CONFERENCE ON NUCLEAR POWER LOCALIZATION
CAPE TOWN, SOUTH AFRICA 2011
BUILDING THE INDUSTRIAL INFRASTRUCTURE

May, 2011
NPP TECHNOLOGY

• Applied science
• Design
• Manufacture Components
• Construct
• Commission
• Operate
• Maintain
• Manage radioactive wastes
• Decommission
INTRODUCTION

Industrial Capacity to Support the Nuclear Power Plant Entry Point
WHY LOCALIZING A NP PROGRAMME
VENDOR’S INTEREST IN LOCALIZATION

• Critical Supply Chain
• Sale Argument
• NPP Cost
  - Component manufacturing
  - Module construction and logistics
  - Construction management
  - Civil works
  - Equipment supply
  - Transportation
  - Workforce etc.
COUNTRY’S INTEREST

NPP & Related facilities

Existing industrial Infrastructure

Industrial Infrastructure Addition to be developed

Spin-off
COUNTRIES’ BENEFIT

- Autonomy - self-reliance
  - ability to implement program without undue dependence on others
- Economic development
  - local companies to benefit from economic activity
- Scientific & Industrial Development
  - strengthens centers of excellence that support other industries
- Shorten the supply chain
  - suppliers closer to customers
  - eliminate language barriers
- Costs
  - reduce costs in a multi-unit new build program
- Spin-Off Effect
  - Industry, education and training, R&D etc.
  - Jobs Creation
TYPICAL MANPOWER LOADING CURVE FOR NUCLEAR POWER PROJECT

Professionals, Technicians & Craftsmen Requirements

40-50 professionals required for nuclear power programme planning & project pre-planning

- Decision to build first nuclear plant
- 2006?
- Pre-project planning
- 2007
- Bid evaluation
- 2010?
- Plant component fabrication
- 2020?
- Project implementation
- 2027
- Plant construction
- 2027
- Plant commissioning
- 2028
- First nuclear plant
- 2030
- Plant operation
- 2032
- Second nuclear plant

Year

1000
2000
3000
4000
5000
6000
### Estimated manpower requirements at the peak during NPP project construction and commissioning

<table>
<thead>
<tr>
<th>Activity</th>
<th>Manpower classification</th>
<th>High-grade Professionals</th>
<th>Professionals</th>
<th>Technicians</th>
<th>Craftsmen</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>1. Pre-Project activities</td>
<td></td>
<td>1</td>
<td>27</td>
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<tr>
<td>2. Project Management</td>
<td>NEPIO/O-O</td>
<td>8</td>
<td>47</td>
<td>10</td>
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<td>65</td>
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<td></td>
<td>Main-contractor</td>
<td>8</td>
<td>22</td>
<td>5</td>
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<td>3. Project engineering</td>
<td></td>
<td>25</td>
<td>185</td>
<td>160</td>
<td></td>
<td>370</td>
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<td>4. Procurement</td>
<td></td>
<td>8</td>
<td>12</td>
<td>10</td>
<td></td>
<td>30</td>
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<tr>
<td>5. Quality assurance / Quality control</td>
<td></td>
<td>8</td>
<td>32</td>
<td>60</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>6. Manufacturing of equipment &amp; components</td>
<td></td>
<td>90</td>
<td>210</td>
<td>600</td>
<td>2100</td>
<td>3000</td>
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<tr>
<td>7. Plant construction</td>
<td></td>
<td>10</td>
<td>80</td>
<td>340</td>
<td>2270</td>
<td>2700</td>
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<tr>
<td>8. Plant commissioning</td>
<td></td>
<td>10</td>
<td>40</td>
<td>50</td>
<td>100</td>
<td>200</td>
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<tr>
<td>10. Nuclear fuel cycle (fuel fabrication)</td>
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<td>5</td>
<td>35</td>
<td>70</td>
<td>30</td>
<td>140</td>
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<tr>
<td>11. Nuclear Licensing &amp; Regulation</td>
<td></td>
<td>45</td>
<td>5</td>
<td>1447</td>
<td>4530</td>
<td>6940</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td>243</td>
<td>720</td>
<td>1447</td>
<td>4530</td>
<td>6940</td>
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</table>
OUTLINE OF THE PRESENTATION

1. STRATEGY FOR LOCAL INDUSTRIAL INVOLVMENT IN NP PROGRAMME
2. ELEMENTS FOR CONSIDERATION
3. BUILDING THE INDUSTRIAL INFRASTRUCTURE
STRATEGY FOR LOCAL INDUSTRIAL INVOLVEMENT
KEY QUESTIONS

• Extend of the Envisaged NP Programme Number of NPPs planned?

