Nuclear Energy and Climate Policy in Indonesia

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ABSTRACT

There are some ways to protect our earth and ecosystem from global warming, such as reducing home heating, reducing kilometers per litre gasoline, and building more efficient power plants which use less primary energy such as oil. Therefore we must combine energy efficiency with a decarbonisation of the energy system such as shift to nuclear energy. Nuclear is one of promising energy in Indonesia. As we know nowadays, Indonesian energy is still depend on oil, but infact oil preservation is decreasing. Then we should have a plan to replace oil energy to others such as renewable energy and nuclear energy. Nuclear power produced from uranium process. One of some reasons to choose nuclear energy is that Indonesia has lot of uranium, so for a major nuclear power program is needed only limited amounts of uranium.

World Nuclear association stated that nuclear power is serving to prevent the emission of carbon dioxide every year. Numerous developing countries including Indonesia have announced their plan to build nuclear power plants. This paper will talk about nuclear power policy in Indonesia, connecting to environmental protection and climate change.

Indonesia with Act number 10 year 1997 connecting "Nuclear Energy" trying to regulate nuclear activities as well as to protect the environment. On the other side Indonesia also has had ratified UNFCCC and Kyoto Protocol. Then Indonesia have to followed all national and international regulations.

1. INTRODUCTION

Climate change is a common concern of mankind, this term determined by General Assembly in their Resolution in 1988 and 1989. That is why all states have to participate to prevent climate change and global warming as a global concern both developed countries and developing countries. Indonesia as an archipelagic country holds special posisition in climate policy, we are rich in diversity including natural resources. On the other side Indonesia has become the three largest emitters of green house gasses in the world. The most activity which produces carbon dioxide is coming from deforestation or

forest fire as estimated by IPCC (Intergovernmental Panel on Climate Change) including land conversion and the use of Coal .

As we know that Indonesia is still depend on Oil and Coal Energy supply, then we have to search another energy source such as gas, and nuclear. Renewable or unrenewable energy has an important role in human life. As a main source in life, the use of energy especially unrenewable energy has to be efficient and effective.

Indonesia which is become one of the three largest emitters of greenhouse gases in the world, is already taking steps to reduce greenhouse gas emissions, by protecting our forests which serve as the worlds great carbon sinks, and also by developing a more sustainable and clean source of energy. Under Indonesias new energy policy, we aim to reduce oil share in the national energy mix from 52% to about 20% in 2005. Meanwhile, we will increase the percentage of gas coal, and renewable energy for domestic consumption. The share for gas is projected to reach 30%, coal 33%, and renewable energy 17% by 2005. Bio-fuels will account for 5% of renewable energy share, while geo-thermals will share 5%, liquefied coal 2%, and other renewable up to 5%.

Susilo Bambang Yudoyono as a President of Republic of Indonesia also stated that :

> We can no longer afford to be trapped in our old ways and our old sources of energy or ignore the emissions that we create. The climate is changing for the worse, and therefore we must also change. The difference is, if we can spot and take advantage of the huge investment opportunities that climate change brings upon us, our change will be a change for the better.[1]

The Minister of Energy and Mineral Resources predicted that Energy demand in Indonesia is projected to grow at 2.7 percent annually from 2002 to 2030. Nuclear energy

[1] See www.thejakartapost.com/news/2008

as a part of Indonesian energy, should be managed for people welfare. At the present time, Indonesia has no nuclear power plant in operation yet, although it is expected that the first nuclear power plant will be operated and commercially available in araound the year of 2016 to 2017 in Muria Peninsula. Indonesia use nuclear energy for peace purposes such as in industry, medical or health and agriculture field. [2]

2. NUCLEAR POLICY in INDONESIA

Nuclear is a part of Indonesian energy, nuclear policy will followed energy policy in Indonesia. Article 8 of Law Number 30 year 2000 regarding "Energy" stated that :

(1) Any energy management activity shall prioritize to the use of environmentally-friendly

(2) Any energy management activity shall meet the requirement set by the laws and regulations on safety which cover issues on standardization, security and safety of the installation, and occupational safety and health.

