

Risk assessment, energy requirements, and democratic accountability in Indonesian nuclear power proposals

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Outline

- Attitude to nuclear power - general and specific
 - Security and sustainability
 - Nautilus Deep Borehole Disposal Study
- Why research Indonesian nuclear power?
 - Suspects with a nuclear history and rising misperceptions
 - Requirements for democratic accountability in electricity policy
- Rationales for PLTN proposal: climate change; energy security; cost
- Site and alternative sites
- Risks
- Players in political ecology of NPP proposal: nuclear pushers, nuclear resisters, & state of play
- Australia and proliferation risk: De-escalating threats and fantasies
- Code of conduct for transfer of nuclear technology to consumer countries

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Attitude to nuclear power

- Basic principles: security and sustainability
- Not opposed to nuclear power in principle
- Must assess each case on its merits
- Nuclear power in general faces three problems not yet solved:
 - Waste disposal
 - Safety and security
 - Nuclear weapons proliferation

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Nautilus Deep Borehole Disposal study

- *Deep Borehole Disposal of Nuclear Spent Fuel and High Level Waste as a Focus of Regional East Asia Nuclear Fuel Cycle Cooperation*
- David von Hippel and Peter Hayes, Austral Special Report 10-03A, 15 December 2010
- <http://www.nautilus.org/publications/essays/apsnet/reports/2010/von-hippel-hayes.pdf/view?searcher%22deep%20borehole%22>

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Specific case of current nuclear power planning in Indonesia

- Suspects with a nuclear history and rising misperceptions
- Requirements for democratic accountability in electricity policy
- Principal risks specific to current proposal
 - Risk 1. Financial
 - Risk 2. Regulation and safety
 - Risk 3. Seismic and tectonic risk

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Reason 1 to study PLTN planning: Suspects with a nuclear history

- Both Indonesia and Australia had secret nuclear weapons programs in the middle Cold War period
 - Indonesia: 1960-1965 - never serious; ended with coup
 - Australia: 1950s - 1972 - very serious; ended by US insistence over NPT

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Indonesian nuclear proliferation issues

- Robert M. Cornejo, 'When Sukarno Sought the Bomb: Indonesian Nuclear Aspirations in the Mid-1960s,' *The Nonproliferation Review*, Summer 2000
- *Indonesian nuclear proliferation – contemporary*, Nautilus Institute
 - <http://www.nautilus.org/projects/holding/reframing/aust-ind-nuclear/ind-nw/ind-np-now>

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Australia nuclear proliferation history

- Stopped by United States in early 1970s
- Many good academic studies and documentation
- See: *Australia nuclear proliferation history*, Nautilus Institute:
 - <http://www.nautilus.org/projects/holding/reframing/aust-ind-nuclear/aust-prolif/aust-prolif-hist-list>
- Royal Australian Air Force institutional memory
 - RAAF bought F-111s bombers in 1960s, reflecting planning for nuclear delivery capability from 1963 decisions
 - For bombing of Surabaya and Jakarta
- Indonesia security planners have not forgotten

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Australia nuclear proliferation risk

- Indonesia security planners have not forgotten
- Not government policy; small minority of fringe analysts outside government
- Current revival of Australian thinking about the nuclear weapon option in part stimulated by assumptions about Indonesian proliferation risk.
- They argue:
 - Northeast Asia will experience nuclear proliferation
 - Indonesia will build nuclear power stations
 - Risk of Indonesian nuclear weapons development
 - Therefore Australia should prepare for worst option by developing uranium enrichment, as prerequisite for nuclear weapon

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Transparency on Indonesian NPP programme a requirement for stable bilateral security

- Problems with these assumptions:
 - Assumes Japan (and others) will definitely acquire nuclear weapons
 - Assumes Indonesia will definitely build NPP
 - Assumes high probability of Indonesian nuclear weapons development
- If such assumptions become the basis of Australian policy, there will be a high likelihood of an Indonesian response:
 - In other words, a vicious cycle of misperceptions, which can only be avoided by transparency

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Reason 2 to study PLTN planning: Requirements for democratic accountability in electricity policy

- Is the proposal a good solution for Indonesia's electricity requirements?
- Is the proposal compatible with global and local sustainability requirements?
- What risks are involved?
- What are the probabilities these risks will be managed appropriately?
- Is the proposal compatible with the requirements of accountability within Indonesian democracy, and beyond?

