



Key Findings

Workshop on

Indonesia's Energy Landscape and Plans with Nuclear Power

**Hotel Santika Premiere Bintaro,
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The Pacific Forum, in cooperation with the Research Center for Nuclear Reactor Technology (PRTRN), Research Organization for Nuclear Energy (ORTN), conducted a workshop on Indonesia's energy landscape and its plans for utilizing nuclear power in its planned transition to clean energy. Approximately 20 scholars and officials participated, all in their private capacity. The off-the-record discussions provided an opportunity to discuss key energy issues affecting countries in Southeast Asia and the prospects for utilizing emerging technologies related to nuclear power generation in Indonesia as Jakarta seeks ways to transition to clean energy as part of its commitment to decarbonization based on the goals set out in the Paris Agreement and the UN Framework Convention on Climate Change. Key findings from this meeting include:

In the introductory remarks and throughout the meeting, it was made clear that while Indonesia has a long history with nuclear technology with its current inventory of research reactors, it has yet to reach the "broken egg" moment that would lead to a full development of a nuclear energy program. Significantly, several Indonesian nuclear experts asked for advice for how they should proceed to "convince their leaders" that Jakarta should include nuclear power in its energy mix.

The recent reorganization of Indonesia's nuclear energy agency (*Badan Tenaga Nuklir Nasional*, BATAN) as the Research Organization for Nuclear Energy (*Organisasi Riset Tenaga Nuklir*, ORTN), which is one of Research Organizations under the umbrella of the [National Research and Innovation Agency](#) (*Badan Riset dan Inovasi Nasional*, BRIN), has had little impact to promote nuclear energy research and development.

Due to rapid economic development, population growth, and urbanization, electricity demand in Southeast Asia has grown rapidly over the past two decades and will continue to grow exponentially in the coming decades. Indonesia's electricity demand is expected to increase to 487 terawatt hours (TWh) by 2030 and 1,455 TWh by 2050.

There have been several initiatives to expand and improve the power grid in Southeast Asia, with most of the emphasis on the Mekong region of continental Southeast Asia and the Laos-Thailand-Vietnam-Malaysia-Singapore Power Integration Project. Challenges associated with undersea connections, geopolitics, and security have nonetheless hampered connectivity between islands in maritime Southeast Asia. Within Indonesia, there are plans for improved interconnections of

electricity transmission in Sumatera, Java, Kalimantan, and Sulawesi in 2024, and the promotion smart grid development.

Based on commitments made in 2015 Paris Climate Agreement (COP21) and subsequent pledges at the 2021 UN Climate Convention (COP26) countries in Southeast Asia have made commitments to reduce carbon emissions by increased reliance on clean energy. Indonesia has committed to a reduction in carbon emissions by 29% through self-effort and 41% with international assistance by 2030 through the development of renewable energy, implementation of energy efficiency, energy conservation, and the application of clean energy technology.

There is a growing acknowledgement by governments in Southeast Asia that nuclear energy should be considered seriously as an alternative clean energy source. Vietnam, Thailand, Philippines, Malaysia, Singapore, and Indonesia have all taken action to incorporate a nuclear option in the energy planning process. Indonesia has established economic viability (NPP electricity selling price ≤ 7.66 cent/kWh) as key criterion for integration of nuclear power into its energy mix.

Successful integration of nuclear energy will require a firm commitment to a regional approach to nuclear safety, security, and safeguards, transparency in national planning efforts, and an ecosystem approach to integrating nuclear power into the regional energy infrastructure.

While Indonesia has not made a formal national commitment to the development of a nuclear energy program, its Energy and Mineral Resources Ministry has announced the formation of a preparatory team for a Nuclear Energy Program Implementation Organization (known as NEPIO) for the purpose of locating potential nuclear power plant sites and examining the country's existing nuclear infrastructure. An IAEA Integrated Nuclear Infrastructure Review conducted in 2009 reported that Indonesia's nuclear infrastructure is fairly robust with minor deficiencies noted in management, financing, stakeholder involvement, siting, and the lack of a national position. The major challenges are public acceptance and cost.

Existing Indonesian plans for integrating nuclear into its power generation mix are fairly modest with the projected introduction of 5 GW of nuclear capacity by 2050 and 30 GW by 2060. Even the most optimistic projection would limit nuclear to around 10% of Indonesia's total electricity supply. Plans for introducing hydrogen as a clean energy alternative are much more aggressive.

The trend toward smaller reactors is important for Indonesia because it reduces the initial facility cost, has a smaller footprint, and provides more siting flexibility. Small modular reactors, especially the floating modules, are seen as especially attractive for providing a reliable power source for individual islands. While there is a great deal of uncertainty given the lack of solid data, Indonesian experts have conducted some scenario planning to determine an optimum distribution of floating nuclear power plants throughout the archipelago.

Indonesia is involved in two separate initiatives involving small modular reactors. The first is the Reactor Daya Eksperimen (Experimental Power Reactor) PeLUIt: Pembangkit Listrik & Uap panas Industri (Electric Power and Industrial Hot Steam Plant) (RDE/MicroPeLIUt) reactor, which is designed to demonstrate the operational characteristics and safety performance of a Pebble Bed Reactor (PBR)-type of High Temperature Gas-cooled Reactor (HTGR). The project is currently

developing a full-scale simulator. The second initiative is the Thorcon molten salt reactor project, which is being designed to operate as a floating nuclear power plant. A proposal to build a prototype has been submitted to the IAEA.

As part of its focus on new research, BRIN/ORTN representatives expressed an eagerness to find new partners to collaborate on the co-development of innovative next generation nuclear reactors that would be built as a demonstration plant in Indonesia. One such project currently on offer is to build a 40MWt pebble bed HGTR as the basis for a zero-emission hydrogen production system.

This document was prepared by David Santoro and Carl Baker. For more information, please contact David Santoro (david@pacforum.org), President & CEO of Pacific Forum. These preliminary findings provide a general summary of the discussion. This is not a consensus document, and the views expressed do not necessarily reflect the views of all participants.