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Международное агентство по атомной энергии
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2010-05-11

Sir,

I have the honour to refer to the Integrated Nuclear Infrastructure Review (INIR) Mission, which was conducted from 23-27 November 2009, upon request from the Government of Indonesia.

In this regard, enclosed you will find the INIR Mission Report, which I kindly request you to forward to the appropriate authorities. In its present form, we consider the report to be restricted to Agency use, unless a request for de-restriction is received from Indonesia. In keeping with the Agency's position on openness and transparency regarding nuclear power development, you are kindly encouraged to consider de-restricting the Mission Report.

Accept, Sir, the assurances of my highest consideration.

Y.A. Sokolov 
Deputy Director General
Head of the Department of Nuclear Energy

Enclosure: INIR Mission Report (2 copies)

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R E P O R T

on

**THE INTEGRATED NUCLEAR INFRASTRUCTURE REVIEW
(INIR) MISSION**

to

Review the Status of Indonesia's National Nuclear Infrastructure

Counterpart: National Nuclear Energy Agency (BATAN)

Jakarta, Indonesia

23-27 November 2009

Technical Cooperation Project: INS/4/037

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FOREWORD
by the
Director General

The IAEA's Integrated Nuclear Infrastructure Review (INIR) missions are designed to assist Member States, at their request, in assessing the status of their national infrastructure for the introduction of a national nuclear power programme. Each INIR mission is coordinated by the IAEA and conducted by a team of international experts drawn from different Member States, who have experience in different aspects of developing and deploying nuclear infrastructure. Through the INIR missions, the IAEA facilitates the exchange of knowledge and experience between team members and the organizations responsible for preparing the infrastructure for nuclear power in the country inviting the mission. INIR missions also help the IAEA to better understand the needs of Member States, which in turn contributes towards improving the services provided by the IAEA.

The IAEA's "*Milestones in the Development of a National Infrastructure for Nuclear Power*" (IAEA Nuclear Energy Series No. NG-G-3.1) contains a description of 19 infrastructure issues to be considered during the different stages of development of a nuclear power programme.

The starting point for an INIR mission is a self-evaluation performed by the Member State against these infrastructure issues. Following such a self-evaluation, the INIR mission reviews the status of the national nuclear infrastructure, identifies existing gaps in specific infrastructure-related areas and proposes plans to fill these gaps. An important aspect of the INIR mission is that it provides Member State representatives with an opportunity to have in-depth discussions with international experts about experiences and best practices in different countries. In developing its recommendations, the INIR team takes into account the comments made by the relevant national organizations. Implementation of any of the team's recommendations is at the discretion of the Member State requesting the mission.

The results of the INIR mission are expected to help the Member State with the development of an action plan to fill any gaps which in turn will help them to proceed with the development of their nuclear infrastructure. The IAEA stands ready to assist, as requested and appropriate, in the different steps of this action plan.

CONTENTS

1.	EXECUTIVE SUMMARY	5
2.	INTRODUCTION	6
3.	OBJECTIVES OF THE MISSION.....	6
4.	SCOPE OF THE MISSION.....	6
5.	WORK DONE	7
6.	EVALUATION RESULTS, CONCLUSIONS AND RECOMMENDATIONS.....	8
7.	SUMMARY EVALUATION RESULTS	41

1. EXECUTIVE SUMMARY

Indonesia has been involved in nuclear activities for several decades and has for a long period planned for the introduction of nuclear power. By Act No. 17 of 2007 on long-term national development plan 2005 to 2025, the country declared that Nuclear energy will be part of the energy mix for 2015-2019 and the Presidential Regulation No. 5 of 2006 on National Energy Policy states that nuclear power will provide 2 % of the electricity by 2025. Indonesia already operates three research reactors.

On 5 August 2009, the Government of the Republic of Indonesia (hereinafter called Indonesia) ,through BATAN, requested the IAEA to undertake an INIR mission to advise on the infrastructure development needed in Indonesia. To prepare for the INIR mission a self-assessment was conducted by Indonesia and provided to the Agency in advance of the mission. The mission was conducted in Jakarta on 23-27 November 2009, by Agency staff and international experts. This mission was conducted with the cooperative and open attitude of the counterpart organizations.

The self assessment report only covered the activities of phase 1 (before a knowledgeable decision is made to launch nuclear power programme). In accordance with the request from the Indonesian authorities the discussions during the INIR mission were concentrated on this phase. The review was made against the “Basis of Evaluation” as it is described in a document titled “Evaluation of the status of national infrastructure development”, IAEA Nuclear Energy Series No. NG-T-3.2. Some considerations for the planning for phase 2 were also discussed. It should be noted that the INIR mission is concentrated on the process to introduce nuclear power and does not assess in depth the quality of the infrastructure building activities. This would require specific missions.

The INIR mission team found that Indonesia is planning in earnest for the introduction of nuclear power. Two key organizations have been formed, BATAN, in charge of development work and preparations for nuclear energy, and BAPETEN, the regulatory body. No decision has, however, yet been made on what organization will be responsible for owning and operating the nuclear power plants. Several options are considered.

The team also found that there is a national consensus in principle that nuclear energy should be a part of the energy portfolio in the country, but the Presidential decision to go forward has not yet been taken. There is good progress in the development of the national infrastructure in many areas, especially nuclear law, safety regulations, grid, human resources development, emergency planning, environmental protection, fuel cycle and waste management.

Less progress has been made in those areas, which will require the involvement of the owner/operator of the nuclear power plants, e.g. management, funding and financing and industry involvement. The activities for stakeholder involvement will in particular require significant improvement.

The infrastructure activities performed by different organisations have so far been informally coordinated, The team considers that it would be advantageous to introduce formal steering and coordination of the future activities.

Based on these findings, the team recommends that in order to implement the provisions of Act No. 17 of 2007 and Presidential Regulation No. 5 of 2006 Indonesia will need to:

1. Clarify the planning and decisions needed for a nuclear power program and identify owner/operator
2. Create an inter-agency team to oversee and steer infrastructure development work
3. Develop a detailed action plan for infrastructure development for phase 2 (until invitation to bid is issued) as part of longer term planning
4. Develop a comprehensive program for stakeholder (incl. public) involvement
5. Expand the existing national policy and strategy for national industry involvement to also include the involvement for constructing and operating nuclear power plants
6. Enhance international/regional/bilateral cooperation

The Agency received valuable feedback from Indonesia regarding the self-evaluation reference materials and the INIR mission process. This was especially useful. The team wishes to thank the Indonesian counterparts for their insight and cooperation.

2. INTRODUCTION

The Indonesia National Nuclear Energy Agency (BATAN) requested the IAEA to perform an Integrated Nuclear Infrastructure Review Mission (INIR) under the framework of TC programme (INS/4/037) in a letter dated on 5 August 2009. An INIR mission provides an external peer reviews conducted by the IAEA upon request from the host Member State (MS).

In response to this request the IAEA prepared a holistic coordinated peer review mission conducted by a team of IAEA and international experts who have direct experience in specialized nuclear infrastructure areas. The team was lead by the Hans Forsström, Director of Division of Nuclear Fuel Cycle and Waste Technology (NEFW) and the team comprises designated IAEA staff from departments of Nuclear Energy, and Nuclear Safety and Security, and international reviewers recruited/selected by the IAEA in consultation with the host MS.

3. OBJECTIVES OF THE MISSION

The main objectives of the missions were to:

- Evaluate the development status in Indonesia of the infrastructure issues described in NE Series Milestones Guide (NG-G-3.1) applying the holistic approach described in NE Series Evaluation technical report (NG-T-3.2).
- Identify areas needing further attention during the building of national infrastructure in Indonesia.
- Assist Indonesia in preparing an Action plan to address areas for further improvement.

4. SCOPE OF THE MISSION

The mission focused on the status of the infrastructure conditions in Indonesia covering all of the 19 issues identified in the Milestones publication in a comprehensive and holistic way. The following activities were included:

- Review of current status of infrastructure development in Indonesia

- Discussion of actions (both sides) from previous missions
- Consideration of an Indonesian Action Plans and possible International Assistance.

The review concentrated on the process to introduce nuclear power and did not go into great depth to evaluate the quality of the planning and infrastructure building activities.

The mission utilized the following techniques:

a) Study of documents, performed in two stages (i) prior to the mission, as part of preparation and (ii) during the mission. The documents include:

- Self-Assessment Report, 2009 October;
- Indonesian strategy documents for peaceful utilization of atomic energy;
- Atomic Energy Law and related decrees and regulations;
- Formulation of sustainable energy development strategies under framework of climate change, IAEA/RCA Project (RAS/0/045), BATAN, 2008

b) Interviews to gather information through discussions with representatives of the counterpart organizations.