Furthermore article 11 (1) stated about national energy policies e.i :

(1) National energy policies shall cover the following issues :

a. availability of energy to meet the nation's requirement;

b. energy development priorities

c. utilization of national energy resources; and

d. national energy buffer reserves

Nuclear is one of new energy sources in Indonesia, as we know that Indonesia still depend on Oil and coal. Article 1 of Law number 30 year 2007 on "Energy " also stated that : "New energy sources shall mean the energy sources that can be produced through

[2] www.atimes.com /atimes/Southeast-Asia, Asia Times online

new technologies, coming from both renewable energy sources, such as nuclear, hydrogen, coal bed methane, liquefied coal, and gasified coal"

Nuclear energy policies often include the regulation of energy use, and standards relating to the nuclear fuel cycle. Other measures include efficiency standards, safety regulations, emission standards, and legislation on energy trading, transport of nuclear waste and contaminated materials, and their storage.

Before we move forward about Indonesian nuclear policy, OECD give an opinion about nuclear energy.

> "Like any other energy source and technology, nuclear energy has advantages and drawbacks in each of the three dimensions of sustainable development: environmental, social and economic. Policymakers must have authoritative facts, figures and analyses to support their decisions on energy choices."

Beside the benefit from nuclear power, it is well known that nuclear energy poses special risks (radiation)to the health and safety of persons and to the environment risk that must be carefully managed. Dealing with radiation, law should serves the following purposes:

a. To bring all radiation sources in the State under regulatory control;
b. To provide that all radiation sources in the State, be kept under regulatory control in such a way that they can be traced;
c. To prevent the unlawfull use of radiation sources within the territory of the State and to provide for the punishment of offenders in the event of unlawful use;
d. To provide for an effective response in the event that radiation sources that have escaped regulatory control are discovered and reported;
e. To plan for the mitigation of accident. [3]

The Considering part (b and c) of Indonesian Act number 10 year 1997 on "Nuclear energy" especially part b and c of this Act states that :

[3] See Carlton Stoiber, et all, *Handbook on Nuclear Law*, International Atomic Energy Agency (IAEA), 2003, pg 58,59.

b. the development and beneficial of nuclear energy in the various field of human life in the world have been so advanced that its beneficial use and development for a sustainable and environmentally insighted national development need to be enhanced and expanded to increase the Nation's welfare and competitiveness;

c. that for the safety, security, peace, health of workers and the public, and environmental protection, the use of nuclear energy shall be implemented correctly and carefully and is aimed to peaceful purposes and for the utmost benefit for the people's welfare and prosperity.

It may then be inferred that Indonesia will only use nuclear technology for peace purposes, intended for the people's welfare. Indonesia is one of the developing countries which use nuclear technology in some fields such as in medical, agriculture, industry and research.

For Industry (activated radioisotope) and research purposes, three nuclear reactors have already been built in Indonesia:

1. Yogyakarta, Central Java. This is the Kartini nuclear research reactor.
2. Serpong (Banten).This is the MPR RSG-GA Siwabessy research reactor.
3. Bandung, West Java. This is the Triga Mark II nuclear research reactor.

The basic principles of nuclear energy regulation practices in Indonesia set out in this Act (Article 15) which provide that the control of nuclear energy application is aimed to :

(a) Assure the welfare, security and peace of the people;

(b) Assure the safety and the health of workers and the public and protection of environment;

(c) Maintain law enforcement in implementation of any nuclear energy application;

(d) Increase legal awareness of the user to promote the creation of safety culture in nuclear field;

(e) Prevent unauthorised changes in the purpose for which nuclear materials are used; and

(f) Promote and assure the maintenance of worker discipline in the application of nuclear energy.

