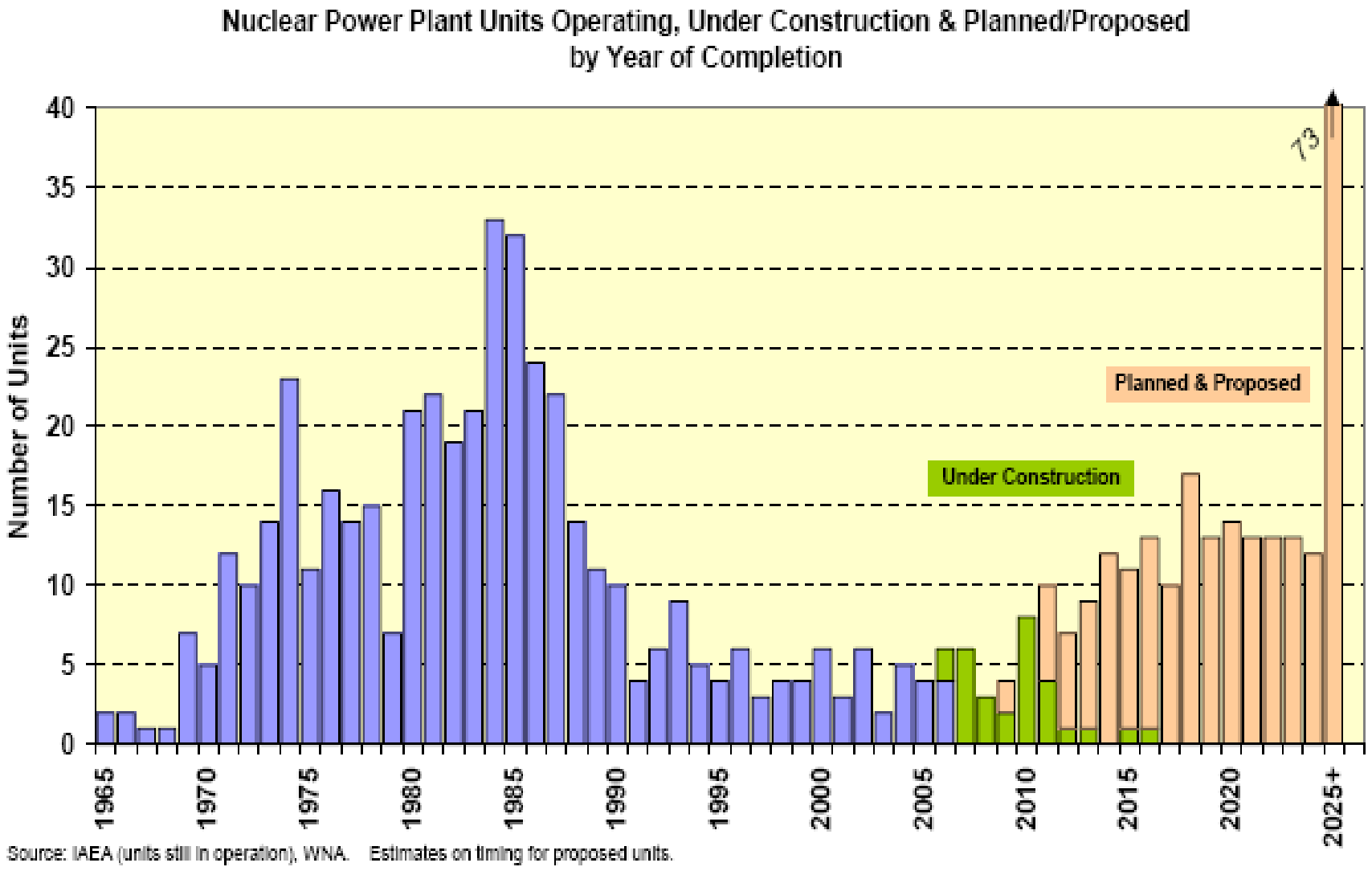
Forecast for New Reactors



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Nuclear is Back

- **US, Canada, France, Russia, build and consider new nuclear**
- **UK and many other countries consider new nuclear**
- **China, Finland, India, and Korea are building new reactors**
- **G8 supports nuclear power as part of the mix**
- **Many eenvironmentalists now supportive**

