THE PROGRESS OF NUCLEAR POWER PROGRAMME IN MALAYSIA


Ir Dr Mohamad Puad Haji Abu,
Director of Nuclear Power Division,
Malaysian Nuclear Agency (Nuclear Malaysia)
Ministry of Science, Technology & Innovation (MOSTI)
Malaysia
OUTLINE OF PRESENTATION

• Introduction
• Nuclear Power Infrastructure Development Program
• Challenges
• ASEAN TWG-NPP
• SMR
Introduction
Despite the existence of Five-Fuel Diversification Policy, i.e. oil, gas, coal, hydropower & renewable energy, there are only three major energy sources used for power generation, with coal mostly imported, indigenous gas supply uncertain beyond 2019, and hydropower resources located mostly in Sarawak & adequate to only around 2030.
PROSPECTS FOR EXISTING ENERGY SOURCES

OIL
- depleting national oil reserves, with exploration moving to deeper seas & Malaysia expected to revert to being a net oil importer within the decade;
- need to reserve oil for future generations & other sectors, such as transportation, where it is difficult to replace oil as fuel;
- oil already decoupled from power sector & no longer viable for electricity.

GAS
- high dependence on gas for power, with cap on use of gas for power generation;
- deregulation of gas prices with subsidy roll-back;
- current gas fields depleted by around 2030 with new fields of higher CO₂ content;
- competing demand as feedstock to petrochemical industry & as industrial fuel;
- committed exports of liquefied natural gas (LNG) from fields in Sabah & Sarawak;
- inadequacy of gas supply for power beyond 2018 & import of LNG from 2015.

COAL
- supply security issues with over 97% national dependence on coal imports;
- supply constraints by exporters & coal price volatility, especially within the region;
- limited availability of high quality indigenous coal deposits, with mostly sub-bitumeneous & lignitic coal.

HYDRO
- remaining potential in the Peninsula exhausted, except for small peaking hydro;
- limit to availability of Sarawak hydropower resources for supply to Peninsula;
- geographical hydropower supply-demand mismatch between Peninsular & Sarawak with need for subsea HVDC link over 670 km. through South China Sea.

RENEWABLE
- renewable energy sources lack economic competitiveness in near future;
- limited potential for renewable energy of total of only 4,000 MWe by 2030;
- introduction of feed-in tariff (FIT) for power generation from renewable energy;
- more suited in reducing commercial energy demand than in substituting supply;
- development of solar power equipment manufacturing industries.
NATIONAL POWER GENERATION MIX FORECAST

2015
121,000 GWh

2020
149,000 GWh

2025
179,000 GWh

2030
211,000 GWh

Legend:
- Natural Gas
- Coal
- Diesel
- Hydro
- Renewable
- Nuclear
DETAILED TIMELINE ON NUCLEAR POWER DEPLOYMENT

Source: Nuclear Malaysia; Malaysia NKEA OGE Laboratory 2010.
Nuclear Power Infrastructure Development Program
Nuclear Power Infrastructure Development Program

• Establishment of National Nuclear Policy
• Formation of NEPIO
• Formation of TSO
• International tender for appointment of consultant:
  – Regulatory study
  – Site study
  – Feasibility study
  – NPIDP study
  – Public acceptance study
National Nuclear Policy

Nuclear Sector Development for Malaysia

July 2010
NUCLEAR SECTOR DEVELOPMENT

VISION
Peaceful, safe & secure utilisation of nuclear energy & technology for national well-being & sustainable development

MISSION
To enhance the national capability & competency for peaceful, safe & secure utilisation of nuclear energy & technology for sustainable development & national well-being through technological innovation & appropriate legal & regulatory framework towards eventual technological self-reliance.

OBJECTIVE
Energy Applications
To enhance the national readiness for the utilisation of nuclear energy as one of the fuel options for electricity generation to ensure energy supply security post-2020.

OBJECTIVE
Non-Energy Applications
To enhance nuclear & radiation technology innovation & application in various industrial sectors, healthcare, agriculture, resource management & environmental protection towards enhancing national economic competitiveness, societal well-being, food & water security, and sustainable development in line with other relevant national policies, particularly the national policies for the relevant sectors of applications.