Indonesia has a plan to build Nuclear Power plant to fulfil energy demand, as we know that reserving oil is decreasing day by day. Various locations have been proposed for building nuclear reactors that will actually be taken into production for the purpose of generating electricity:

1. Muria, Central Java.
2. Gorontalo, in the north of Sulawesi.
3. Banten West Java

Indonesia has various reasons for wanting to build nuclear power plant namely:

1. Domestic energy consumption in Indonesia is growing rapidly.
2. Nuclear energy will reduce dependence on petroleum, a non renewable resources Indonesia, an OPEC member and long-time net oil exporter became a net importer of oil at the beginning of 2005. Nuclear energy, like Coal, natural gas, and biofuel(from plants such as *jatropha curcas or the castor oil plant)* may allow Indonesia to diversify from petroleum.
3. Export more oil, if domestic energy consumption can be provided through nuclear energy, it may be possible to do it.
4. Producing other renewable energy from other sources, such as wind power and solar power, are far more expensive.
5. Although Indonesia, earthquakes frequently occur, Japan also has nuclear reactors as a lesson.
6. The emission of harmful gases can be reduced.

Energy Minister Purnomo Yusgiantoro said that Indonesia would have to turn to nuclear power as fossil fuels dwindled, adding that in the future, "nuclear power will play a more

important role in our energy mix". According to Energy Ministry projections, total demand in the country is projected to reach 450.3 terawatt-hours by 2026 (a terawatt is a trillion watts, or 1,000 gigawatts).

Under its current energy blueprint, the government is aiming to contribute some 17% of power demand by 2017 from renewable sources, including nuclear and geothermal energy. "The role of nuclear plants is to stabilize and secure the supply of electricity," Yusgiantoro said, "and protect the environment from harmful pollutants as a result of the massive use of fossil fuels." National nuclear Energy Agency, *Badan Tenaga Nuklir Nasional (BATAN*), is adamant that constructing the first nuclear plant should go ahead on the foothills of Mount Muria.

Both Parliament and the International Atomic Energy Agency (IAEA) have already approved Indonesia's first designs for a nuclear power plant. "We will assist Indonesia so that all safety considerations will be properly addressed," said IAEA chief and Nobel laureate Mohamed ElBaradei while visiting Jakarta on December 2007.[4]

Java is the hungriest place for electricity and reports say that 60 percent of the energy consumption of Indonesia is on Java.[5]

It is expected that by 2008 companies will be invited to bid on the construction contracts for the power plants at Muria. Construction is hoped to begin by 2009 with the plants coming on line in 2016.

Article 33 of the Indonesian's Constitusion 1945 mentioned that Energy resources constituting natural riches shall be controlled by the state, and utilized for the greatest prosperity and welfare of the people. Management of energy in Indonesia shall mean: an activity consisting of the provision of strategic reserves and the conservation of energy resources. With this regard, energy shall be managed under 8 principles :

a. Principle of beneficial use which means that energy must be managed to meet the people requirements

[4] *Asia Times online*, supra
[5] Thejakartapost, supra

b. Principle of fair efficiency means that energy must be managed to make sure that people have equal access to energy at an affordable and economic price
c. The Principle of value added enhancement means that energy must be managed to achieve an optimum economic value
d. The principle of sustainability means that energy must be managed to guarantee that energy can be made available and utilized for the present and future generations
e. The principle of people's welfare means that energy must be managed for the greatest welfare and prosperity for the people
f. The principle of environmental functions preservation means that energy must be managed in such a way that the quality of the environmental functions will be better
g. The principle of national resilience means that the nation must be able to manage energy on its own capability
h. The principle of integratedness means that energy must be managed in an integrated manner among sectors

3. NUCLEAR ENERGY and INDONESIAN CLIMATE POLICY

To executing nuclear activities, Indonesia has Nuclear Energy Board (BATAN), and also BAPETEN to control nuclear activities. In accordance with Act No. 10 Year 1997 on Nuclear Energy and the latest Presidential Decree No. 64 Year 2005, BATAN has been stipulated as a Non Departmental Government Institution which is under and responsible to the President. BATAN is led by a Chairman and its programme is under the coordination of the Minister for Research and Technology. The main duties of BATAN are to conduct research, development and the beneficial applications of nuclear energy in accordance with the laws and regulations.[6] Other Body which connected to nuclear

