MALAYSIA: OPTIMIZING IAEA & INTERNATIONAL COOPERATION FOR A NEW NUCLEAR POWER PROJECT

By
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Malaysian Nuclear Agency
IAEA National Liaison Agency
OUTLINE

- Introduction
- Status of activities
- Cooperation with the IAEA
- Cooperation with others international partner
- Summary
MAP OF MALAYSIA

PENINSULAR MALAYSIA
40% of land area; 80% of population.

STATES OF SABAH & SARAWAK
80% of land area; 20% of population.

MALAYSIA (2010)
Land Area: 329,733 sq. km
Population: 28.3 million (2010 Census)
Thematic Areas:

1. Nuclear Power Programme Planning and Related National Infrastructure Building
2. Nuclear Safety, Security and Safeguards
3. Research and Development in Physical and Biological Sciences
4. Industry and Environment
5. Radiation Processing Technology Applications
6. Nuclear and Radiation Technology Applications
7. Medical and Healthcare
8. Agriculture and Biotechnology
9. Human Capacity Building and Knowledge Management
ETP launched on 25 October 2010

EPP 11 of OGE: Deploying Nuclear Energy For Power Generation
Malaysia is exploring the option of deploying nuclear energy in order to meet future demand and diversify the energy mix for Peninsula Malaysia.
NUCLEAR ENERGY IN THE ECONOMIC TRANSFORMATION PROGRAMME (ETP)

EPP 11: Deploying Nuclear Energy for Power Generation

**Rationale**

Malaysia is exploring the option of deploying nuclear energy in order to meet future demand and diversify the energy mix for Peninsular Malaysia. A Nuclear Power Development Steering Committee, headed by the Ministry of Energy, Green Technology and Water, was set up in June 2009 to plan and coordinate the preparatory efforts towards deploying nuclear energy for electricity generation. The committee has been tasked to conduct various studies towards preparing a Nuclear Power Infrastructure Development Plan (NPIDP), which is targeted to be ready by 2013. Prior to conducting these necessary studies, a nuclear power pre-feasibility study and initial site selection study has already been undertaken.

**Actions**

The Steering Committee is studying the possibility of delivering a twin-unit nuclear power plant with a total capacity of 2 gigawatts, with the first unit in operation by 2021. The plan under development lays out a development timeline of 11 to 12 years from pre-project to commissioning. The plan presents a positive case for nuclear energy in Malaysia (*Exhibit 6-17*). Firstly, if Malaysia developed nuclear energy, it would be cost-competitive, supplying the cheapest source of energy. Secondly, nuclear power is a cleaner energy than coal and gas (0 grams of carbon dioxide equivalent per kilowatt hour vs approximately 800 and 400 grams respectively).
NUCLEAR ENERGY IN THE ECONOMIC TRANSFORMATION PROGRAMME (ETP)

Funding
Building the twin unit nuclear plant is expected to require a **RM21.3 billion investment** up to 2020.

Enablers
In order to ensure prompt delivery, the project will be launched without delay and four critical path items must be addressed with highest priority. Firstly, there must be **public acceptance of the project**. Secondly, Malaysia must **ratify the relevant international treaties**. Thirdly, the Government must ensure that the **correct regulatory framework is put in place**. Finally, **approvals for plan sites including from local populace must be obtained**.

Impact
Construction of the nuclear power plants will have a temporary GNI impact in the construction sector, with GNI contribution of **RM0.2 billion** from the creation of 2,600 jobs. The jobs will include roles covering plant operation and maintenance, waste management and licensing and regulation. Once operational (post 2020), the two 1-gigawatt nuclear power plants will generate GNI amounting to **RM1.8 billion** per year from the electricity generated.
ESTABLISHMENT OF MALAYSIA NUCLEAR POWER CORPORATION (MNPC) AS NUCLEAR ENERGY PROGRAMME IMPLEMENTING ORGANISATION (NEPIO)

2011
7TH JANUARY 2011:

ESTABLISHMENT OF MALAYSIA NUCLEAR POWER CORPORATION (MNPC) AS A NEW FULLY DEDICATED NUCLEAR ENERGY PROGRAMME IMPLEMENTING ORGANISATION (NEPIO)

Malaysia Nuclear Power Corporation (MNPC) registered under the Companies Act of Malaysia, as a fully Government-owned company limited by guarantee, without share capital, placed under the jurisdiction of the Prime Minister’s Department, as a new fully dedicated NEPIO,

and officially launched by the Prime Minister to spearhead nuclear power deployment under the Economic Transformation Programme (ETP) on 11th January 2011.
CORE ACTIVITIES WITH IAEA RELATED TO NUCLEAR POWER PROGRAMME