Guidelines to conduct the mission were based on the following IAEA-related publications:

- (1) Considerations to launch a nuclear power program IAEA GOV/INF/2007/2/
- (2) Milestones in the Development of a National Infrastructure for Nuclear Power IAEA Nuclear Energy Series No. NG-G-3.1(2007)
- (3) Evaluation of the status of national infrastructure development, IAEA Nuclear Energy Series No. NG-T-3.2
- (4) Responsibilities and Competencies of a Nuclear Energy Program Implementing Organization (NEPIO) for a National Nuclear Power Program, NE Series NG-T-3.1
- (5) Other publications as appropriate from the bibliography included in Milestones (NES No. NG-G-3.1) noted above.
- (6) INIR, Integrated Nuclear Infrastructure review Mission – Guidance on preparing and conducting INIR Missions. IAEA working material.

5. WORK DONE

The INIR mission evaluated progress in Indonesia in each of the 19 infrastructure issues for the Phase 1 and 2, with respect to the specific guidance mentioned above. In preparation for the mission, BATAN coordinated the entire process and performed double-checks on responses provided and handled the overlap between various responsible institutions.

How to Read this Report

The results of the mission are presented in Chapter 6. For each of the 19 Milestones issues in Phase One¹ a table summarizing the view of the team of the status of each infrastructure issue

¹ As described in NE Series Report NG-G-3.2, 'Evaluation of the Status of National Nuclear Infrastructure Development'

together with the team’s findings, conclusions, recommendations and suggestions are presented.

A summary is presented in a simplified form in Chapter 7. The colour coding used should, however, be interpreted with care. Green should not be taken as an indicator that no further work is required; rather, it is an indicator that the work underway or planned was deemed by the team to fit with the goals of the Indonesian program as well as with the Agency’s reference materials. Similarly red should **not** be interpreted that the country cannot move to the next phase of the nuclear power programme, as there is no single avenue for development of infrastructure and launching a nuclear power programme. It rather indicates that there is an increased risk to the programme, if when making a decision to introduce nuclear power, the various issues have not been fully addressed at that stage.

As many of the 19 infrastructure elements are overlapping in nature, the team tried to associate its findings, conclusions and recommendations with the most salient issue. Some comments may appear under more than one issue to emphasize the cross-cutting nature of infrastructure-building.

For the purposes of the INIR mission results, the following definitions were used:

Recommendations: Recommended action to take in accordance with the Basis of Evaluation for phase 1.

Suggestions: Suggested action to take in accordance with the known good practices and relevant IAEA publications and to be well prepared for the next phase of the infrastructure building. Some of the suggestions are also directed towards prioritized work in phase 2.

6. EVALUATION RESULTS, CONCLUSIONS AND RECOMMENDATIONS

1. National Position	Phase 1
1.1. Governmental clear commitment ²	<p>The country has several decades of history of activities towards the peaceful use of nuclear energy including planning for power generation.</p> <p>Act 10/1997 clearly states that nuclear activities should take into account safety, security and peace, workers’ health, and surrounding community and environment. It also defines the responsibilities of BATAN, to be in charge of development work and preparations for introduction of nuclear energy, and BAPETEN, to be the regulatory body and to set licensing criteria.</p> <p>There is national consensus in principle that nuclear energy</p>

² This is there underlying intention of point 1.1 in NG-T-3.2 although it is formulated in a different way there.

	<p>should be a part of the energy portfolio in the country. By Act 17/2007 (long-term national development plan to 2025), the country declared that the first nuclear power plant should be in operation in the 2015-2019 time frame and the Presidential decree 5/2006 states nuclear power will be a part (2%) of energy mix until 2025. However, the implementation programme has not yet been determined. It is also not determined who will own and operate the country's Nuclear Power Plants.</p>
<p>1.2. The NEPIO established and staffed</p>	<p>Some issue-specific inter-agency teams have been established and are active such as on Human Resources Development. A proposal for establishing an <i>inter-agency national team</i> (Under the responsibility of the Ministry of Energy and Mineral Resources (MEMR), reporting to the President), to materialize Presidential Regulation 5/2006 and Act 17/2007, was sent to the Government, but no decision to create this team has yet been made. The planned function of this national team is as follows::</p> <ul style="list-style-type: none"> • to provide a basis of national consensus on nuclear power by disseminating information on nuclear power generation, • to prepare the basis for Government consultation with the Parliament regarding the decision to launch nuclear power plant programme, • to formulate the organization and ownership structure of NPP, • to prepare the licensing system for nuclear power plant construction and operation, • to formulate the preparatory document needed for the nuclear power plant construction, • to identify issues concerning to the technology transfer, and • to report periodically to the President on the activities by the team. <p>The proposed national team is supposed to consist of three layers:</p> <ul style="list-style-type: none"> • a steering team (MEMR, Ministry of Finance, Ministry of Industry, Ministry of Environmental, Ministry of National Development Planning, Ministry of Research and Technology, Ministry of External Affairs, State Ministry of State

	<p>Owned Company, BATAN & BAPETEN),</p> <ul style="list-style-type: none"> • an executing team (Directorate General of Electricity and Energy Utilization, BATAN & MEMR), and • working groups to assist the executing team. <p>The working groups include:</p> <ul style="list-style-type: none"> • Working group for socialization and dissemination of nuclear energy utilization for nuclear power generation • Working group for formulating the organization, ownership structure and licensing system for NPP. • Working group for formulating basic principle of user requirement of NPP. • Working group for formulating the technology transfer. <p>There will still be many activities left in phase 2 (before reaching the stage of tendering bids), in order to make sure that the development is efficient and well balanced in a way that there will be no important missing or delayed element in the process of national infrastructure building. It is therefore important:</p> <ul style="list-style-type: none"> • to create an <i>action plan for infrastructure development for phase 2</i>, • to install an appropriate <i>coordination/monitoring-/oversight mechanism</i>, and • to give the team (probably the steering committee as is mentioned above) the authority to advise on necessary corrective actions, • to define the responsibilities by clarifying “who is responsible for what part of the nuclear energy programme”.
1.3. National strategy defined	<p>“Blueprint for National Energy Management 2006 – 2025” was published in 2007 providing a time schedule for the work towards milestones 1 -3. But the source of funding is not clear. A plan for development of policy and strategy has not yet been fully developed for all the 19 issues but could be developed by the national team discussed in 1.2 or other suitable group.</p>

Conclusions:

The INIR review team concludes that there is national consensus in principle that nuclear power is a part of the energy portfolio in Indonesia and that substantial work has been performed to prepare the infrastructure needed for a nuclear power programme. The team, however, faced difficulties in seeing the overall picture as to what extent the activities were well coordinated. If Indonesia wish to introduce nuclear power as is scheduled in Act No. 17 of 2007 and Presidential decree No. 5 of 2006, it is necessary to establish a well coordinated implementation programme and identify the role and responsibilities of the different organizations involved. The proposed inter-agency team (proposed as a national team) could be established a) for creation of action plan for infrastructure building , b) coordination, oversight, monitoring, steering in order to make sure balanced and coordinated development of national infrastructure, c) for defining the responsibilities by clarifying “who is responsible for what part of nuclear energy programme”, and d) for full development of policy and strategy over the 19 issues of Milestone document.

Recommendations and Suggestions:

In order to implement the provisions of Act 17/2007 and Presidential Decree 5/2006 it is recommended that Indonesia:

Recommendation no. 1: Clarify the planning and decisions needed for a nuclear power program and identify owner/operator.

Recommendation no. 2: Create an inter-agency team to oversee and steer infrastructure development work

Recommendation no. 3: Develop a detailed action plan for infrastructure development for phase 2 (until invitation to bid is sent out) as part of longer term planning

Recommendation no. 4: Define the responsibilities of organizations to be involved in phase 2, by clarifying “who is responsible for what part of the nuclear energy programme”.

2. Nuclear Safety	Phase 1
2.1. Key elements of nuclear safety understood	<p>With respect to nuclear safety Indonesia has demonstrated a strong commitment to using nuclear power for peaceful purposes. Their guidance document for implementation and development of sustainable nuclear energy systems covers safety objectives and principles.</p> <p>The regulatory body has been set up under Act No 10 of 1997 on Nuclear Energy and is presently regulating research reactors and radiation safety. A significant number of regulations have been prepared on many issues and plans are in place for others.</p> <p>Both BATAN and BAPETEN staff demonstrated their</p>

	understanding of the key elements of safety e.g. responsibility of the operator (BAPETEN Chairman Decree No 10 of 1999). INSAG documents had been reviewed and key issues identified. Training programmes in specific areas have been budgeted for and training held. It was recognized that the areas of training for leadership and management of safety could usefully be explored further. .
2.2. Need for intergovernmental instruments on safety recognized	Indonesia has ratified the Nuclear Safety Convention (CNS) through President Decree No 106. Indonesia produced a National Report on Compliance with the CNS for 2004 and 2007. A table was provided showing the treaties and conventions they have signed and ratified.
2.3. Support through international cooperation intended	BATAN has been actively involved in the Asian Nuclear Safety Network (ANSN) and participates in virtual meetings, topic groups etc. It is involved in ANSN programmes and has received a number of IAEA missions as part of the IAEA's technical co-operation programme. With respect to co-operation with other organisations it has links with FNCA, MEMR –JETRO and BAPETEN has contact with KAIS of Korea and EPRI, DOE and NRC. •

Conclusions:

The INIR review team concludes that milestone 1 was achieved for this element.

