

# **IMPROVING THE PROSPECTS OF FINANCING NUCLEAR POWER PLANTS**

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# OBJECTIVE

- Changing global environment of increasing energy consumption influencing need for nuclear power
- Capacity, diversity, generation cost, supply security and greenhouse gas emissions are all drivers
- Nuclear traditionally difficult to finance
- What factors can positively influence financing of new nuclear power plant projects?
- What changes can be introduced that will help?

# SCOPE

- Establish all factors which could influence financing of new projects and impact investor confidence
- Understand risk implications
- Provide practical guidance on steps to improve investment potential
- Consider political, socio-economic, technical, commercial and financial issues
- Complete life cycle of plant and programmes

# PROGRAMME

- **General Conference 2006 Agency requested to report to 51<sup>st</sup> session on innovative means of financing**
- **Internal Agency working group outline draft**
- **July 2007 Financing Workshop with invited experts**
- **September 2007 first draft report issued**
- **November 2007 review at Milestone Workshop**
- **December 2007 second Financing Workshop**
- **March 2008 final draft report to be issued**

# PARTICIPANTS

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- Dr Y Ibrahim - Exec Chairman NPPA, Egypt
- Mr E Napitupulu - Advisor to PT PLN Indonesia
- Mr A Tanrikut – Acting VP Turkish Atomic Energy Authority
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# REPORT CONTENTS

- Introduction
- Objectives and scope
- Background to new nuclear power projects
- Special features of nuclear power with respect to finance
- Key influencing factors and their implications
  - Political and legal risks
  - Technical risks
  - Financial risks
- Mechanisms to reduce investment risks
- Actions to explore options for prospects of financing nuclear power projects
- Conclusions

# REPORT THESIS

- Improving prospects = increasing investor confidence
- Understanding risks which impact financing
- Establishing risk ownership and responsibility
- Identifying risk mitigation strategies
- There may not be a financing ‘silver bullet’

# INTRODUCTION

- Advice and information for
  - Member states
  - Sponsors
  - Utilities
  - Architect engineers and contractors
  - Investors
  - Funding agencies
- Not focussed on technology of nuclear power, only on its financial implications

# OBJECTIVES AND SCOPE

- **Technologically complex and uncertain**
  - Still not fully matured
- **Expensive**
  - High capital cost
  - Long timescale return on investment
- **High safety standards**
  - Management of radioactive wastes
  - Potential for low probability high consequence accidents
- **Political and societal implications**
  - National and international
- **Each aspect fully examined**
  - Financing risks identified
  - Establish owners and mitigation

# BACKGROUND TO NEW NUCLEAR PROJECTS

- Early rapid developments in 1950's and 1960's
- Successive generations of commercial reactors
  - Generation 1 1960's and 1970's
  - Generation 2 1970's and 1980's
- Predominance of government lead programmes
- Pace of development halted
  - TMI
  - Chernobyl
- Continuing product development
  - Inherent/improved safety
  - Improved cost/programme predictability
  - Standardisation with reduced FOAK risk
- Declining vendor and A/E population and falling skills and experience

# BACKGROUND TO NEW NUCLEAR PROJECTS

- Financing of nuclear projects in the future will be exposed to much more private discipline
- Designs adopted for new or expanded programmes could be 'state-of-the-art' versions of existing designs  
New, 'first-of-a-kind' designs would impose more risk for financing in the absence of government backing
- The capability of individual nations to 'go it alone' and develop their own technology may represent prohibitively high technical and cost risks
- Nuclear power is an international business with world-wide implications for its development, application and especially in its potential for accidents. Any new power reactor programme, therefore, must respect this aspect, ensuring adoption of the highest and shared standards of design, construction and operation together with a robust safety culture and adherence to the norms and standards of the international community as evidenced by applicable treaties and conventions.

# **SPECIAL FEATURES OF NUCLEAR POWER PROJECTS WITH RESPECT TO FINANCE**

- **High capital cost, long construction period**
- **Long term return on investment**
- **Long term government commitment and public support**
  - **Plan, build, operate, decommission, waste management**
  - **Need to ensure funds for operation, maintenance, decommissioning and waste management**
- **Underpinning technical and human resource**

# KEY INFLUENCING FACTORS AND THEIR IMPLICATIONS

- Political and legal
- Technical
- Financial

# POLITICAL AND LEGAL RISKS

- **Commitment**
  - Sustainability through project/programme life-cycle
  - Legal underpinning
  - Public confidence
- **Regulatory change**
- **Obligations**
  - International treaties**
    - NPT, 3<sup>rd</sup> Party Liability, insurance

# TECHNICAL RISKS

- **Reactor plant design and construction**
  - Confidence ('proven'), competitive and licensable (COO and national)
- **Fuel cycle**
  - Extraction, conversion, enrichment, fabrication
- **Waste management**
  - 'end points' and legacy ownership
- **Physical Infrastructure**
  - Soil and sub-soil suitability
  - Cooling water provision
  - Earthquake characteristics
  - Groundwater and airborne pathways for radioactive discharges in normal and accident conditions
  - Natural and man-made hazard effects
  - Security
  - Transportation routes / construction logistics