• Human Resource Development
• Expert Mission
• Coordinated Research Projects
• Support for Self-Assessment
DETAILED TIMELINE ON NUCLEAR POWER DEPLOYMENT

**Project Development**

- Start Feasibility Study (FS) & Bid Specifications including basic & detailed design & site selections (PFS)
- Complete Regulations
- Govt. Policy Decision on Nuclear Project & Plant Type
- Sign/Accede/Ratify International Instruments & National Legislative Development
- Infrastructure Assessment & Planning & Project Management, Bid Evaluation & Safety Assessment Training
- Continuous Stakeholder Involvement, Public Information Programme & Long-Term Supporting Human Capital & Industrial Development & Technology Acquisition
- Regulatory & Quality Assurance Training & Implementation & Technological Support Organisation (TSO) Development

**Programme & Legislative Development**

- Detailed Site Investigations, EIA/RIA/SIA with input from NPP vendor on plant design
- Preliminary Safety Analysis Report (PSAR) for Site Permit
- Site Permit
- Construction Permit
- Site Grading
- Start Site Excavation
- Bid Evaluation
- Bid Specifications & Issue Request for Proposals (RFP)
- Finish Detailed Plan
- Financial Planning & Closure
- First Concrete Pouring
- NPP Vendor Procurement of Components
- 40-month Construction Period
- Nuclear Fuel Loading
- 8-month Commissioning
- Pre-Operational Baseline Radiological Data Gathering
- Final Safety Analysis Report (FSAR) for Operating Licence
- Operator Training
- Operating Licence
- Pre-Operational Baseline
- Radiological Data Gathering
- Final Safety Analysis Report (FSAR) for Operating Licence
- Operator Training
- Operating Licence

**YR**

- **YR1**
- **YR2**
- **YR3**
- **YR4**
- **YR5**
- **YR6**
- **YR7**
- **YR8**
- **YR9**
- **YR10**
- **YR11**
- **YR12**

Source: Nuclear Malaysia; Malaysia NKEA OGE Laboratory
STATUS OF ACTIVITIES

- Establishment of NEPIO – 7 January 2011
- IWP 2012-2016

19 issues:

i. National Position
ii. Nuclear Safety
iii. Management
iv. Funding and financing
v. Legislative framework
vi. Safeguards
vii. Regulatory framework
viii. Radiation protection
ix. Electrical grid
x. Human resource development
xi. Stakeholder involvement
xii. Site and supporting facilities
xiii. Environmental protection
xiv. Emergency planning
xv. Security and physical protection
xvi. Nuclear fuel cycle
xvii. Radioactive waste
xviii. Industrial involvement
xix. Procurement
<table>
<thead>
<tr>
<th>Activities</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEW NUCLEAR LAW</td>
<td>Drafted new comprehensive nuclear law on safety, security &amp; safeguard,</td>
</tr>
<tr>
<td></td>
<td>Formation of a new effectively independent nuclear regulatory body proposed to be Malaysian Atomic Energy Regulatory Commission (MAERC),</td>
</tr>
<tr>
<td>NPRIDP</td>
<td>Formulation of Nuclear Power Regulatory Infrastructure Development Plan (NPRIDP) with a comprehensive, clear short and medium term actions, benchmarked against IAEAs 19 Infrastructure issues, for comprehensive nuclear regulatory development.</td>
</tr>
<tr>
<td>INTERNATIONAL LEGAL INSTRUMENT</td>
<td>Identification of international instrument for Malaysia to be a party, for international confidence –building in nuclear power development.</td>
</tr>
<tr>
<td>SUBSIDIARY REGULATION &amp; GUIDELINES</td>
<td>Drafted subsidiary regulations &amp; subsidiary guidelines for the new law.</td>
</tr>
<tr>
<td>Field</td>
<td>Detail</td>
</tr>
<tr>
<td>-----------------------</td>
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</tr>
<tr>
<td>NPIDP</td>
<td>Formulation of a Nuclear Power Infrastructure Development Plan (NPIDP) based on a comprehensive assessment of national state-of-preparedness on IAEA 19 Infrastructure Issues, Formulation of Public Communications Kick-Start Strategy &amp; 10- Year Road- Map on Nuclear Energy – Final.</td>
</tr>
<tr>
<td>FEASIBILITY STUDY</td>
<td>Detailed technical, financial &amp; economic analysis of the viability of nuclear power as part of national energy mix vis-a’-vis other sources, Identification and/or establishment of a Special Purpose Vehicle (SPV) nuclear power plant owner/operator &amp; its manpower requirements, Assessment of sources &amp; method of nuclear power project financing, Recommendations on possible nuclear reactor technologies, plant size, manpower requirement &amp; other main technical features.</td>
</tr>
<tr>
<td>SITE EVALUATION</td>
<td>Short listing &amp; detailed evaluation of nuclear power plant candidate sites in accordance with regulatory requirements &amp; guidelines under new law, with Detailed Environmental, Radiological &amp; Social Impact Assessment (DEIA, RIA &amp; SIA).</td>
</tr>
<tr>
<td>BID DOCUMENTS</td>
<td>Recommendations for bidding &amp; contractual approach to nuclear power project implementation, Preparation of bid documents &amp; bid evaluation methodologies to invite potential vendors for nuclear power project implementation.</td>
</tr>
</tbody>
</table>
NUCLEAR POWER INFRASTRUCTURE DEVELOPMENT PLAN (NPIDP)