Recommendations and Suggestions

No major gaps were identified which would lead to recommendations

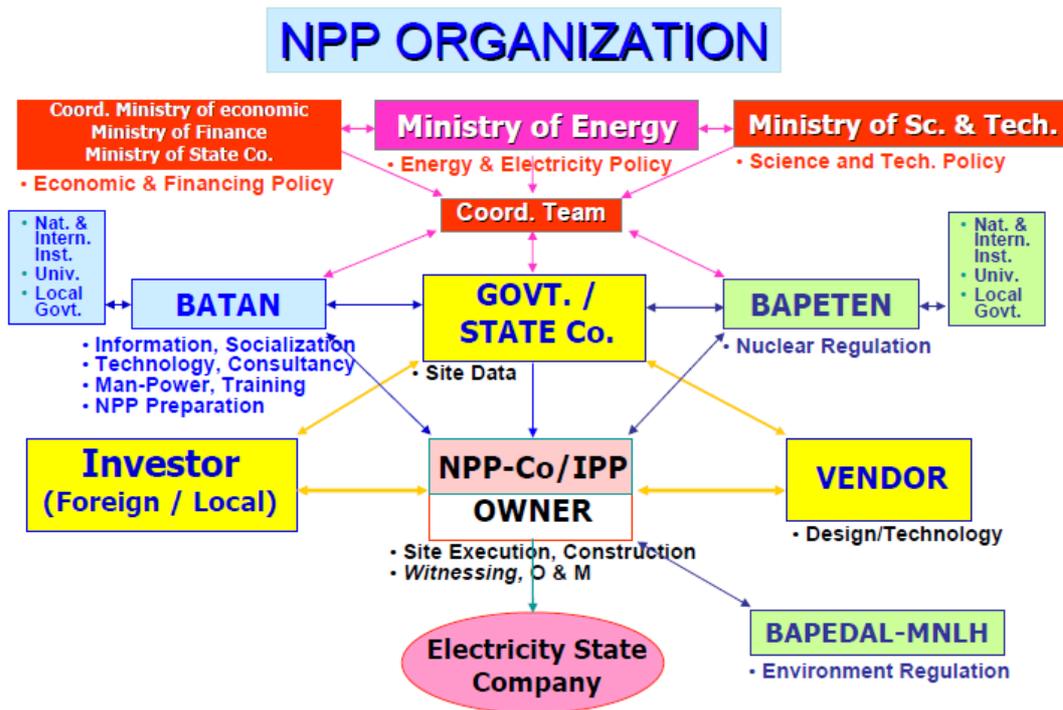
Suggestion no 1: BAPETEN should:

- *proceed with its existing plans to review and where appropriate revise its management system,*
- *give thought on where technical support would be available should a NPP programme be implemented,*
- *explore the need for training for leadership and management of safety,*
- *look into the question of how to review contractors /suppliers management systems, and*
- *explore where IAEA could provide support in the area of training.*

3. Management	Phase 1
3.1. Energy strategy and nuclear power compatibility analyzed	<p>Indonesia has carried a number of studies on national energy strategy with nuclear option, which were used as basic consideration in issuing the Presidential Decree 5/2006 on National Energy Policy stating that, in 2025, 5% of national energy demand will be supplied by new (nuclear power is a part of it) and renewable energy resources. Viability of nuclear power was confirmed but this needs <i>continuous updating</i> using new information. The non-market value of nuclear energy (especially related to environment) is explicitly considered in the long-term energy policy.</p> <p>A National Energy Council (chaired by the President but day-by-day oversight by the Minister of Energy and Mineral Resources - MEMR) has been established and will revise national energy policy in 2010 in line with the existing law.</p> <p>The 2008-2018 projection of power generating source for the country's largest Jamali (Jave-Madura-Bali) network shows significant projected increase of the use of coal-fired power stations, even though new (including nuclear power) and renewable power generating sources are actively introduced.</p>
3.2. Unique Member State conditions evaluated	<p>BATAN in cooperation with other related institutions has initiated the preparation of documents describing national criteria and general specification for an NPP to be deployed in Indonesia. These include draft document of Bid Invitation Specification (BIS), User Consideration Document for Indonesia, and Guidance for the Application and Development of Sustainable Nuclear Energy System in Indonesia. It was especially, clarified in the BIS that the Suppliers have to have special considerations for volcano, tsunami and earthquake.</p>
3.3. Available nuclear technologies identified	<p>Indonesia (BATAN and the Ministry of Energy and Mineral Resources) has performed two studies (OPR 1000 in cooperation with Korea Hydro Nuclear Power Co., KHNP) and (APWR 1000 in cooperation with Mitsubishi Heavy Industries Co., MHI), both of which had shown the design's compliance to unique requirements set by Indonesia.</p>

<p>3.4. Ownership options and operational responsibilities considered</p>	<p>Several studies have been carried out in order to investigate ownership structure including a financing scheme for the first NPP in Indonesia, e.g. a joint study by BATAN, PLN (State Electricity Company) and KHNP and a joint study by BATAN and Gajah Mada University and a workshop on financing of NPP was held by MEMR-JETRO.</p> <p>Options in Act 10/1997 included ownership by the state-owned Utility and private funding project. Consortium by a private Utility and the state-owned Utility PLN is also proposed.</p> <p>Through these activities it was recognized that the BOO scheme is more expensive than conventional scheme. However, no decision is made on this subject yet. It was proposed that a national team will formulate a plan for the organization and ownership structure of an NPP but a decision on this has also still to be made. Fig. 1 illustrates the owner/operator and its relationship with relevant organization (concept by BATAN).</p>
<p>3.5. Authorities and responsibilities established</p>	<p>The responsibilities and roles played by BATAN, BAPETEN and other organizations are defined in Act 10/1997, including the role of the owner/operator. Until now no decision has been made on which organization should own and operate the NPPs. A complete detailed delineation of authority and responsibility was proposed by BATAN but is not yet defined. This is something that needs to be defined in the course of phase 2.</p>
<p>3.6. Appropriate expertise and experience involved</p>	<p>To ensure that appropriate expertise and experience has been involved, Indonesia requested an IAEA Expert Mission in 2007 to review the draft BIS document. All comments and recommendations proposed from the mission have been used to refine the draft of BIS document.</p>
<p>3.7. Commitment to management systems that promote and support a strong safety culture evident</p>	<p>BAPETEN's document requires commitment in each relevant organization involved in nuclear activities.</p>

Fig- 2 Organizational relationship for NPP Programme



Conclusions:

The INIR review team concludes that Indonesia has considered in great detail the different management issues. This includes a number of studies on national energy strategy and the possible role of nuclear power, including assessing national criteria and general specifications for an NPP to be deployed in Indonesia. However, these studies need to be continuously updated by using the latest information.

The authorities and responsibilities for BATAN, BAPETEN and other organizations are defined. Ownership options and operational responsibilities have been considered, but no decision has yet been made on which organization will own and operate the NPPs.

In summary the team concludes that the activities connected to the management issues are consistent with the level of development of the programme, with the exception of those activities that are dependent on the decision on owner/operator.

Recommendations and Suggestions

Recommendation no. 5: Identify owner/operator of NPP(s) and determine its responsibilities in the development of the nuclear power infrastructure.

Suggestion no. 2: Continuously update national energy strategy using the latest information.

4. Funding and financing	Phase 1
4.1. Adequate funding for the NEPIO provided	<p>A NEPIO was not created, but a different approach was taken by creating issue-specific working groups. Necessary funding was obtained through the budget of relevant ministries and organizations (BATAN, BAPETEN..). Further funding needs to be secured for the proposed national team to achieve the intended goal of the team.</p>
4.2. Strategies for funding and financing established	<p>The national strategy for the first NPP funding and financing, coupled with the issue of owner/operator was studied but the country has not yet reached a conclusion on this. Indonesia recognized this is one of the most critical issues for a nuclear power programme. The candidate owner/operator PLN understands the possible financial risk and its factors. Studies have been carried out (see 3.4).</p> <p>Indonesia considers the funding for the construction of NPP will be a combination of long-term loans and equity in a way:</p> <ul style="list-style-type: none"> • That the loan part, most likely obtained from ECA (Export Credit Agency) and commercial bank through loan agreement with the NPP vendor, would be used mostly to finance procurement of foreign contents, and • That most of the equity portion would be used to finance local capital expenditure, such as land acquisition, professional fee, mobilization, certification, etc. The equity is sourced partly from the public utility (possibly PLN or other state owned enterprises) and from private investors as partners (in the case of a public/private consortium). <p>Funding for spent fuel handling and final disposal, waste management and decommissioning is under the owner responsibilities. The cost for radioactive waste management and disposal is born by the owner/operator of NPP(s) and is used by BATAN which is in charge of management (after transfer from the NPP site) and disposal of wastes from NPP(s). The funding method for long-term liabilities (e.g. decommissioning and spent</p>

	fuel disposal) needs to be further developed.
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Conclusions

The INIR review team concludes that Indonesia is well aware of the different funding and financing aspects, but a decision can only be made following a decision on owner/operator.