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Vendors Role in New Build

- **Vendors have now taken a more product oriented view i.e. develop new products considering all the risks associated with its implementation**
  - **Modern standard designs (ACR-1000, AP1000, EPR, etc)**
- **Worked with regulatory body and government to improve licensing process**
- **Developed expertise to mitigate project delivery risk**
- **Results are expected to be lower costs and lower risks**

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Nuclear Project Risk

- **What are the risks in a nuclear power plant project?**
- **Who takes the risks or how are the risks shared?**

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Nuclear Project Issues

- **Large capital**
- **Long project schedule**
- **High demand on skilled human resources**
- **Low variable cost of operations**
- **Complex regulatory regime**

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Past Risk Sharing Practice

- **Risk was assumed by Government, government owned utilities, public utility boards**
- **All costs both construction and operations passed on to the customer**

Essentially 100% risk on the customer.
Many projects had long delays and
Large cost overruns

Current Risk Sharing Practice

Customer is largely protected through open deregulated market

- **Risk is shared by:**
  - **Owner/Operator**
  - **Investor/Lender**
  - **Plant supplier**
  - **Main contractor/Subcontractors**
  - **Government (in case of threat to supply security)**

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Recipe for Success

- **Well designed economic plant**
- **Stable regulatory regime**
- **Risk sharing amongst all project stakeholders**
- **Extensive project planning**
- **Secure financing**
- **Strong project delivery team**
- **Managing nuclear legacy liabilities**

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Risks and Typical Risk Sharing

- **Technology (Reactor Supplier)**
- **Regulatory (Owner/Technology Supplier)**
- **Interveners (Owner/Government)**
- **Construction (Owner/Investor/Contractors)**
- **Operation (Owner/Operator/Investor/lender)**
- **Nuclear legacy (Owner/Government)**
- **Market (Owner/Investor/lender)**
- **Force Majeure (Owner/Investor/Lender)**
- **Political (Owner/Investor/Lender)**

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Project Delivery Models

Supplier as Project Manager

- **Could be Turnkey Model**

Owner as Project Manager

- **Could be:**
  - **Island Model**
  - **Multi-Package Model**

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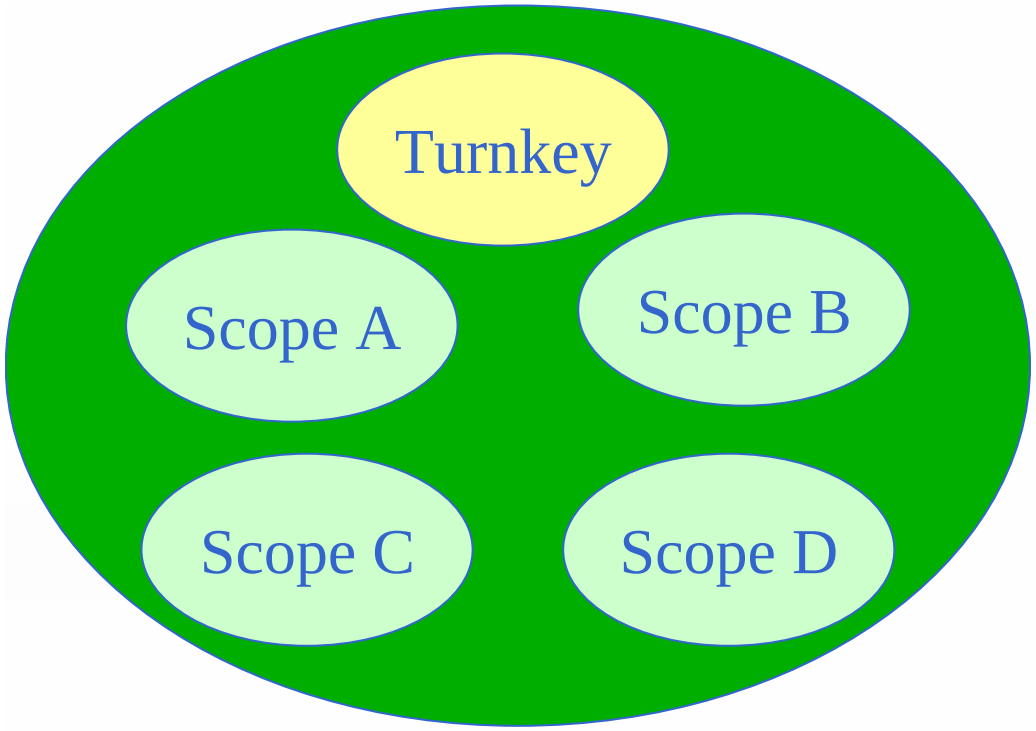
Risk Sharing by Vendor