• To what degree the country wish to be independent: execution of the programme, construction, operation, maintenance etc.?

• To what degree is it feasible for the present industries to meet these objectives and participate with their existing know-how?

• What new technologies and facilities are needed?

• Risks for any deficiencies in the transfer process with the timing of the nuclear programme?

• Investment required in setting up the planned Industrial Infrst.?
KEY QUESTIONS

• Is that investment economically viable & comparative cost advantage for the country?

• The new infrastructure open up to new non-nuclear work and will it help to make the existing industries more competitive?

• Human resources available be able to meet the additional load implied by participation in the nuclear programme?

• How firm is the nuclear programme and is it likely to change along the way?

In all cases, for the industrial infrastructure to be a success, it should be first economically viable so that it may provide a maximum of motivation to the participating industries and meet the political strategy needs: job creation, development etc.
<table>
<thead>
<tr>
<th>ISSUES FOR CONSIDERATION</th>
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</thead>
<tbody>
<tr>
<td><strong>ISSUES</strong></td>
</tr>
<tr>
<td>National position</td>
</tr>
<tr>
<td>Management</td>
</tr>
<tr>
<td>Funding and financing</td>
</tr>
<tr>
<td>Legislative framework</td>
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<tr>
<td>Regulatory framework</td>
</tr>
<tr>
<td>Human resources development</td>
</tr>
<tr>
<td>Interested parties involvement</td>
</tr>
<tr>
<td>Site and supporting facilities</td>
</tr>
<tr>
<td>Electrical grid</td>
</tr>
<tr>
<td>Environmental protection</td>
</tr>
<tr>
<td>Emergency planning</td>
</tr>
<tr>
<td><strong>Industrial involvement</strong></td>
</tr>
<tr>
<td>Procurement</td>
</tr>
<tr>
<td>Security and physical protection</td>
</tr>
<tr>
<td>Procurement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PHASE 1</strong></th>
<th><strong>PHASE 2</strong></th>
<th><strong>PHASE 3</strong></th>
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</thead>
<tbody>
<tr>
<td>CONDITIONS</td>
<td>CONDITIONS</td>
<td>CONDITIONS</td>
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</table>

- **Conditions:** Indicates areas requiring specific attention and action.
MILESTONE APPROACH

Nuclear power option included in national energy strategy

MILESTONE 1: Ready to make a knowledgeable commitment to a nuclear programme

MILESTONE 2: Ready to invite bids for the first nuclear power plant

MILESTONE 3: Ready to commission and operate the first nuclear power plant

Nuclear Infrastructure Development Programme

PHASE 1
Pre-project
Considerations before a decision to launch a nuclear power programme is taken

PHASE 2
Project decision making
Preparatory work for constructing a NPP after policy decisions has been taken

PHASE 3
Activities to implement a first NPP

Construction

Operation of the first nuclear power plant

First NPP Project

Feasibility study
Bidding process
Commissioning
PHASE 1

- Assessments of national and local industrial capabilities;
- Assessment of the interest of business and industrial leaders in participating in the nuclear programme considering the special requirements that are necessary;
- Consideration of the ability to obtain the necessary investment for intended upgrading of industrial facilities and programmes;
- Develop short term and long term policies to encourage the level of participation that is practical and desired.
Industry, Government, Operator and Labor must have a clear understanding what is possible and what is required to achieve formulate a national position

- Skills
- Local Manufactures Capabilities
- Technology Transfer Mechanisms
- Intellectual Property Requirements
- Funding & Financing
- Viability & Affordability
- Industry Gap to Nuclear Requirement : Safety, Code & Standards etc.
Cooperation plays a more relevant role in the contractual programme. Vendors / Contract with Utility Vendors / Contracts with RBs Suppliers / Contracts with local industry.
ELEMENTS FOR CONSIDERATION
TYPE OF RISKS

- Political Risk
  - Sustained commitment to nuclear program
  - Public opinion

- Country Risk
  - Currency (foreign exchange)
  - Law & Dispute Resolution
  - Local content
  - Other (currency controls, tax, import restrictions, corruption, ownership)

- Regulatory / Licensing Risk
  - Component Certification
  - Design approval
  - Construction & Operating licenses
  - Construction & Operation oversight
TYPES OF RISKS

• Technology Risk
  • Certification of design
  • First-of-a-kind risk
  • Does the technology work?

• Completion Risk
  • Schedule Delays
  • Cost Overruns

• Labor & Materials Risk
  • Labor availability and pricing
  • Materials pricing
1. **Extend of Available national industry and extend of national participation**

   *Technical limitations* may result from the:
   - Ability of local suppliers to meet delivery schedule
   - Ability to meet stringent quality requirements
   - Availability of qualified manpower
   - Availability of relevant technology and know-how.