Recommendations and Suggestions

Recommendation no. 6: *Identify the appropriate funding scheme for the selected owner/operator.*

Suggestion no. 3: *Fully secure resources (staffing and funding) to the national inter-agency team mentioned in recommendation no. 2.*

Suggestion no. 4: *Develop a funding method for long-term waste and decommissioning liabilities.*

5. Legislative Framework	Phase 1
5.1. Adherence to all relevant international legal instruments planned	<p>Indonesia is party to:</p> <ul style="list-style-type: none"> - the Convention on Early Notification of a Nuclear Accident; - The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency; - The Convention on Nuclear Safety. - Convention on the Physical Protection of Nuclear Material - The Amendment to the Convention on the Physical Protection of Nuclear Material (in 2009) <p>Indonesia has a Safeguards Agreement and an Additional Protocol with the IAEA in connection with the Treaty on the Non Proliferation of Nuclear Weapons.</p> <p>Indonesia is not Party to:</p> <ul style="list-style-type: none"> - The Amendment to the Convention on the Physical Protection of Nuclear Material (Ratification is under preparation by Indonesia Foreign Affair Ministry) - The Vienna 1997 Convention on Civil Liability for Nuclear Damage - The Joint protocol relating to the Application of

	<p>the Vienna Convention and the Paris Convention.</p> <ul style="list-style-type: none"> - The Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management. (Indonesia has signed, but not yet ratified this instrument. The ratification process has started). <p>As concerns the Vienna Convention some national legislation exist to a similar effect.</p>
<p>5.2. Plans for development of national nuclear power legislation in place</p>	<p>In 1997, Indonesia adopted Nuclear Energy Act no.10. This Act is the primary legislation in the country. It replaced the previous Atomic Energy Act of 1964. Act 10 designates the Nuclear Energy Control Board (BAPETEN) as the governmental body to exercise regulatory control over nuclear activities. Under the same Act, the National Nuclear Energy Agency (BATAN) retains authority for promotion and development of nuclear energy in Indonesia.</p> <p>BAPETEN's regulatory independence is based on its status as a non-departmental government agency organized under and directly responsible to the President of the Republic of Indonesia pursuant to Presidential Decree No. 76 (1998), as revised by Presidential Decree No. 103 (2001) on "Status, Function, Authority, Form and Organization Structure of Non-Departmental Government Agencies".</p> <p>A large number of Government Regulations and Government Decrees have been promulgated for the purpose of further defining the regulatory framework in Indonesia.</p> <p>Act No. 10 comprises 48 articles organized into ten chapters, as follows:</p> <ul style="list-style-type: none"> I. General Provisions II. Institutions III. Research and Development IV. Enterprises V. Regulatory VI. Radioactive Waste Management VII. Liability for Nuclear Damage VIII. Penal Provisions IX. Transitional Provisions X. Final Provisions <p>The various Chapters do not seem well-balanced in terms</p>

	<p>of the level of detail they contain. For example, some important Chapters (like II on Institutions) are very brief and general, while others (like VII on Liability and VIII on Penal Provisions) are quite detailed.</p> <p>Act No. 10 does not include detailed provisions on a number of specific subjects usually associated with nuclear power development and regulation. Some of these subjects are very briefly referred to in the Act and are addressed in regulations (for example, transport of radioactive materials). Others (such as IAEA Safeguards) will become increasingly important with the expansion of Indonesia's nuclear program. The following listing includes examples of some of these subjects that might be included as separate chapters in an amended Act with expanded provisions include:</p> <ul style="list-style-type: none"> ▪ Physical protection of radioactive materials and associated facilities ▪ Transport of radioactive materials ▪ Decommissioning of nuclear facilities ▪ Safeguards ▪ Emergency Preparedness and Response ▪ Public Participation in the Siting and Licensing Process ▪ International Cooperation and Assistance ▪ Human and Technical Resources ▪ Export and Import ▪ Border Monitoring and Control <p>Act No. 10 is now over ten years old, and a number of significant legal developments have occurred since its promulgation in 1997 that could be usefully recognized in an amended Act.</p> <p>The Indonesian Government has issued some other related acts, including:</p> <ul style="list-style-type: none"> – Act No. 23 Year 1997 on Environmental Protection – Act No. 24 Year 2007 on National Disaster Countermeasure – Act No. 14 Year 2001 on Intellectual Properties and Rights – Act No. 26 Year 2007 on Land Use Plans – Act on Foreign Investment
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	<ul style="list-style-type: none"> – Act on Taxation – Act on Local Autonomy and Presidential Decree No. 85 – Act on financial guarantee <p>Ultimately the decision whether or not to amend or revise the Act or whether instead to remedy the aforementioned situation through the secondary legislation rest with Government</p>
5.3. Consultation with national stakeholders about the legislative framework taken place	Stakeholders involved during the development of Act No. 10 Year 1997 were the House of Representatives and Ministry of Science and Technology, Ministry of Environment, State Secretary, Department of Justice, Department of Foreign Affairs, Department of Energy and Mine, Ministry of Health, Department of Finance and National Atomic Energy Agency.

Conclusions

The INIR review team concludes that Indonesia has a clear understanding of the international legal regime concerning nuclear power, and has plans to review the national laws governing its nuclear power programme.

Recommendations and Suggestions

Recommendation no. 7 : *Review the nuclear and relevant non-nuclear legislation that will impact the nuclear power project*

Recommendation no. 8 : *Indonesia should finalize the ratification process for the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management and the Amendment to the Convention on the Physical Protection of Nuclear Material. Indonesia should further clarify the situation concerning:*

- *The Vienna 1997 Convention on Civil Liability for Nuclear Damage*
- *The Joint Protocol relating to the Application of the Vienna Convention and the Paris Convention.*

6. Safeguards	Phase 1
6.1. Obligations under NPT and non-proliferation treaties and other international instruments, recognized	Indonesia ratified nuclear non-proliferation treaty in 1978 as indicated by the issue of Act No. 8 Year 1978 on Ratification of Convention on Prevention of Distributing Nuclear Weapons. Since then, Indonesia has implemented System of Accounting for and Control of Nuclear Materials. Indonesia signed “Protocol Additional to the Agreement between the Republic of Indonesia and the IAEA for the Application of Safeguards in connection with the Treaty on the non

	<p>Proliferation of Nuclear Weapons” on Sept. 29, 1999.</p> <p>The other national instruments indicating Indonesia’s recognition of non-proliferation treaty are:</p> <ul style="list-style-type: none"> – BAPETEN Chairman Decree No. 2 Year 2005 on System of Accounting for and Control of Nuclear Materials – BAPETEN Chairman Decree No. 9 Year 2006 on the Implementation of Additional Protocol for System of Accounting for and Control of Nuclear Materials – BAPETEN Chairman Decree No. 9 Year 2008 on the Establishment and Format of Declaration for the Implementation of Additional Protocol on System of Accounting for and Control of Nuclear Materials
6.2. Development, implementation and enforcement of safeguards framework, including SSAC establishment, planned	<p>Indonesia has been implementing and enforcing IAEA safeguard regime for its research reactors and other nuclear facilities.</p> <ul style="list-style-type: none"> • Government Regulation (GR) No. 29 Year 2008 • BCR 02 Year 2005 on SSAC • BCR 09 Year 2006 Conducting of Additional Protocol of SSAC
6.3. International requirements for any existing nuclear facilities or locations outside facilities met	See information from 6.2 above

Conclusions

The INIR review team concludes that Indonesia has a clear understanding of the safeguards requirements concerning nuclear power.

Recommendations

None

7. Regulatory Framework	Phase 1
7.1. Development of an adequate	According to the Act No. 10 Year 1997 on Nuclear Energy, the Nuclear Energy Regulatory Agency

regulatory framework planned	<p>(BAPETEN), is a national authority in controlling the use of nuclear energy in Indonesia. BAPETEN was established in 1998 with the main task to protect the working personnel, public and environment from the harmful effect of nuclear energy utilization. Chairman of BAPETEN is responsible and reporting directly to the President of Republic of Indonesia. Personnel of BAPETEN, now is around 400 people. BAPETEN performs its main task through 3 (three) regulatory functions: (1) development of regulation, (2) licensing, and (3) inspection. Figure 3 shows BAPETEN's organizational structure.</p> <p>It has regulated the countries research reactors for a number of years and recognizes the need to develop its activities with the necessary advice and assistance should a nuclear power programme go ahead. A paper on the 'Roles of BAPETEN in NPP Construction Plan in Indonesia' has been produced.</p>
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Conclusions

The INIR review team concludes that the regulatory framework is in place and no major gaps were identified with respect to Phase 1. For moving into the later phases that would involve regulating the construction, commissioning and operation of a NPP, resourcing, training, technical support and enforcement policy are seen as areas to be reviewed to ensure they are fit for purpose.