Typically

- **There is a limit to the risk that vendors will take**
- **Exclude circumstances beyond their control**
- **Commensurate with role and responsibility**
- **Consequential risk generally not taken**

Owner/generator can not pass on all the risk

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Ownership Models

Public Model

- **Government ownership or guarantee**
- **Public utility boards**

Private Model

- **Large utilities with strong balance sheet (with or without smaller partners)**
- **Project Company owned by a number of partners (on or off balance sheet)**

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Elements of Cost

- **Pre Project activities**
- **Siting, licensing, EIA**
- **Financing (interest during construction, exposure fees, insurance premiums)**
- **Engineering/Procurement/Construction**
- **Operation and maintenance**
- **Fuel**
- **Capital upgrade**
- **Decommissioning and waste disposal**

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Sources of Financing

- **Government budget**
- **Equity**
- **Bonds**
- **Bank loans**
- **Institutional lenders/investors (e.g., pension funds)**
- **Export credit agencies**

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Sources of Financing

Equity investment

- **Often with higher return expectations**
- **May require participation in management and oversight by the investor**
- **Offered by experienced investors (utilities/large consumers)**
- **Influenced by shareholder's view**

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Sources of Financing

Bank loans

- **Banks experienced in nuclear financing**
- **Mid to short term**
- **Priced based on perceived risk**
- **Often involves full recourse expectation**

Sources of Financing

- **Institutional Investors**
  - **Example, Pension fund**
  - **Could be long term**
  - **Moderate return expectation**
  - **Less expectation of management participation**

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Sources of Financing

- **Export Credit Loans**
  - **Long term (could be 15 years plus construction period)**
  - **Reasonably priced based on OECD consensus**
  - **Can be used primarily for the exported supply and services**
  - **Could be direct lending or guarantee of commercial loans**

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Sources of Financing

Expectation of financing institutions

- Credible public consultation
- Credible environmental assessment
- Acceptable security for loans

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Phases of Project

Pre Project **tens of millions**

Pre Construction **hundreds of millions**

Construction/Commissioning **billions**

Operation

ongoing

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Private Financing Model

Pre Project	**Very high risk, all equity, very high return expectations**
Pre Construction	**High risk, mostly equity, high return expectations**
Construction/ Commissioning	**Medium risk, equity+debt, moderate return expectation, market based interest rate**
Operation	**Low risk, could be mostly debt**

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Phases of Project

Pre Project	**Equity**
Pre Construction	**Equity**
Start of Construction/Commissioning	**Equity plus debt financing**
Start of Operation	**Refinance debt to pay down equity**