FIVE SECTORAL APPLICATION THRUST AREAS

THRUST 1: Energy
THRUST 2: Industry
THRUST 3: Medicine & Healthcare
THRUST 4: Food & Agriculture
THRUST 5: Water, Natural Resource & Environmental Management

FIVE CAPACITY-BUILDING THRUST AREAS AS FOUNDATION

THRUST 6: Research, Development & Application
THRUST 7: Comprehensive Nuclear Legislation & Regulations
THRUST 8: Human Capital Development & Competency
THRUST 9: Public Information
THRUST 10: Compliance with International Nuclear Governance
## NUCLEAR SECTOR DEVELOPMENT

### FIVE SECTORAL APPLICATION THRUST AREAS

|------------------|-------------------|-------------------------------|-----------------------------|---------------------------------------------------------|

### FIVE CAPACITY-BUILDING THRUST AREAS AS FOUNDATION

<table>
<thead>
<tr>
<th>THRUST 6: Nuclear Energy &amp; Technology Research, Development, Application &amp; Commercialisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>THRUST 7: Comprehensive Legislative &amp; Regulatory Framework &amp; Institutional &amp; Technological Infrastructure</td>
</tr>
<tr>
<td>THRUST 8: Human Capital Development &amp; Competency Verification</td>
</tr>
<tr>
<td>THRUST 9: Transparent, Objective, Accurate &amp; Timely Dissemination of Public Information</td>
</tr>
<tr>
<td>THRUST 10: Compliance with the International System of Governance &amp; Engagement In International Cooperation &amp; Relations</td>
</tr>
</tbody>
</table>
11/1/11

FORMATION NEPIO

Malaysia Nuclear Power Corporation (MNPC), a company limited by guarantee and not having a share capital
Functional Structure

Y.A.B. Prime Minister

Chairman
Chief Executive Officer
2 Ex-Officio
4 Member

Chief Executive Officer
Expert in Nuclear Field

Nuclear Power Programme Development Unit
Unit Head
Officer on secondment from Malaysia Nuclear Agency

Public Information & Public Consultation Officer
Technical, Commercial & Policy Consultants
Economic & Technology Localization Assessment Team
Human Capital Development Team

Nuclear Regulatory Coordination Unit
Unit Head
Officer on secondment from Atomic Energy Licensing Board

Legal & Regulatory Team

Nuclear Power Project Development Unit
Unit Head
Officer on secondment from Tenaga Nasional Berhad

Nuclear Power Plant Technology & Fuel Cycle Assessment Team
Environmental Assessment & Siting Team

Cabinet Committee on Nuclear Power
Secretariat: MNPC
MNPC Objectives

Three (3) objectives:

1. To plan, spearhead and coordinate the implementation of nuclear energy development programme for Malaysia and to take the necessary action to realize the development of the first nuclear power plant in Malaysia.

2. To ensure the development of nuclear infrastructure for the country is in line with International Atomic Energy Agency (IAEA) guidelines covering 19 key areas (national position, nuclear safety, management, funding and financing, legislative framework, safeguards, regulatory framework, radiation protection, electrical grid, human resource development, stakeholder involvement, site and supporting facilities, environmental protection, emergency planning, security and physical protection, nuclear fuel cycle, radioactive waste, industrial involvement and procurement).

3. To identify company or special purpose vehicle (SPV) to be the owner and/or operator of nuclear power plant.
Current Activities of MNPC

International Tender for appointment of consultant:

• Regulatory infrastructure study (Study in Progress)
• Site study (awarded)
• Feasibility study (awarded)
  • Technology assessment and selection
    • May be SMR or Bigger
• Nuclear Power Infrastructure Development Program study (awarded)
  • Industrial capability
  • R&D Capability
  • Education & Training capability
  • ETC
• Public acceptance study (awarded)
Whatever finding by the consultant will be verified by IAEA
1/1/11

FORMATION TSO
Malaysia Nuclear Agency (Research Centre)
### ORGANISATIONAL ROLE & FUNCTIONS

<table>
<thead>
<tr>
<th>ROLE UNDER THE ECONOMIC TRANSFORMATION PROGRAMME (ETP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The key role of Nuclear Malaysia in the National Key Economic Areas (NKEA) under the Economic Transformation Programme (ETP) is in supporting the implementation of the Entry Point Project (EPP) on nuclear power development under the Oil, Gas &amp; Energy (OGE) Sector as a Technical Support Organisation (TSO) as indicated in the Implementation Charter for the EPP in nuclear power development.</td>
</tr>
</tbody>
</table>

A TSO Transformation Plan is being developed by Nuclear Malaysia, taking into account the anticipated transfer of responsibilities on nuclear power programme development to the newly-established Malaysia Nuclear Power Corporation (MNPC) under the Prime Minister.
Task of Nuclear Agency