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Democratic accountability

- Accountability = no culture of impunity
- Democratic accountability =
 - Responsiveness to lawfully expressed public opinion
 - Accountability to elected legislature and regulatory bodies
 - Legislature and regulatory bodies possess:
 - requisite knowledge base
 - requisite legal powers
 - capacity to compel enforcement

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Democratic accountability and transparency

- Transparent and rule-based decision-making
- Transparent and appropriate assessment and allocation of risk
- Regulatory competence and efficacy
- Legally established and enforced public scrutiny and access to documentation

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Rationales for the nuclear choice for Indonesia

- Electricity crisis
 - >>> “increase supply at appropriate prices”
- Energy security: running out of oil
 - >>> “long-term uranium supply assured”
- Cost considerations:
 - >>> “nuclear power is at least comparable to fossil fuels like gas”
- Indonesia = No. 3 in world greenhouse gas emissions
 - >>> “reduce with nuclear power”

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Indonesia’s problematic GHG emissions source = forestry, not energy

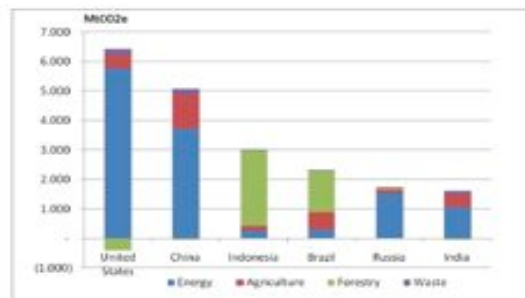
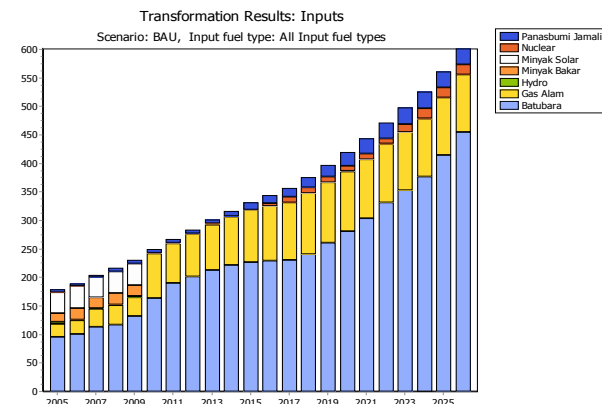


Figure 1. The Comparison of GHG Emission

Source: PEACE/World Bank, 2007

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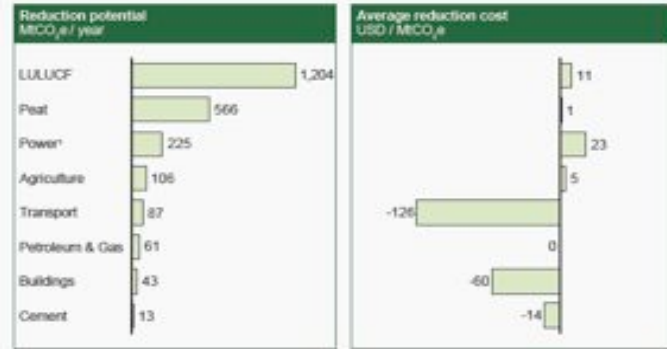
Energy Input for Power Generation in Java-Bali system



Source: Fabby Tumiwa, Indonesia Climate Change Mitigation Strategy and its Implication on Energy Sector Development, Nautilus Institute, EASS Meeting, Beijing, 23-24 Sept 2010

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Indonesia's reduction potential is concentrated largely in the forestry and peat sectors