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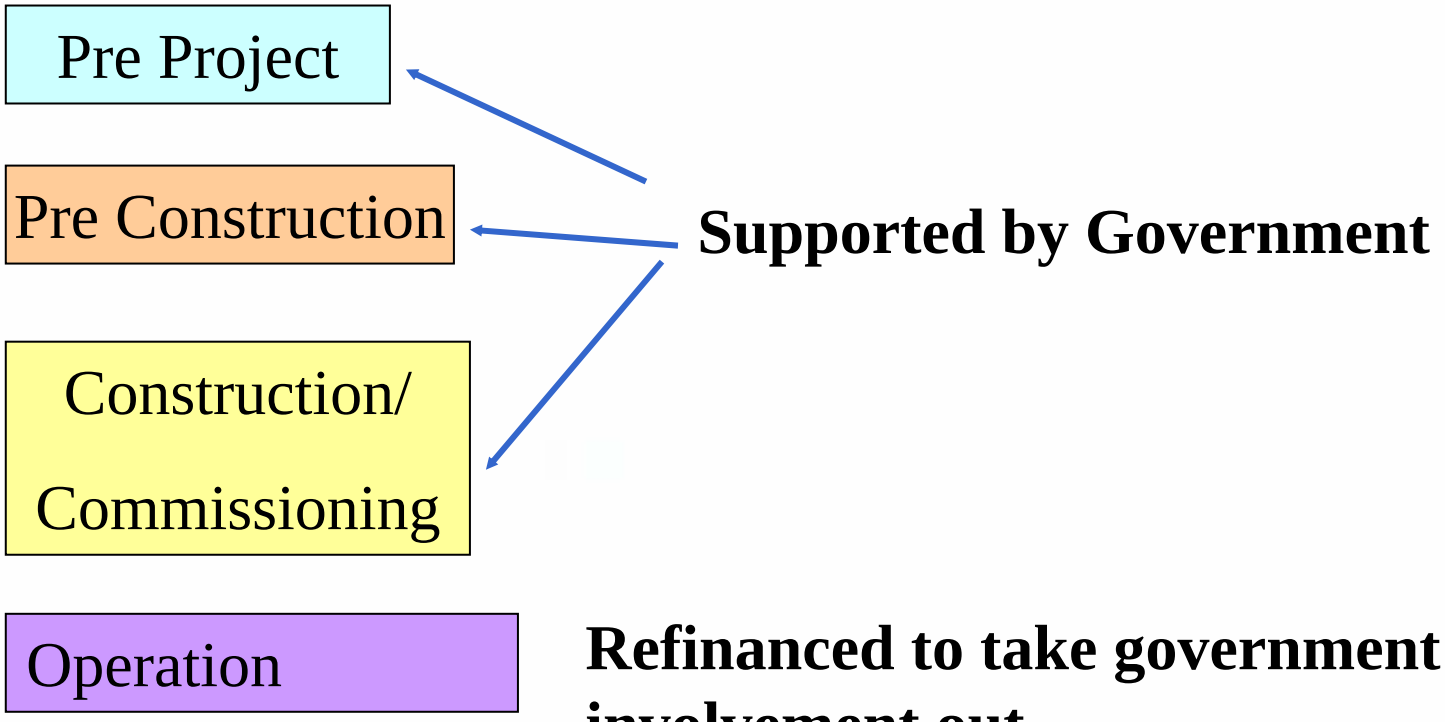
A Two Phase Approach



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Source/Security for Phases of Project

Pre Project	**Equity – Balance Sheet**
Pre Construction	**Equity – Balance Sheet**
Construction/ Commissioning	**Equity – Balance Sheet** **Debt – Balance Sheet**
Start of Operation	**Refinanced debt – Long Term Power Purchase Agreement - Market Strength**

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Elements of a Successful Financing

- **Strong project participants with good experience and balance sheet**
- **Long term Off taker with good balance sheet**
- **Fluid and solid market**
- **Project in service (amortized debt+ equity+ decommissioning) competitive**
- **Construction risk mitigation- turnkey- government funds**
- **Reputable operator**
- **Regulatory certainty early in project cycle**
- **Developed infrastructure**

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