1. Support
   - nuclear power plant regulator
   - NPP operator
   - local industry

2. Develop new technologies

3. Provide expertise and advice to government

4. Conduct R&D

5. Transfer of Technology
TSO PROGRAM/ACTIVITIES (Nuclear Malaysia Involvements)

- Public information
- Siting
  - Environmental Impact Assessment (EIA)/
  - Social Impact Assessment (SIA)
  - Radiological Impact Assessment (RIA)
- Feasibility Study
  - Technology assessment
  - Safety assessment
  - Industrial capabilities
- Education and Training
  - Reactor Operator Training
  - Radiation Protection Officer Training
  - Nuclear Engineering Experimental Lab for academics and Industry
- Regulatory framework preparation
  - Licensing Regulation for Nuclear Installation
  - Safety Analysis Report
- Invitation and Evaluation of bids for nuclear power plants
  - Technical Evaluation
Challenges
## KEY CHALLENGES IN NUCLEAR POWER DEPLOYMENT

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Potential resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public Acceptance</strong></td>
<td>▪ Public opinion survey to identify priority segments &amp; concerns</td>
</tr>
<tr>
<td></td>
<td>▪ Awareness projects</td>
</tr>
<tr>
<td></td>
<td>▪ Transparency in project implementation</td>
</tr>
<tr>
<td><strong>International Governance</strong></td>
<td>▪ Fast-track process and make government priority</td>
</tr>
<tr>
<td></td>
<td>▪ Sign/ratify relevant treaties &amp; conventions</td>
</tr>
<tr>
<td><strong>Regulatory Context</strong></td>
<td>▪ Align on international best practices</td>
</tr>
<tr>
<td></td>
<td>▪ Top-down mandate to accelerate process</td>
</tr>
<tr>
<td></td>
<td>▪ Engage foreign experts to assess site &amp; construction permit applications</td>
</tr>
<tr>
<td><strong>Nuclear Plant Site Acquisition</strong></td>
<td>▪ Put in place detailed regulations</td>
</tr>
<tr>
<td></td>
<td>▪ Acquire approval for plant sites</td>
</tr>
<tr>
<td></td>
<td>▪ Obtain public support in locality</td>
</tr>
<tr>
<td><strong>Construction Timeline</strong></td>
<td>▪ Public information programme</td>
</tr>
<tr>
<td></td>
<td>▪ Option for localities to bid to host nuclear plants as in Japan &amp; Republic of Korea</td>
</tr>
<tr>
<td><strong>Project Financing</strong></td>
<td>▪ Negotiate with vendors based on timeline</td>
</tr>
<tr>
<td></td>
<td>▪ Require best-in-class timeline from vendors</td>
</tr>
<tr>
<td></td>
<td>▪ Obtain low-cost financing</td>
</tr>
<tr>
<td></td>
<td>▪ Combine low-cost &amp; market financing (e.g. sovereign-guaranteed foreign export credits, foreign equity, commercial loans, including Islamic financing)</td>
</tr>
</tbody>
</table>

Source: Nuclear Malaysia; Malaysia NKEA OGE Laboratory 2010.
ASEAN TWG-NPP
General

- ASEAN Member State- Indonesia, Vietnam, Thailand, Malaysia, Philippine, Singapore, Brunei, Laos, Myanmar.
- Established in 2008
- The goal of the Ad-hoc TWG-NPP is to facilitate technological cooperation among ASEAN Member States in pursuing clean and sustainable nuclear energy in a safe and secure manner
TOR

• To provide a forum for the exchange of information on the progress of national and international science and technologies activities with regard to nuclear power plants,
• To coordinate the implementation of joint scientific and technological cooperation activities in support of the development of NPP,
• To provide technical advice and support ASEAN Member States for the implementation of national plans to develop NPP, and
• To provide recommendations and inputs to the ASEAN Committee on Science and Technology (COST), the AMMST and other relevant ASEAN bodies, and contribute to status reports, coordinated research projects and technical meetings in fields related to NPP;
• Where appropriate, to develop and coordinate a program to promote the benefits of NPP to ASEAN’s peoples.
Project Development

• Research and Development in Reactor Technology
  – SMR
  – Fuel Technology
  – Gen iv

• Education and Training for Capacity Building
  – Higher Education
  – R&D
  – Reactor Operator
Small and Medium Reactor
Need in Malaysia

• Research reactor – TRIGA PUSPATI (RTP) 1MW at Nuclear Malaysia. For now, Malaysia need research reactor with high neutron flux which can be supply by Fast Neutron Reactor SMR.

• Future electricity generation at remote area or island.

• For future Hydrogen production.

• In 2021 and 2023 Malaysia plan to have 1000 MW reactor respectively and probably by 2030, 2 SMR might be proposed to propel nation's future energy demand
Thank you.