* Excludes of demand side reductions from other sectors
SOURCE: Indonesia GHG Abatement Cost Curve

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Existing Indonesian research reactors

Location	Type	Output	Operational from:
Serpong	GA Siwabessy	30 MW	1987
Jogyakarta	Triga Mk II	100 kW	1979
Bandung	Triga Mk II	1,000 kW	1964

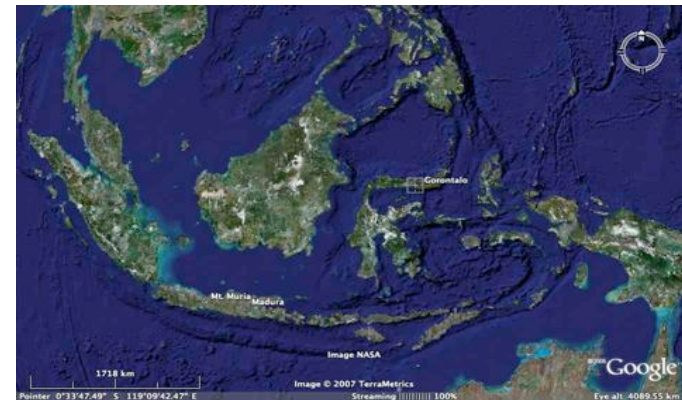
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Reactors under discussion

Location	Reactor type/output	Purpose	Main backers	Would-be partner	Status
Muria peninsula Central Java	1 (+3) x 1,000 MW	Electricity	<ul style="list-style-type: none"> BATAN Ministry of Research and Technology Energy Minister Darwin Zahedy Saleh PT Medco Energi - Arifin Panigoro 	<ul style="list-style-type: none"> KEPCO (Korea) Mitsubishi (Japan) Areva (France) 	Under close presidential consideration Postponed BATAN timetable: <ul style="list-style-type: none"> 2008 tender 2010 start 2016 first reactor
Madura, East Java	2 x 100 MW	Desalination + electricity co-generation	BATAN, IAEA	KEPCO	Feasibility study
Gorontalo, Sulawesi	Floating/70 MW	Electricity	Provincial government	RAO UES (Russian United Energy)	Unclear; probably dead

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Planned nuclear power reactor sites



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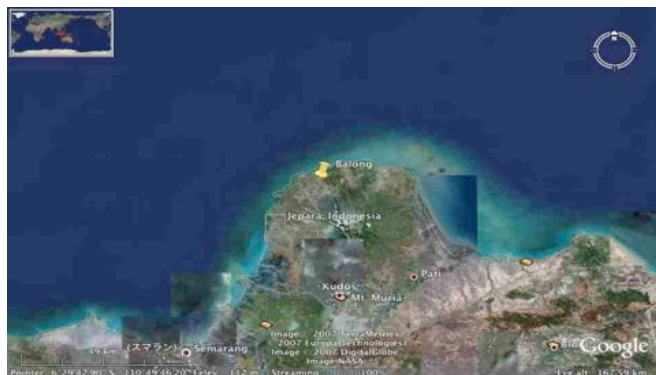
Sites in Java considered for a nuclear power plant since 1980



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Muria Peninsula, Central Java



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Desa Balong, Jepara, Muria Peninsula



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Current alternative site proposals

- Banten:
 - Pulau Panjang (S 5° 55' 0" E 106° 9' 0")
 - Bojonegara (S 5° 58' 0" E 106° 5' 0")
- Bangka Belitung
 - Muntok/Teluk Inggris (S 2° 4' 0"E 105° 11' 0")
 - # Pulau Naduk, (aka Nanduk, Nado) (S 2° 58' 0", E 107° 27' 0")
 - Pulau Lepar [aka Lepa] (S 3° 1' 11", E 106° 53' 39")
 - Permis
- See: *Contemporary alternative site proposals*, Nautilus Institute, <http://www.nautilus.org/projects/holding/reframing/aust-ind-nuclear/ind-np/muria/contemporary-alternatives>