Recommendations and Suggestions

Suggestion no. 5: *With respect to further assistance an IAEA Integrated Regulatory Review Service (IRRS) mission could be considered at an appropriate time.*

Fig.2. Hierarchy of legislation system in Indonesia

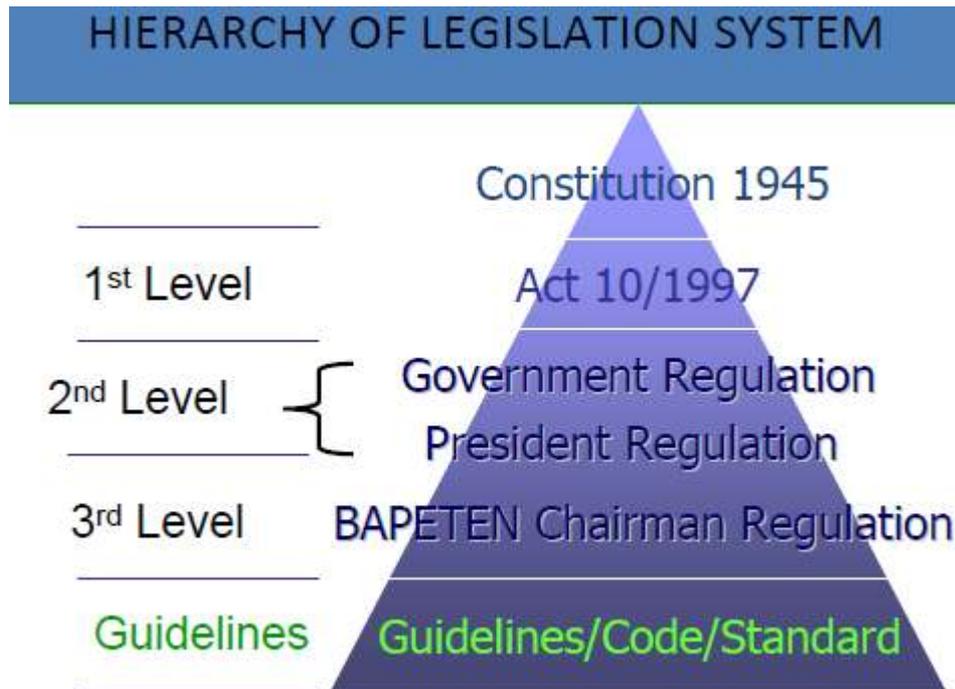
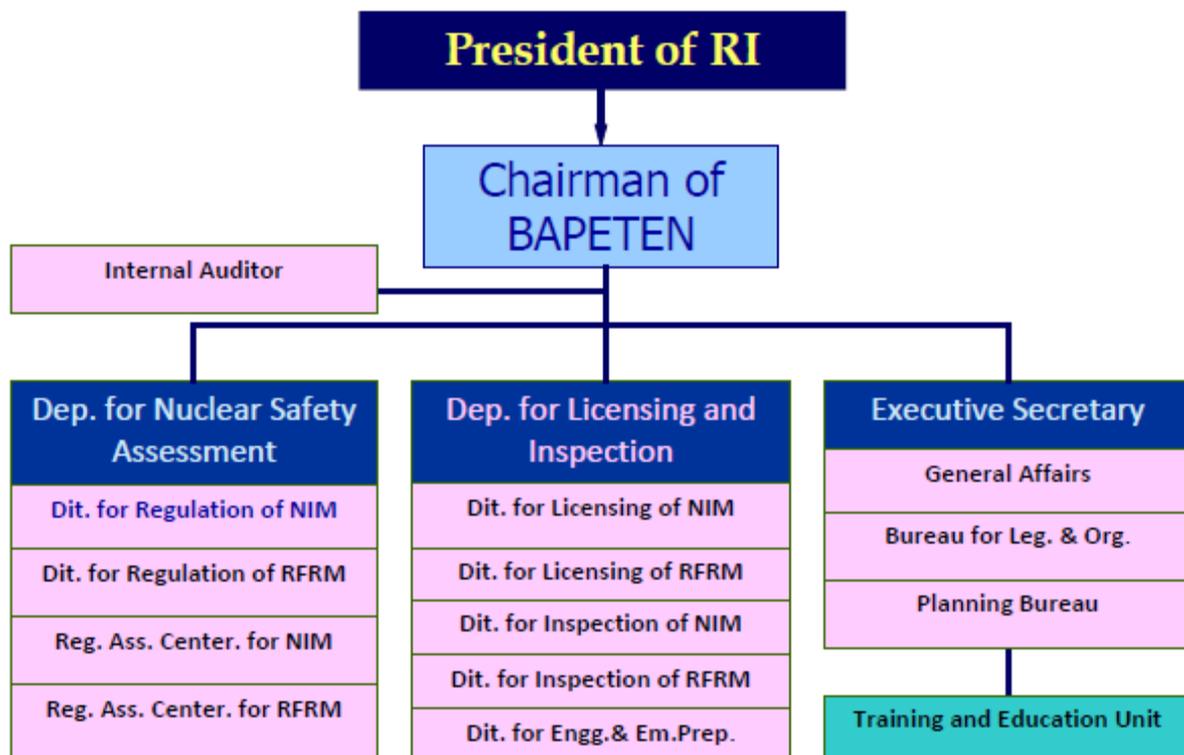


Fig.3 BAPETEN organizational structure



8. Radiation Protection	Phase 1
8.1. Hazards presented by nuclear power plant operation recognized	<p>Some studies to analyse hazards presented by NPP operation have been carried out. In addition, the studies covered additional hazards from fuel transport, waste management and storage and decommissioning, as described in the safety analysis reports of the research reactor and other nuclear facilities.</p> <p>An assessment had been conducted on the applicability of IAEA standards in these areas.</p>
8.2. Enhancements to national regulations and infrastructures planned	<p>It was suggested that it would be of benefit to set up an advisory committee to the chair of BAPETEN to discuss specific regulations / drafts (done ad hoc currently). This would assist in identifying the additional regulations and infrastructure required for a larger radiation protection programme to ensure that workers and the public are adequately protected in line with up to date requirements.</p>

Conclusions

The INIR review team concludes that Indonesia is well prepared in the field of radiation protection consistent with the level of development of the NPP project.

Recommendations and Suggestions

Suggestion no. 6 : *Set up an advisory committee to the chair of BAPETEN to discuss specific regulation drafts.*

9. Electrical Grid	Phase 1
9.1. Electrical grid requirements considered	<p>Currently Indonesia's power generation capacity is around 30 GWe with a per capita annual electricity consumption of around 550 KWh. Grid inter-connections within and between islands and neighbouring countries are shown on Fig. 4.</p> <p>The country's electricity consumption is rapidly growing at an average rate of 6.8%/year. There are currently five candidate</p>

	<p>sites to install NPP under various stage of survey. The preferred site is located in Java island, where the grid size is the largest (22GWe JAMALI grid).</p> <p>PLN (state-owned utility with fully bundled structure of generation, transmission and distribution) assessed implication of installing NPP(s) in the JAMALI grid including stability of the network once NPP is abruptly isolated from the grid and the reliability of off-site power. PLN concluded in its 2005 study report that the JAMALI grid can accomodate 2 1GWe NPPs. PLN considers it has a capability to assess the implication of installing NPPs in other candidate sites.</p> <p>Regarding the black startup capability, PLN considers that black start out capability will be provided by gas and hydro power rather than steam power plant including NP.</p>
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Conclusions

The INIR review team concludes that the considerations of the grid for the nuclear power project are well understood by PLN. PLN considers it has the capability to analyze implications of installing NPP(s) in its network including alternative site.

Recommendations and Suggestions

None



Fig.4. Indonesian electrical grid size and interconnections

10. Human Resources	Phase 1
10.1. Necessary knowledge and skills identified	<p>A human resource development (HRD) plan for implementing a nuclear energy programme was initiated in 2008 (HRD Blue Print). Work is ongoing on this HRD programme, with the effort to be completed in 2010. A Working Group has been established under MEMR to coordinate these efforts. BATAN has also conducted joint studies with Korean and Japanese organizations with nuclear power experience to support this HRD Blue Print.</p> <p>IAEA TRS No. 200, <i>Manpower Planning</i>, has been used as a source in the HRD Blue Print to identify competences and human resources needed by future organizations in order to implement a nuclear power programme. More detailed assessment of competences and human resources needed for future organization and blue print of Human Resources Development (HRD) programme and concept of Nuclear Training Center (NTC) facilities are being conducted by an interdepartmental organization including MEMR, BATAN, Department of Labour and Transmigration, BAPETEN, and Ministry of Research & Technology.</p>
10.2. Develop and maintenance of human resource base planned	<p>In order to develop and maintain human resources, BATAN has sent personnel abroad to obtain Master and Doctoral degree and for technical visits and work assignments to organizations such as General Electric, Westinghouse, Atomic Energy of Canada Limited, Mitsubishi, Korea Nuclear and Hydro Power (KHNP), Korea Atomic Energy Research Institute (KAERI) and Korea Power Engineering Company (KOPEC).</p> <p>BATAN has established the Education and Training Center (PUSDIKLAT), which is responsible for the implementation of education and training programs related to nuclear science and technology. A higher education institute called College of Nuclear Technology (STTN) based on Presidential</p>

	<p>Decree No. 71 Year 2001. STTN provides two major study programmes:</p> <ul style="list-style-type: none"> – Nuclear -Chemistry – Nuclear Techno-Physics . <p>The participation of key stakeholder organizations in the development and review analysis, which identifies the competences needed, is indicated by the Decree of ETC-MEMR Chairman No. 105K Year 2008 and Decree of BATAN Chairman No. 071 Year 2009. The stakeholders involved are BATAN, BAPETEN, MEMR, Ministry of Research and Technology, Department of Labour and Transmigration, and universities.</p> <p>The number of professionals in Indonesia with nuclear technology education and training is quite high compared to most other countries considering nuclear power programmes; BATAN has a workforce of over 4000, and BAPETEN about 400.</p> <p>A presentation by an MEMR representative during the mission demonstrated that Indonesia is using a Systematic Approach to Training (SAT) for positions in the energy field. This SAT-based approach has not yet been applied to nuclear related jobs/positions. There are multiple organizations that are candidates for being the future operating organization for the first NPPs in Indonesia, including PLN. To date these organisations have not been actively involved in preparation of the HRD Blue Print.</p>
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Conclusions

The team concludes that Indonesia has implemented the Human Resource related actions for Phase 1, and has a solid foundation for preparing for Phase 2. The HRD Blue Print has not yet been developed to the extent that a detailed determination can be made if Indonesia has suitable national human resources to implement Phase 2 without external assistance.