# FINANCIAL RISKS

- High capital investment (~\$2bn per plant)
- Long construction time (~4-5 years)
- Sustained revenue (10-20) years
- Early programmes government backed
- Requirement changes
- Requirements of financial institutions
  - Contracting governance, repayment, charge over assets, creditworthiness, government backstop

# MECHANISMS TO REDUCE INVESTMENT RISKS

- Political and legal
- Technical
- Financial

# POLITICAL AND LEGAL

- Supporting the adoption of nuclear energy
- Becoming a signatory to relevant international conventions
- Enactment of national legislation establishing the necessary regulatory, legal, insurance and other institutional arrangements
- Encouraging and coordinating public acceptance
- Creating a national climate in favour of investing in nuclear
- Establishing and providing suitable sites for nuclear power plants including the practical processes for selection, evaluation, planning consents (approval or license) and preparation
- Establishing a strategy and defining responsibilities for the management of wastes, including the sentencing of spent fuel
- Ensuring a stable regulatory process which respects national sovereignty consistent with meeting the high and internationally agreed levels of nuclear safety
- Providing support to the utility wishing to invest in nuclear including consideration of financial guarantees of their performance, particularly for the first unit
- Recognising the need to ensure confidence in long term returns

# SOME SPECIFICS

- Enactment of a special 'nuclear law'. This is one means of 'confirming' government confidence and agreement to a nuclear power project and of giving long term sustainability
- Articulating an energy policy which specifically addresses and endorses the use of nuclear power as a valid contributor, providing strategic value in terms of cost, diversity, security and environmental benefit
- Providing 'backstop' financial guarantees, especially for the first (few) units
- Especially in deregulated markets, introducing a mechanism to safeguard longer return on investment periods Some countries are considering long term 'power purchase agreements'
- Financial support (or at least guarantees) for early licensing work to facilitate vendors demonstrating satisfaction of sovereign safety and licensing. The right to sovereign accountability for safety might be said to result in the obligation to fund its demonstration if it is judged that nuclear should be a component of national energy policy

# TECHNICAL

Probably foremost in risk reduction is the adoption of 'proven' plant designs. A definition of 'proven' is needed in this respect but it should embrace:

- A design based on several years of operating experience of similar plant
- Of proven constructability in a valid and sensibly small time schedule
- Avoiding FOAK technical, schedule and licensing issues
- Having regulatory acceptance (licensability) in its country of origin
- Able to be competitively selected from a peer group of alternatives

# TECHNICAL

- There needs to be a clear strategy to manage construction risk. The major factors which apply here include
  - Confirming site suitability and preparation and obtaining necessary clearances and consents
  - Establishing a schedule that ensures regulatory issues which may arise from the national assessment of the selected design do not significantly 'distort' the original design basis and are cleared before construction is committed
  - Ensuring necessary infrastructure improvements are identified and completed without becoming critical issues either for the construction works or investment decisions
- The strategy and plans for fuel supply should be developed at the same time as the reactor design. This will ensure that all aspects of material supply, conversion, enrichment and fabrication are considered and contracts drafted which can demonstrate confidence.
- The strategy for waste management and decommissioning will need to be prepared consistent with government policy in order that the complete 'envelope' of investment requirements can be defined.

# FINANCIAL

**An imperative is to establish and develop through time a well-founded business plan. This should as a minimum identify and define:**

- The technology strategy, which may be based around a ‘proven’ design(s)**
- The process of evaluation and competition which will determine price and schedule with confidence**
- The fuel cycle strategy and associated fuel costs**
- The waste and decommissioning strategy**
- The revenue plan and the necessary features which together with the above will determine financial feasibility**
- Requirements for and cost of infrastructure improvement**
- Requirements for and cost of utility preparation and staffing (training, recruitment, etc)**
- Strategy for technology transfer and local supply**

# FINANCIAL

- **Commercial risks**
  - Credit rating of sponsor
  - Market
  - Competition
  - Schedule
  - Utility risk
- **Economic risks**
  - Inflation
  - Interest rates
  - Exchange rates
- **Political risks**
  - Force majeure
  - Change in law
- **Government participation is seen as vital for a first unit in respect of non-design related ‘first of a kind’ issues such as**
  - First experience of regulatory process
  - Site preparation
  - Local supply chain and labour issues

# **ACTIONS FOR IMPROVING FINANCING PROSPECTS**

- **Generating a global acceptance of the benefits of nuclear**
- **Allowing real credit for environmental benefit**
- **Internationally endorsed codes and standards**
- **International design certification**
- **Establishing appropriate levels of maturity for host countries**
- **Confidence in fuel supply**
- **Involvement of investment community**

# CONCLUSIONS

- Improving prospects for financing means understanding financing risks, establishing ownership and effecting mitigation
- Risks include
  - Political and legal
  - Technical
  - Financial
- There may be no financial ‘silver bullet’

# CONCLUSIONS

- **Generation 1 and 2 programmes were largely government lead, developed and financed**
- **New generation**
  - More internationally based
    - Products, standards, resources
  - More likely to involve private finance but needs government support
  - International designs and standards
- **Nuclear perceptions and realities**
  - Generally negative (cost, hazard etc) at best neutral
  - Diversity, security, carbon-free, cost effective
- **All these factors impact on financing**

# NEXT STEPS

- **Integration with Milestone Document**
- **Redraft at workshop in December 2007**
- **Involvement of financial experts**
- **Final draft to be issued March 2008**