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Banten site proposals



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Bangka sites



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Range of risks that need to be assessed

- Site selection
- Environmental impact
- Facility design, safety and security
- Proliferation risk: direct and indirect
- Security risks beyond proliferation
- Appropriateness of risk assessment techniques
- Finance
- Liability
- Regulatory integrity and effectiveness
- Transparency of decision-making
- Appropriate forms of community consultation

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Risk 1. Financial

- The example of the Bataan Nuclear Power Plant in Luzon in the Philippines.
 - Constructed by Westinghouse and Bechtel under President Marcos; highly corrupt process
 - Never commissioned; closed by President Aquino in 1986 because of dangers deriving from corrupt construction.
 - New studies revealed volcanic (Mt Pinatubo eruption) and seismic hazards concealed or ignored.
 - Philippines government completed paying off its obligations on the plant in April 2007, more than 30 years after construction began.

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Economics of nuclear power: starting points (US\$2007)

\$2007	Fuel cost (\$/mmBtu)	Capital cost (\$/kW)	Break even tariff (cents/kWh)
Nuclear	0.67	4,000	8.4
Coal	2.60	2,300	6.2
Gas	7.00	850	6.5

Source: John M Deutch et al., *Update of the 2003 Future of Nuclear Power*, Massachusetts Institute of Technology, 2009

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Construction time of nuclear power plants worldwide

Period of reference	Number of plants constructed	Average time (months)
1965-1970	48	60
1971-1976	112	66
1977-1982	109	80
1983-1988	151	98
1995-2000	28	116
2001-2005	18	82

Source: Stephen Thomas, Peter Bradford, Antony Froggatt and David Milborrow, *The Economics of Nuclear Power: Research Report 2007*, Greenpeace, 2007

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Batan basic estimates vs MIT basic estimates

	BATAN estimates	Update of the MIT 2003 Future of Nuclear Power Study
Construction cost (US\$/kW)	US\$1500-\$1800/kW	US\$4,000/kW

Sources:

Soedyartomo Soentono, *National Nuclear Power Programme Expectation to International Organisations*, Special Symposium for the IAEA 50th Anniversary, April 11, 2007, Aomori, Japan.
 2009 Update of the MIT 2003 Future of Nuclear Power Study, MIT, 2009:
<http://web.mit.edu/nuclearpower/pdf/nuclearpowerupdate2009.pdf>

The Indonesian electricity crisis

- Supply shortfall, but also....
- Structural issues
 - Low electricity tariffs don't cover production costs
 - Restricted capacity for routine maintenance and upgrades
 - Rapid and serious deterioration of existing infrastructure
 - Structural reform required
- Is nuclear power part of the solution?
 - An investment of this magnitude and degree of risk may potentially exacerbate the financial problems that underpin the current electricity crisis

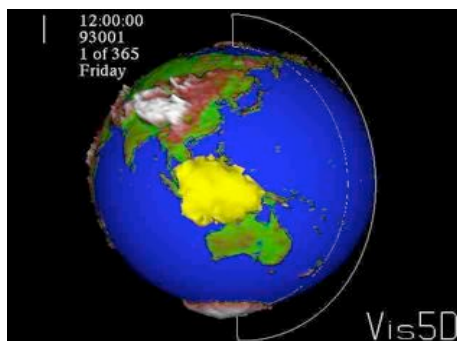
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Risk 2. Regulation, safety and impunity

- Regulation for security and safety
- Indonesia has acceded to relevant IAEA protocols
- Nuclear Energy Control Agency (Bapeten) central to implementation
 - Confidence undermined by 2007 convictions of two senior Bapeten officials and member of parliament
- Doubts about accountability and administrative culture of impunity after Sidoarjo mud explosion.
- Safety risks - the big question:
 - “if something happens at Muria, what are the consequences”