- Legal Framework & Licensing Process
- Human Resource Capability Assessment & Development
- Industrial Capability Assessment & Development
- Nuclear Power Technological Capability Assessment & Technology Development Road Map
- Public Communication Kick-start Strategy on Nuclear Energy
- Self-Assessment of IAEA’s 19 Infrastructure Issues
TC National Projects:

2012-2013 Cycle:
- Establishing a National Database on Biodiversity and Radiology
- Developing Efficient Non-Destructive Testing (NDT) Data Management through Integrated NDT Modalities
- Strengthening National Capacity and Capability for Nuclear Power Programme Planning
- Identifying Suitable Disposal Sites for Low Level Waste (LLW) and Disused Sealed Radioactive Sources (DSRS)
- Strengthening the Regulatory Authority’s Capabilities to Ensure Safety, Security and Safeguards for the Development of the Nuclear Power Programme

2014-2015 Cycle:
- Enhancing the National Non-Destructive Testing Capabilities for the Nuclear Power Programme
- Supporting Development National Nuclear Power Infrastructure
- Supporting Site Characterization for the Development of a Low Level Waste Repository and Borehole Disposal Facility
- Strengthening the Regulatory Authority’s Capabilities to Support the Development of the Nuclear Power Programme

2016-2017 Cycle:
- Establishing National Non-Destructive Testing Capacity for Nuclear Sector
- Geological Survey on Thorium Reserve in Malaysia
- Supporting National Nuclear Power Infrastructure Development in Malaysia up to Milestone 2 by the end of 2016
PLANNED ACTIVITY

• Expert mission to conduct workshop on Nuclear Power Reactor Simulator For Education and Training
• Utilizing the IAEA-based nuclear reactor simulation program
• In line with Nuclear Malaysia’s role as a lead agency and Centre of Excellence for training in nuclear technology
• Planned for 15-19 December 2014
• IAEA Supply Chain Management, 13-17 October 2014
## MALAYSIA’S INVOLVEMENT IN TC REGIONAL PROJECTS

<table>
<thead>
<tr>
<th>Code</th>
<th>Regional Project Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAS2016</td>
<td>Supporting decision making for nuclear power planning and development - Phase II</td>
</tr>
<tr>
<td>RAS9053</td>
<td>Strengthening Occupational Radiation Protection</td>
</tr>
<tr>
<td>RAS9059</td>
<td>Strengthening Nuclear Regulatory Authorities in the Asia and the Pacific Region</td>
</tr>
<tr>
<td>RAS9061</td>
<td>Strengthening Regional Nuclear Regulatory Authorities and Safety Culture</td>
</tr>
<tr>
<td>RAS9066</td>
<td>Strengthening Education and Training Infrastructure and Building Competence in Radiation Safety</td>
</tr>
<tr>
<td>RAS9068</td>
<td>Strengthening and Harmonizing National Capabilities for Response to Nuclear and Radiological Emergencies</td>
</tr>
<tr>
<td>RAS9070</td>
<td>Supporting Human Resource Development in Nuclear Security</td>
</tr>
<tr>
<td>RAS9071</td>
<td>Establishing a Radioactive Waste Management Infrastructure</td>
</tr>
<tr>
<td>RAS9074</td>
<td>Enhancing and Strengthening National Regulatory Infrastructure for Safety through Self-Assessment</td>
</tr>
</tbody>
</table>
## MALAYSIA’S INVOLVEMENT IN TC INTER-REGIONAL PROJECTS