Recommendations and Suggestions

Suggestion no. 7 : Involve owner/operator candidate organizations as soon as possible in planning for human resource development

Suggestion no. 8 :Develop a human resource development plan for implementing phase 2 that includes a determination if national human resources are sufficient to implement phase 2.

11. Stakeholder Involvement	Phase 1
<p>11.1. Strong public information and education program initiated</p>	<p>BATAN has established the Center for Nuclear Technology and Science Dissemination. However, no one from this Center participated in the INIR Mission discussions. Information was provided regarding the activities that this Center has launched; public dialogue, public education, workshops on nuclear science, support for public education infrastructure, and radio broadcasts. The purpose of these activities is to develop public understanding on the use of nuclear energy for peaceful purposes. An NPP Socialization Team of the Minister of Research and Technology (a Working Group) has been set up. However, a communication strategy and plan that involves and coordinates participation of all the Indonesian organizations involved in implementing a nuclear power programme needs to be fully developed.</p> <p>It was also unclear to what extent broad opinion surveys had been conducted to understand the public knowledge of and support for nuclear power in Indonesia.</p> <p>The IAEA provided an Expert Mission (EM) to Indonesia in March 2008 on the strategy for communicating with stakeholders on a new NPP programme. This EM provided several recommendations to strengthen such efforts. Among them were:</p> <p style="padding-left: 40px;">“Measurement should be developed for various stakeholder audiences as a means of establishing a baseline of support and assessing progress at achieving various objectives. Public opinion research, media coverage, and favourable legislation are just a few of the metrics that allow for this evaluation. It should be clear what measurement will be conducted, by</p>

	<p>whom, how frequently and at what expense. In addition a reporting mechanism for sharing results is a good way of connecting the various agencies involved in nuclear power plant development.”</p> <p>“The dissemination strategy must have a greater degree of individual clarity and ownership. As long as only agencies are named as being responsible for these actions, the actions will likely not take place.”</p> <p>“In order to acquire firmly a positive response from the people and local residents, positive activities are needed. Communication programs aimed at both the general public and the population around the NPP candidate site should be carefully planned and implemented and started as soon as possible so that “quick wins” can be demonstrated and positive momentum built. Desirable communication policy To earn public trust, policy should be open and transparent. Desirable or not, public opinion is a major determinant in NPP project. Thus, the first communication step should be a broad public discussion of all issues.”</p> <p>No information was provided during the INIR Mission indicating that the above recommendations had been implemented.</p> <p>BATAN in coordination with the local Government in the Muria Peninsula has conducted dissemination activities regarding nuclear energy. However, there is vocal opposition at the preferred Ujung Lemah Abang site of the Muria Peninsula to siting a nuclear power plant there. No information was provided that indicated that public information activities have been conducted at the other NPP sites being considered in Indonesia.</p> <p>According to the self-evaluation report Terms of Reference were recently drafted to include</p>
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	information sharing on safe utilization of nuclear energy in the ASEAN Energy cooperation.
11.2. Need for open and timely interaction and communication regarding the nuclear power program addressed	<p>BATAN Center for Nuclear Technology and Science Dissemination has developed a training programme for spokespersons on nuclear power.</p> <p>The formal process for an environmental impact assessment of industrial facilities in Indonesia (including nuclear power plants) has been recently revised to include public hearings in the local community to provide an opportunity for stakeholders to express their concerns or support for such applications. Such public hearings will also be applicable to the environmental impact assessment for a NPP, but are not a part of the BAPETEN process for licensing of nuclear facilities.</p>

Conclusions

The INIR team concludes that stakeholder involvement and communication is a weak point in the preparations for a nuclear power programme and that there is a need to strengthen these activities.

Recommendations and suggestions

Recommendation no. 9: *Develop and implement comprehensive programmes for stakeholder involvement and public communication.*

Recommendation no. 10: *Involve professional communicators in the development and implementation of plans.*

Recommendation no. 11: *Implement national opinion surveys to determine the degree of public knowledge and attitudes towards nuclear power and evaluate effectiveness of communication efforts.*

Recommendation no. 12: *Evaluate if public participation should be included in the decision making process, such as reactor licensing by BAPETEN.*

12. Site and supporting facilities	Phase 1
12.1. General survey of potential sites conducted	A feasibility study had been carried out in 1996 by NEWJEC covering regional analysis, screening, selection and comparison of candidate sites was undertaken. Potential sites and a preferred site have been identified. A Site Data Report (SDR)

	<p>for Ujung Lemah Abang (one of preferred sites) was produced but needs updating for new requirements and once an owner has been determined. Other sites are being evaluated.</p> <p>BAPETEN Chairman Regulation No. 05 Year 2007 on Requirement for Site Safety Evaluation has adopted IAEA Safety Guide NS-R-3 and BAPETEN Chairman Decree No. 01 Year 1999 on Guidance for Nuclear Siting had been produced.</p>
<p>12.2. Selected site(s) justified</p>	<p>Extensive discussions have been held with the relevant IAEA section over the location of potential sites with respect to external hazards. An evaluation report has not yet been produced to clearly demonstrate that the selected site(s) are acceptable from all aspects. This report should also contain plans for additional studies and site investigations that will need to be performed during phase 2 in order to complete and refine the assessment of plant site characteristics.</p>

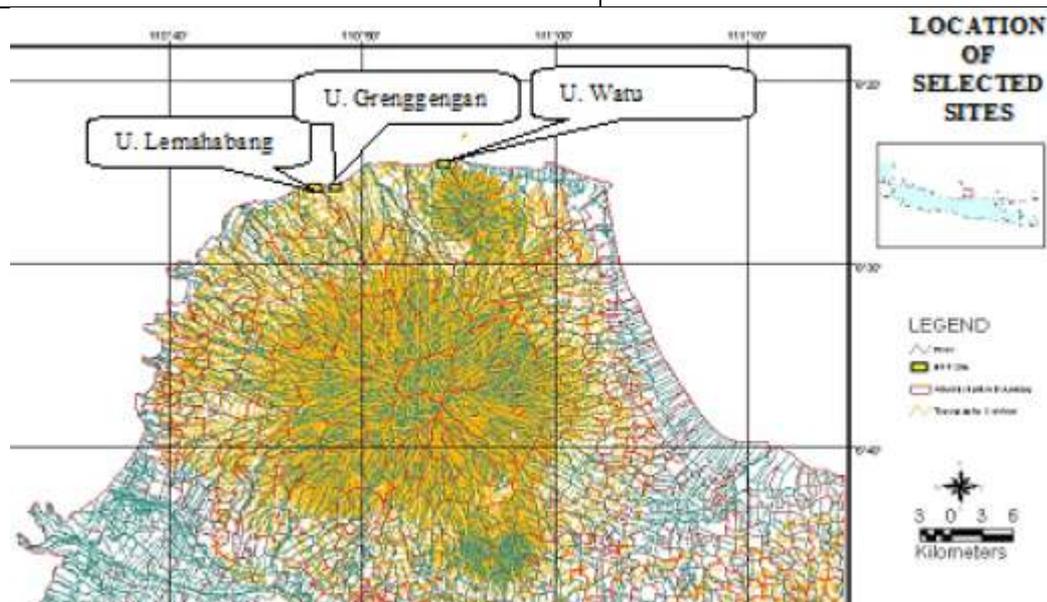


Fig. 5. Muria peninsula site

Conclusions

The INIR review team concludes that site selection process is consistent with the level of development of the programme, but that certain questions remain. The team concluded that Indonesia has a good understanding of the issues

Recommendations and Suggestions

Recommendation no. 13: Update the Site Data Report when owner/operator is identified.

Recommendation no. 14: Prepare a Site Evaluation Report for the preferred site. Continue investigations of alternative sites.