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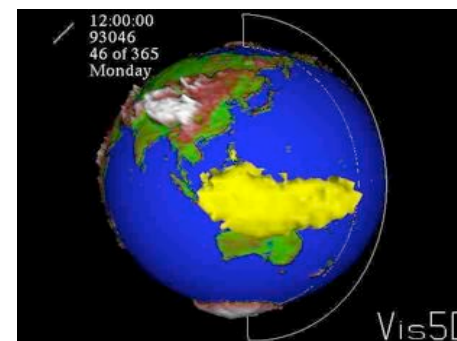
Muria NPP explosion, Day 1



Source: John Taylor and Drew Whitehouse, *An Analysis and Visualization of the Risk Associated with the Potential Failure of Indonesian Nuclear Reactors*, ANU, 1998

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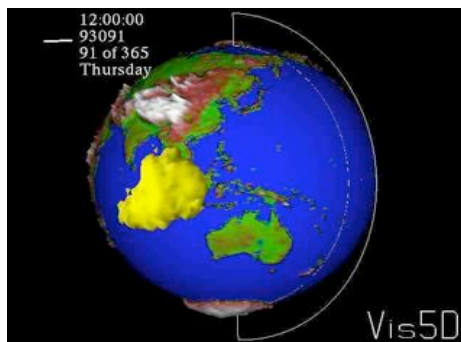
Muria NPP explosion, day 45



Source: John Taylor and Drew Whitehouse, *An Analysis and Visualization of the Risk Associated with the Potential Failure of Indonesian Nuclear Reactors*, ANU, 1998

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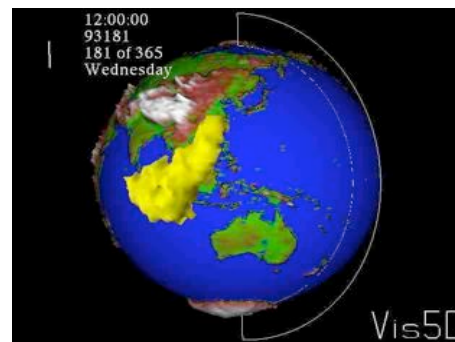
Muria NPP explosion, day 90



Source: John Taylor and Drew Whitehouse, *An Analysis and Visualization of the Risk Associated with the Potential Failure of Indonesian Nuclear Reactors*, ANU, 1998

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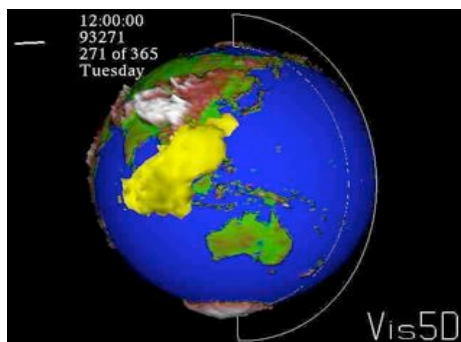
Muria NPP explosion, day 180



Source: John Taylor and Drew Whitehouse, *An Analysis and Visualization of the Risk Associated with the Potential Failure of Indonesian Nuclear Reactors*, ANU, 1998

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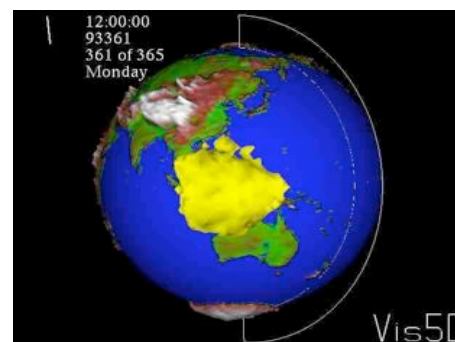
Muria NPP explosion, day 270



Source: John Taylor and Drew Whitehouse, *An Analysis and Visualization of the Risk Associated with the Potential Failure of Indonesian Nuclear Reactors*, ANU, 1998

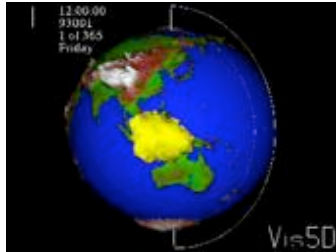
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Muria NPP explosion, day 360