   *Financial and economic limitations* linked to the:
   - Availability of funds for expanding the factory facilities and machinery which would permit acquisition of new technologies;
   - Adequacy of the market size to justify the investments required for the items to be produced domestically;
   - Actual total cost of the items to be produced domestically as compared with cost on the international market.
2. Legal framework including International treaties, export and import control, Liabilities etc.
3. Safety and security
4. Non proliferation
5. Contracting Strategy and Contract Structures
6. Economy, Funding and Financing
7. Transport and logistic
8. Codes and Standards
9. Integrated Management systems
10. Supply Chain Mechanisms
11. Intellectual Property Rights
12. Public information and communication
13. Workforce planning and development
BUILDING THE INDUSTRIAL INFRASTRUCTURE
LOCAL DEVELOPMENT

1. KNOWLEDGE
2. METHODS / PROCESSES / ORGANIZATION
3. TECHNOLOGY & TECHNICS ABSORPTION
4. NETWORKING, PARTNERSHIP, COOPERATION
5. CONTRACTING APPROACH
<table>
<thead>
<tr>
<th>Activity</th>
<th>Turnkey</th>
<th>Split package</th>
<th>Multiple package</th>
</tr>
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<tbody>
<tr>
<td>Pre-project activities</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td>Project management</td>
<td>MC</td>
<td>AE or U</td>
<td>U + AE</td>
</tr>
<tr>
<td>Project engineering</td>
<td>MC</td>
<td>AE or U + SS</td>
<td>U or AE</td>
</tr>
<tr>
<td>Quality assurance / Quality control</td>
<td>MC + U</td>
<td>AE + SS + U</td>
<td>U + AE</td>
</tr>
<tr>
<td>Procurement</td>
<td>MC</td>
<td>AE or U + SS</td>
<td>U or AE</td>
</tr>
<tr>
<td>Application for license</td>
<td>U</td>
<td>U</td>
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<tr>
<td>Licensing</td>
<td>RA</td>
<td>RA</td>
<td>RA</td>
</tr>
<tr>
<td>Safeguard, physical protection</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>MC</td>
<td>SS + EM</td>
<td>EM</td>
</tr>
<tr>
<td>Site preparation</td>
<td>U or MC</td>
<td>U or AE</td>
<td>U or AE</td>
</tr>
<tr>
<td>Erection</td>
<td>MC</td>
<td>AE + SS</td>
<td>U or AE</td>
</tr>
<tr>
<td>Equipment installation</td>
<td>MC</td>
<td>AE + SS</td>
<td>U or AE</td>
</tr>
<tr>
<td>Commissioning</td>
<td>MC</td>
<td>AE + U</td>
<td>U or AE</td>
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<tr>
<td>Plant operation and maintenance</td>
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<td>U</td>
<td>U</td>
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<tr>
<td>Fuel procurement</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td>Fuel fabrication</td>
<td>FS</td>
<td>FS</td>
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<tr>
<td>Waste management</td>
<td>U</td>
<td>U</td>
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</tbody>
</table>

Symbols:  
AE: Architect engineer  
RA: Regulatory authority  
EM: Equipment manufacture  
SS: System supplier  
FS: Fuel supplier  
U: Utility  
MC: Main contractor
BUILDING INDUSTRIAL INFRASTRUCTURE

1. KNOW WHERE THE COUNTRY IS: ASSESSMENT NATIONAL INDUSTRY
2. STRATEGY FOR INDUSTRIAL INVOLVEMENT
3. FRAMEWORK FOR INDUSTRIAL INVOLVEMENT
4. WORKFORCE DEVELOPMENT
5. TRANSFERT OF TECHNOLOGY & INTELECTUAL PROPERTY MECHANISMS ESTABLISHMENT
6. FUNDING, FINANCING, CONTRACTING etc.
7. INDUSTRIAL CAPACITY BUILDING
POTENTIAL LOCALIZATION PROGRAMME

1. Preliminary survey of major manufacturers in the country
2. Assessment of localization potential
3. Detailed manufacturer survey
4. Establish pre-project agreements with selected manufacturers
5. Establish manufacturing technology transfer plans for each manufacturer
6. Following project commitment, commence full technology transfer programs
CONCLUSION
Participation of the national industry in the nuclear power programme / business depends upon the strategic analysis undertaken as part of national policy and the proposed scope of the NPP programme from which business plans and incentives will emerge.

Public Private Partnership ensure a long term sustainability of the local industrial Involvement in nuclear business
Thank you for your attention

...atoms for peace.