13. Environmental Protection	Phase 1
13.1. Unique environmental issues recognized	<p>A report of a study on initial background around nuclear facilities was prepared by BATAN in 2004-2007.</p> <p>A BAPETEN Chairman Decree No 03-P/Ka-BAPETEN /VI-99 covers the procedures for carrying out and reporting on the environmental impact assessment. This report predates the split of BATAN and BAPATEN and environmental issues are now dealt with by a different organisation, the Ministry of Environment. A report by the Diponegoro and Gadjah Mada universities states the positive environmental impact of a nuclear power programme. In addition there is a report on the joint study for Programme Preparation and Planning of the NPP Development in Indonesia (BATAB-KHNP phase 2).</p>
13.2. Environmental impact assessment production and communication recognized	<p>A clear procedure for EIA exists in Indonesia and is organised by the Ministry of Environment. It includes public hearings. The EIA process will start when the specific site is selected. An interdepartmental team for the NPP development programme ‘socialisation’ is coordinated by MEMR.</p>

Conclusions

The INIR review team concludes that work has been initiated in a manner consistent with the development of the nuclear power programme.

Recommendations and Suggestions

Suggestion no. 9 : Clarify the relationship between the environment ministry and other organisations that are involved in the nuclear power programme.

14. Emergency Planning	Phase 1
14.1. Appreciation of the need for emergency planning developed	A National Nuclear Emergency preparedness plan has been discussed by BAPETEN and BATAN has prepared General guidance for Nuclear Emergency preparedness for the Serpong nuclear area. Interdepartmental meetings have been held and their continuation is encouraged. BATAN and BAPETEN were observers at joint training exercises on emergency preparedness and radiological accidents in the US. Indonesia has ratified the convention on early notification of radiological accident. A workshop on Emergency Preparedness for NPP was held in 2008. Guidance on a nuclear preparedness plan has been produced for the Serpong nuclear facilities.
14.2. Communication with and involvement of local and national government taken into account	Interdepartmental meetings have discussed the involvement of all local government offices that are expected to be involved in an emergency plan. Although responsibilities are clearly defined in regulations, there are still issues to be clarified between department and related organization involved in the National Emergency Response Organization (NERO), in particular for radiation events, specifically with respect to knowledge and skill on technical matters as functional requirement as mentioned in IAEA Safety Standard GSR 2. In addition, due to the number of provinces, there is a recognized need to ensure the comprehensiveness of coordination with emergency services across all provinces.
14.3. Emergency planning for existing radiation facilities and practices in place	IAEA EPREV missions were made to Indonesia in 1999 and 2004 and these reviews have resulted in recommendations to improve capability of personnel, equipment and documentation.

Conclusions

The INIR review team concludes that the need for emergency planning is well understood but that additional coordination with local and governmental authorities needs to be conducted.

Recommendations and Suggestions

Suggestion no. 10: The Governmental and local authorities should be involved in the preparation of the Emergency Preparedness Review process.

15. Security	Phase 1
	<p>The IAEA completed an IPPAS Mission in 2001, a follow-up IPPAS Mission in 2007 and an International Nuclear Security Advisory Service (INSServ) Mission in 2004 and submitted the resulting draft Integrated Nuclear Security Support Plan (INSSP) to the Government of Indonesia for approval.</p> <p>Further, a sustainability Mission to assess the capability of Indonesia to independently maintain and improve the security of nuclear and radioactive materials was completed in 2009 and a report on findings and recommendations is under development. Implementation of the recommendations in these two documents should provide a solid nuclear security foundation in Indonesia.</p> <p>A Committee of National Detection Strategy is being prepared and local coordination at Serpong has been initiated. Some BATAN and BAPETEN personnel have received extensive IAEA training, but the understanding of nuclear security at the national level should be improved.</p> <p>A plan for the establishment of the National security organisation should be developed, including an organizational chart and a description of the functions. Indonesia is assisted by the IAEA and US DOE in determining the security level at BATAN. Although there is awareness of different threats posed to the security at the BATAN sites, there is a need for Indonesia to develop its own capability for vulnerability analyses and risk assessments.</p>

	<p>Senior government officials, including the Chairman of BATAN, are aware of the existence of various international guidelines.</p> <p>The IAEA in collaboration with BATAN has recommended developing a plan for a National security training program, involving all applicable response personnel and organizations.</p> <p>There is a security culture growing at BATAN, but a concentrated effort by senior National and Site leadership will be needed to foster further growth in phase 2.</p>
15.2. Necessary regulation identified	<p>There is a strong focus on the security of nuclear facilities and nuclear material in Indonesia. Government Regulations and several decrees of BAPETEN Chairman are in force. Some amendments are in process. Workshops and seminars are proposed for better understanding.</p> <p>The security oversight of the nuclear facilities needs improvement. A plan should be developed including how to include the IAEA Nuclear Security Series recommendations into the regulatory requirements. This plan should also include allocation of adequate resources.</p> <p>BAPETEN together with BATAN and other related institutions has prepared a Design Basis Threat (DBT) document for the national level. Local DBT will be prepared by BATAN. The DBT document identifies potential threats for illegal and malicious acts. A plan should be developed to define the applicable mechanism by which risk data is gathered, reviewed and used to update risk assessments and to identify who should be involved. A national team to prepare and review site DBTs should be established.</p>
15.3. Effective security protection for existing uses of radiation sources in place	<p>IAEA has conducted an International Nuclear Security Advisory Service (INSServ) mission and drafted an Integrated Nuclear Security Support Plan (awaiting Indonesia approval) and has conducted a Sustainability Mission. Both Missions will provide action plans for Indonesia to address key nuclear security requirements. Indonesian audit/review capacity should be improved to meet international requirements. An Indonesian audit or review</p>

	would also be beneficial in the near future to identify ongoing gaps and needs.
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Conclusions

In General, the INIR review team concludes that Indonesia is well positioned to meet the security requirements for Phase 1 of its National Infrastructure. Implementation of the recommendations in the Integrated Nuclear Security support Plan and the report from the sustainability mission in 2009 should provide a solid nuclear security foundation in Indonesia, meeting the requirements of Phase 1 and preparing it to move substantially toward meeting Phase 2 security requirements. Many of the recommendations for Indonesia involve regulatory, training and security culture development at the research reactor sites.

Recommendations and Suggestions

Suggestion no. 11: *Planning for nuclear security implementation should be continued, and where applicable, involve relevant stakeholder organizations. The recommendations provided from INSServ and Sustainability missions should be followed up, in particular:*

- *Development of security oversight and inspection capability in the regulatory body.*
- *Development of a national nuclear security training capability for workers, management and security personnel at sites with nuclear and radioactive material.*
- *Development of site-level DBT and documentation demonstrating that the site security systems are sufficient, as well as a review process for both.*
- *The Government of Indonesia should define organizations to participate in the review and update the national and site DBTs.*

Suggestion no. 12: *A program of strong security culture and regulation that addresses security requirements to radioactive sources and waste should be reviewed, guided by the IAEA Nuclear Security Series documents “Nuclear Security Culture” and “Security of Radioactive Sources”. As many key people might leave shortly a staffing plan should be developed to ensure knowledge retention and seamless transitions in job positions.*

Suggestion no. 13: *It is advisable that a National Committee to oversee nuclear security coordination across all government bodies is established and National training capability is developed.*

16. Nuclear Fuel Cycle	Phase 1
16.1. Knowledge of nuclear fuel cycle steps and approaches developed	Different aspects of the nuclear fuel cycle have been considered in Indonesia, including domestic uranium production and fuel fabrication, if economically motivated. The first few fuel loads will be bought on the

	<p>international market. An understanding of the different components of the front end market exists.</p> <p>The Act No.10 of 1997 gives the responsibility to BATAN to explore for uranium and consider the possible commercialisation of uranium production and fuel fabrication. Some smaller uranium deposits have been identified in the country. A feasibility study for a fuel fabrication plant has been performed. Fuel cycle aspects have also been included in the study of the nuclear power plant and in the User Consideration document.</p> <p>The strategy for spent fuel management is long term storage, i.e. a wait and see policy. Government regulation 27/2002 states that spent fuel is a waste. Several options are considered including return of fuel to the country of origin, direct disposal of fuel or reprocessing after 2075. Some preliminary studies of the different components of spent fuel disposal have been made.</p> <p>The regulatory aspects of fuel cycle facilities are covered in BAPETEN Chairman Regulation No. 11 Year 2007.</p> <p>Indonesia has signed the Joint Convention and is in the process of ratifying it. Expected within a year.</p>
16.2. Need for site spent fuel storage recognized	Spent fuel is planned to be stored for 10 years in reactor pools and then put in long term storage at or away from reactor. The draft Bid Invitation Specifications includes storage pools for 10 years capacity.
16.3. Interim spent fuel storage considered	See 16.2 .

Conclusions

The INIR review team concludes that the planning for fuel cycle activities is consistent with the level of development of the program.