Source: John Taylor and Drew Whitehouse, *An Analysis and Visualization of the Risk Associated with the Potential Failure of Indonesian Nuclear Reactors*, ANU, 1998

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Risk 3. Seismic and tectonic risks

- Key study: McBirney et al, "Volcanic and seismic hazards at a proposed nuclear power site in central Java", *Journal of Volcanology and Geothermal Research* 126 (2003) 11-30.
- Gunung Muria: "a capable volcano", less than 25 km from NPP site; nearest vent 4.5 km
- Site within "screening distance" for pyroclastic material and flows, debris, mud, and new vents
- Gases indicative of magma found 1.5 km from site
- Close to two major north-south seismic fault lines
 - New offshore fault lines recently discovered, but data restricted
- Site unstable due to permeable weathered upper layer of soil and proximity to faults

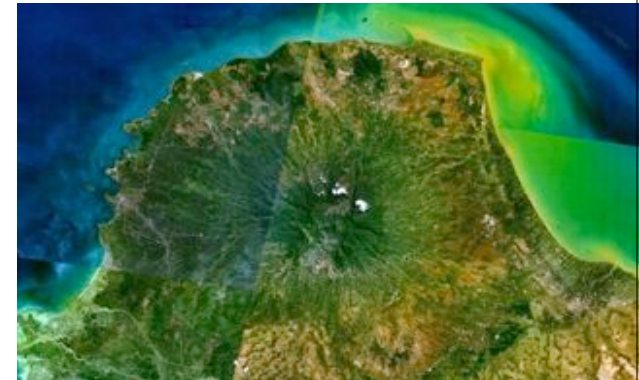
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Information restricted, inadequate, and faulty

- Indonesian government claims not supported by public reports by IAEA and Indonesian government consultants
- Almost all official Indonesian and IAEA volcanic and seismic studies have been kept from the public domain over more than three decades.
- One report (McBirney et al) which utilized these numerous studies drew attention to significant methodological and data limitations in these studies.
- Reliance on earthquake resistance standards derived from earlier Japanese modelling may be inappropriate due to significant differences between the site's geological conditions and those in Japan.
- Feasibility study reliance on Japanese standards for earthquake resistance undermined by Kashiwazaki-Kariwa NPP shutdown after 2007 earthquake

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Gunung Muria



- Volcano Type: Stratovolcano
- Volcano Status: Holocene
- Last Known Eruption: 160 BC ± 300 years
- Summit Elevation: 1625 m

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Players in political ecology of NPP proposal: national

Government - national

President
Cabinet/coordinating ministers

DPR/parties
DPR Komisi VII

Batan (National Nuclear Energy Agency)

Bapeten (National Nuclear Regulatory Agency)

Ministry of Research and Technology

Ministry of Energy and Natural Resources

Ministry of Finance

Ministry of State Enterprises

Ministry of Environment

TNI

Indonesia – regional government

Non-government

Jepara/Balong

- Persatuan Masyarakat Balong
- MAREM
- Garda Muria; Muria Institute
- NU Central Java/Jepara and NU-related
- Local industry

National

- WALHI
- Greenpeace
- WWF Indonesia
- Ind Inst for Energy Economics
- Inst for Infrastructure Reform
- Pelangi Indonesia
- Anti-Nuclear Society (Manusia)
- CSIS
- Pro-nuclear groups
- Scientific groups

Corporate

- PLN
- Medco Energi
- Coal and gas electricity generators
- ??

Indonesia – nuclear establishment

- Batan
- Bapeten
- Ministry of Research and Technology
- Universities
- Batan alumni
- Pro-nuclear groups

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Players: foreign and multilateral

Vendor countries/vendors

Japan

Mitsubishi Heavy Industries
Toshiba-Westinghouse (GE-Hitachi)
JETRO
METI
MEXT
JBIC
Training organisations and universities

Korea

Korea Electric Power/Korea Hydro Nuclear Power (KEPCO/KHNP)
Korea Power Engineering Company (KOPEC)
Doosan Heavy Industries
Ministry of Foreign Affairs and Trade
Ministry of Knowledge Economy
Ministry of Education, Science & Technology
Research Institutes: KAIST, KINS, KINAC
Training organisations and universities

United States

(GE-Hitachi)
Department of Energy
State Dept: Office of Cooperative Threat Reduction

France

Areva
Government?