<table>
<thead>
<tr>
<th>Code</th>
<th>Inter-regional Project Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT2013</td>
<td>Supporting nuclear power infrastructure capacity building in Member States introducing and expanding nuclear power</td>
</tr>
<tr>
<td>INT2014</td>
<td>Supporting Member States to Evaluate Nuclear Reactor Technology for Near-Term Deployment</td>
</tr>
<tr>
<td>INT2017</td>
<td>Capacity building in long-range strategic nuclear energy planning for global sustainability</td>
</tr>
<tr>
<td>INT9175</td>
<td>Promoting safe and efficient clean-up of radioactively contaminated facilities and sites</td>
</tr>
</tbody>
</table>
INTERNATIONAL PROJECT ON INNOVATIVE NUCLEAR REACTORS AND FUEL CYCLES (INPRO)

- 36th member – by joining research program
- **Participation Modes:** Participating in INPRO collaborative projects.
- Planning of activities and bringing national expertise to the Project through their representative in the INPRO Steering Committee;
- Participation in the INPRO Dialogue Forums and in collaborative projects; and
- Malaysia will host the Training Meeting on Nuclear Energy System Modelling and Assessment using the INPRO Methodology in March 2015
## OTHER INTERNATIONAL COOPERATION

<table>
<thead>
<tr>
<th>Type of Cooperation</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral cooperation</td>
<td>On-going process with Japan, Korea, Canada, Vietnam and Indonesia</td>
</tr>
<tr>
<td>Forum for Nuclear Cooperation in Asia (FNCA)</td>
<td>Involved in all areas including research reactor, neutron analysis, agriculture, medical, industry, human resource and waste management</td>
</tr>
<tr>
<td>123 Agreement</td>
<td>Early stage and on-going, led by MOSTI</td>
</tr>
<tr>
<td>ASEANTOM</td>
<td>Actively involved</td>
</tr>
<tr>
<td>CBRNE</td>
<td>Involved in CoE P28: Supporting Development of an Integrated national Security for nuclear and Radioactive Materials</td>
</tr>
<tr>
<td></td>
<td>Treaty, Convention or Agreement</td>
</tr>
<tr>
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<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>1968 Treaty on the Non-proliferation of Nuclear Weapons (NPT)</td>
</tr>
<tr>
<td>2</td>
<td>1979 Convention on the Physical Protection of Nuclear Material (CPPNM)</td>
</tr>
<tr>
<td>3</td>
<td>1986 IAEA Convention on Early Notification of a Nuclear Accident</td>
</tr>
<tr>
<td>4</td>
<td>1986 IAEA Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency</td>
</tr>
<tr>
<td>5</td>
<td>1986 IAEA Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency</td>
</tr>
<tr>
<td>6</td>
<td>1997 Additional Protocol to the IAEA Comprehensive Safeguards Agreement</td>
</tr>
<tr>
<td>8</td>
<td>1994 Convention on Nuclear Safety</td>
</tr>
<tr>
<td>9</td>
<td>1963 Vienna Convention on Civil Liability for Nuclear Damage</td>
</tr>
<tr>
<td>10</td>
<td>1997 Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage</td>
</tr>
</tbody>
</table>
### Optimizing International Cooperation in Human Capital Development

<table>
<thead>
<tr>
<th>No</th>
<th>Organization</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Post-Graduate Programme at KEPCO International Nuclear Graduate School (K-INGS)</td>
<td>Nuclear Power Plant Engineering</td>
</tr>
<tr>
<td>2</td>
<td>Hitachi Scholarship Programme</td>
<td>Nuclear Engineering</td>
</tr>
<tr>
<td>3</td>
<td>Post-Graduate Programme Korea Advanced Institute of Science and Technology (KAIST)</td>
<td>Nuclear Engineering</td>
</tr>
<tr>
<td>4</td>
<td>Ministry of Education, Culture, Sports, Science and Technology (MEXT, Japan) Programme</td>
<td>Nuclear Engineering</td>
</tr>
<tr>
<td>5</td>
<td>World Nuclear University (WNU)</td>
<td>Nuclear Engineering</td>
</tr>
<tr>
<td>6</td>
<td>Twinning Nuclear Short Course with International University (Summer School, Winter School) e.g. KAIST, BORDEAUX University</td>
<td>Nuclear Engineering</td>
</tr>
<tr>
<td>7</td>
<td>Tokyo Institute of Technology (TITECH)</td>
<td>Nuclear Engineering</td>
</tr>
</tbody>
</table>
SUMMARY

• With regards to the NPP development in Malaysia, we are active without decision.

• As a newcomer country, Malaysia will continue optimizing cooperation with IAEA and other international organizations