Recommendations and Suggestions

Suggestion no. 14 : *Work should start early on the activities of phase 2, in particular a strategy and planning document should be developed for all aspects of the fuel cycle and ensure the appropriate inclusion in bidding documents.*

17. Radioactive Waste	Phase 1
17.1. The burdens of radioactive waste from nuclear power plants recognized	The responsibilities for waste management are clarified in the Act No. 10 of 1997. An overall plan has been established for all types of waste from NPPs. The owner of the power plant will be responsible for the treatment, conditioning and packaging of the low and intermediate level waste and for the storage of spent fuel. The LLW will be delivered to BATAN who is responsible for interim storage and disposal. Site studies for a disposal facility for LLW have been performed based on available geological information. Preferred site would be close to the NPP. The disposal facility is planned to be in operation shortly after the NPP.
17.2. Current capabilities for waste processing, storage and disposal reviewed	<p>Batan has at present the responsibility to treat, condition, store and subsequently dispose of all radioactive waste in Indonesia. Treatment, conditioning and storage facilities have been established at the Serpong site. These are not intended for the future NPPs that will have their own facilities.</p> <p>A demonstration disposal facility is considered at Serpong and site investigations have been performed.</p>
17.3. Options for ultimate disposal of high level radioactive waste recognized	The different components of the system for disposal of spent fuel have been studied. A good awareness was shown of the work going on internationally. No siting work has been performed yet. The main concerns are earthquakes.

Conclusions

The INIR review team concludes that the actions in this area are consistent with the development of the national nuclear power programme. Waste management for the research reactor is well developed. Some activities normally covered in the next phase have already been done, including defining a national waste management organization and some preliminary site investigations for low-level waste disposal.

Recommendations and Suggestions

Suggestion no. 15 : *It would be useful to develop early a formal strategy and planning document for all aspects of waste management, including an appropriate funding (for decommissioning and spent fuel and waste management) to ensure the fund buildup during NPP operation. It would further be useful to involve the prospective owner/operator of the NPP in this work.*

18. Industrial Involvement	Phase 1
18.1. National policy with respect to national and local industrial involvement considered	<p>Ministry of Industry has issued Decree No. 04/M-IND/PER/1/2009 on Local Content for Fossil Fuel Power Plants, Water and Geothermal Generated Power Plant. The target for local content for NPP construction will be defined later.</p> <p>Several surveys of industries potential to participate in the NPP construction have been done by BATAN-KHNP, BATAN-KEPCO, BATAN-Westinghouse, and BATAN-NEWJEC. Dialogue with domestic suppliers has started considering their participation to NPP project. These studies recognized that national industry capability will be up to 20% of the total investment of the first NPP, mainly for civil works, but also for some components. Siemens-Indonesia, for instance, already supplies main condenser to Olkiluoto 3 in Finland (EPR).</p>
18.2. Need for strict application of quality program for nuclear equipment and services recognized	<p>Qualification of domestic suppliers is yet to be done but this will mainly be included during the process of discussion with the Supplier of the NPP as a part of supply chain. National standards for nuclear components were developed for research reactors but not yet for NPP. The standards could depend on the country of Supplier.</p> <p>BAPETEN had issued a guideline for Management System for all nuclear related organizations to follow (see section 7 Regulatory Framework).</p>

Conclusions

The INIR review team concludes that that the actions in this area are consistent with the development of the national nuclear power programme.

Recommendations and suggestions

Suggestion no. 16 : Set up a target for local content for NPP construction utilizing the result of the survey of domestic industrial capability.

Suggestion no. 17 : Develop relevant phase 2 action plans.

19. Procurement	Phase 1
19.1. Unique requirements associated with purchasing nuclear equipment and services recognized	Presidential Decree No. 80/2003 on procurement in government institutions for procurement process of goods and services (which would apply to NPPs as well if the project has a component of government funding). BATAN has a QA center to assure nuclear grade supply to RR. Indonesian standard is set up nuclear grade quality requirement for RR. PLN is involved in this work. Once owner/operator is identified, the organization is supposed to establish nuclear procurement team and start training.
19.2. Consistent policies for nuclear procurement in place	The requirement is recognized by BATAN. Policy for development of an appropriate management system (including quality control and assurance) is set for all organizations involved nuclear activities are already set by BAPETEN.

Conclusions

The INIR review team concludes that that the actions in this area are consistent with the development of the national nuclear power programme.

Recommendations and Suggestions

None

7. SUMMARY EVALUATION RESULTS

The table provided below represents a summary of the views of the team with respect to whether Indonesia has met the conditions of the “basis for evaluation” identified for each Milestone issue in NG-T-3.2 “Evaluation of the Status of National Nuclear Infrastructure Development.” The team did not review in detail the content of any materials provided. The table is intended to provide decision-makers and key stakeholders involved in the nuclear power programme infrastructure development with a visual overview of areas where the team found additional attention should be focused. *Care must, however, be taken in interpreting the table and the colour coding used. It must NOT be interpreted that the country cannot move to the next phase of the nuclear power programme until all turn to green, since there is no single uniform avenue for development of infrastructure and launching nuclear power programme. It rather indicates that there is an increased risk to the programme, if when making a decision to introduce nuclear power, the various issues have not been fully addressed at that stage. Also a “green” indicator does not mean that no additional actions are required.*

1. National Position		Phase 1
Conditions		Status
National Position	1 Safety, security and safeguard committed	
	2 National position declared	Launching Nuclear Power programme is not yet declared.
1.2. The NEPIO established and staffed		National implementation programme not yet established
1.3. National strategy defined		National implementation programme not yet established
2. Nuclear Safety		Phase 1
Conditions		Status
2.1. Key elements of nuclear safety understood		
2.2. Need for intergovernmental instruments on safety recognized		
2.3. Support through international cooperation intended		
3. Management		Phase 1
Conditions		Status
3.1. Energy strategy and nuclear power compatibility analyzed		Continuous updating of viability is needed
3.2. Unique Member State conditions evaluated		
3.3. Available nuclear technologies identified		
3.4. Ownership options and operational responsibilities considered		Need to be identified
3.5. Authorities and responsibilities established		
3.6. Appropriate expertise and experience involved		
3.7. Commitment to management systems that promote and support a strong safety culture, evident		

4. Funding and Financing		Phase 1
Conditions		Status
4.1. Adequate funding for the NEPIO provided		Funding for coordination team

	missing
4.2. Strategies for funding and financing established	Options evaluated, but awaiting decision on owner/operate
5. Legislative Framework	Phase 1
Conditions	Status
5.1. Adherence to all relevant international legal instruments planned	The adherence to some not yet completed
5.2. Plans for development of national nuclear power legislation in place	
5.3. Consultation with national stakeholders about the legislative framework taken place	
6. Safeguards	Phase 1
Conditions	Status
6.1. Obligations under NPT and non-proliferation treaties and other international instruments, recognized	
6.2. Development, implementation and enforcement of safeguards framework, including SSAC establishment, planned	
6.3. International requirements for any existing nuclear facilities or locations outside facilities met	

7. Regulatory Framework	Phase 1
Conditions	Status
7.1. Development of an adequate regulatory framework planned	
8. Radiation Protection	Phase 1
Conditions	Status
8.1. Hazards presented by NPP operation recognized	
8.2. Enhancements to national regulations and infrastructures planned	
9. Electrical Grid	Phase 1
Conditions	Status
9.1. Electrical grid requirements considered	
10. Human Resources	Phase 1
Conditions	Status
10.1. Necessary knowledge and skills identified	
10.2. Develop and maintenance of human resource base planned	
11. Stakeholder Involvement	Phase 1
Conditions	Status
11.1. Strong public information and education programme initiated	Well-structured programme needs to be established
11.2. Need for open and timely interaction and communication regarding the nuclear power programme addressed	Needs to determine on public participation in decision-making process

12. Site and supporting facilities	Phase 1
Conditions	Status
12.1. General survey of potential sites, conducted	
12.2. Selected site(s) justified	Evaluation not done yet
13. Environmental Protection	Phase 1
Conditions	Status
13.1. Unique environmental issues recognized	
13.2. Environmental impact assessment production and communication recognized	
13.3. An effective environmental framework for existing uses of radiation sources in place	
14. Emergency Planning	Phase 1
Conditions	Status
14.1. Appreciation of the need for emergency planning, developed	
14.2. Communication with and involvement of local and national government taken into account	
14.3. Emergency planning for existing radiation facilities and practices in place	
15. Security	Phase 1
Conditions	Status
15.1. Necessary regulation identified	
15.2. Effective security protection for existing uses of radiation sources in place	
15.3. Necessary regulation identified	

16. Nuclear Fuel Cycle	Phase 1
Conditions	Status
16.1. Knowledge of nuclear fuel cycle steps and approaches developed	
16.2. Need for site spent fuel storage recognized	
16.3. Interim spent fuel storage considered	

17. Radioactive Waste	Phase 1
Conditions	Status
16.4. Knowledge of nuclear fuel cycle steps and approaches developed	
16.5. Need for site spent fuel storage recognized	
16.6. Interim spent fuel storage considered	
18. Industrial Involvement	Phase 1
Conditions	Status
18.1. National policy with respect to national and local industrial involvement considered	Under consideration
18.2. Need for strict application of quality programs for nuclear equipment and services recognized	
19. Procurement	Phase 1
Conditions	Status
19.1. Unique requirements associated with purchasing nuclear equipment and services recognized	
19.2. Consistent policies for nuclear procurement in place	