Multilateral actors

IAEA
O Dept of Nuclear Energy
O Dept of Nuclear Safety and Security
O Dept of Safeguards
World Bank
Asian Development Bank
Climate change-related global and regional funds
IEA/OECD
Nuclear safety organizations

Lobbies ?

Australia

PM&C
DFAT
Defence
ANSTO
Dept Resources & Energy
Uranium exporters
Dept CC and Energy Efficiency
Uranium exporters
Worley Parsons

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Politics - nuclear pushers

- Nuclear agency BATAN
- IAEA
- Nuclear plant vendors:
 - KEPCO/Korean Hydro Nuclear Power
 - Mitsubishi Heavy Industry
 - Areva
- Minister of Energy and Natural Resources Darwin Saleh
- Ministry of Research and Technology
- President Susilo Bambang Yudhoyono
- PT Medco (Arifin Panigoro)
- Nationalist streams in parties and military
- United States - divided pro and con

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Politics - nuclear resisters

- Locals:
 - villagers
 - student supporters: Garda Muria and Muria Institute
 - Jepara and Central Java NGOs and political parties
 - Muria region local industry
 - Central Java NU: the *fatwa haram*
- Jakarta-based NGOs
- International NGOs and INGOS
- Internal government:
 - Ministry of Environment - ?
 - Ministry of Finance - ?

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State of play: post-election revival = ?

- Electricity crisis
- powerful government promoters, as well as opponents
- Presidential involvement (National Energy Council)
- pressure from vendors
- civil society campaign fatigue
- finance central (VP Boediono; Finance Minister)
- non-rational factors probably the key

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Australia and Indonesia: de-escalating threat perceptions and fantasies

- Actual Indonesian state proliferation risk low;
- A.Q.Khan-type nuclear black market risk significant
- But minority stream of Australian security specialists view likely Indonesian proliferation risks as reason to review Australian weapons options (including U. enrichment)
- Indonesians remember Australian past nuclear programme; coupled with ADF force structure developments (esp. cruise missile planning)
- Highest risk is negative cycle of misperceptions as basis for strategic planning
- What do we need: a robust international code of conduct for nuclear consumer countries

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Possible issue areas for a code of conduct for transfer of nuclear technology to consumer countries

1. Planned Impacts on Humans, the Environment, and Natural Resources
2. Risk of Unplanned Impacts on Humans, the Environment, and Natural Resources
3. Implications for Proliferation of Nuclear Weapons
4. Requirements and Implications for Governance
5. Implications for Land Use

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Possible issue areas for a code of conduct for transfer of nuclear technology to consumer countries

6. Compatibility with the Country's Development Trajectory
7. Flexibility and Resilience
8. Social Impacts
9. Economic Feasibility and Impacts
10. Allocation of Technical and Financial Risk

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- *Indonesian nuclear power proposals*, Nautilus Institute public documentation site
<http://www.nautilus.org/Nautilus/australia/reframing/aust-ind-nuclear/ind-np/>
- Richard Tanter, Arabella Imhoff and David Von Hippel, *Nuclear Power, Risk Management and Democratic Accountability in Indonesia: Volcanic, regulatory and financial risk in the Muria peninsula nuclear power proposal*, Austral Policy Forum 09-22A, 7 December 2009
- Richard Tanter, *Nuclear fatwa: Islamic jurisprudence and the Muria nuclear power station proposal*, Austral Policy Forum, 13 December 2007, 07-25A
- <http://www.nautilus.org/about/staff/richard-tanter/publications>
- This talk will be available at my Talks page:
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