[6] www.batan.go.id

activities is BAPETEN. The Nuclear Energy Control Board of Indonesia (BAPETEN) is a Non-Departmental Government Agency that is under the supervision and reponsible directly to the President of the Republic of Indonesia wich shall have the task to control the operation of the utilisation of nuclear energy in Indonesia. BAPETEN was established on 8 May 1998 by the Presidential decree of The Republic of Indonesia Number 76, 1998 as the implementation of the Act Number 10, 1997 on Nuclear Energy and start to operation on 1 January 1999.[7]

Yearly emissions in Indonesia from energy, agriculture and waste all together are around 451 million tons of carbon dioxide equivalent, so Indonesia is a major emitter of GHGs.[8]

GHG emissions summary (MtCO2e)

Emissions sources	**United States**	**China**	**Indonesia**	**Brazil**	**Russia**	**India**
Energy	5,752	3, 720	275	303	1,527	1,051
Agriculture	442	1,171	141	598	118	442
Forestry	(403)	(47)	2,563	1,372	54	(40)
Waste	213	174	35	43	46	124
Total	**6,005**	**5,017**	**3,014**	**2,316**	**1,745**	**1,577** [9]

Coal is possibly the most carbon-intensive source of energy, and currently Indonesia still possesses large coal reserves that could last over 50 years. Current contribution of coal to the final energy mix is about 14 percent. Through the 2005 National Energy Policy, the Government has set up a target to more than double the contribution of coal to more than 30 percent.[10]

[7] www.bapeten.go.id
[8] Summary : Indonesia and Climate Change, DFID and World Bank, 2007

[9] Ibid
[10] BATAN, Symposium for the IAEA 40 years Annyversary, Japan, 2007

It is expected that, with current governmental policies that promote the expansion of fossil fuels and the high barriers to clean , renewable sources of energy.

There are two opinions about the use of nuclear power in relations to climate change, the founder of Greenpeace Patrick More stated that : "nuclear energy is the only non greenhouse gas emitting energy source that can effectively replace fossil fuels and satisfy global demand"[11] The World Nuclear Association also stated that nuclear power is serving to prevent the emission of some two billion tons of carbon dioxide every year.

Studies of the " full life cycle" of different form of generations compare greenhouse gas emissions from nuclear power, renewable and fossil fuels, in producing a kilowatt-hour of electricity. For nuclear energy, this analysis encompasses all emissions associated with uranium mining, uranium conversion and enrichment, fuel manufacture, transport, plant construction, and electricity generation. These study demonstrate that the fuel life cycle emissions of nuclear energy and renewables are similar and are orders of magnitude lower than the emissions from fossil fuels.[12] On the other side some researcher have estimated that nuclear energy is not the cleanest, wind turbines have one-third the carbon equivalent emissions of nuclear power over their lifecycle. Component of the nuclear fuel cycle such as uranium mining, milling, and enrichment is responsible for 38 percent of equivalent emissions. [13] The other way to reduce carbon dioxide is energy efficiency which will reduce energy growth. We must therefore combine energy efficiency with a

[11] See Benjamin Sovacool, ***Nuclear Power is a False Solution to Climate Change***, Opinion, Singapore 07/15/08.
[12] World Nuclear Association, ***The Contribution of Nuclear Energy to Sustainable Development,*** WNA 2007, pg 5
[13] Benjamin Sovacool, Loc Cit.

decarbonisation of the energy system. Part of the answer can be a shift to nuclear and renewable energy sources to produce electricity.[14]

Emissions from non-forestry sector in Indonesia are small, but emissions from industry, power generation, and the transport sector are growing rapidly.

It still in debate in Indonesia about nuclear energy and climate change, due to the greenhouse-gas intensity of its lifecycle, nuclear power plants would not benefit directly from a global carbon tax or a carbon cap-and trade system. While the nuclear industry would certainly be penalized less than fossil fueled generators, the carbon equivalent emissions from uranium mining operations, enrichment facilities, and spent fuel storage are significant.

Indonesia also has the commitment with others ASEAN countries to reduce greenhouse gas concentrations which conclude in **Singapore Declaration on Climate Change, Energy and the Environment.**

Singapore Declaration stated that all countries should play a role in addressing the common challenge of climate change, based on the principles of common but differentiated responsibilities and respective capabilities; and that developed countries should continue to play a leading role in this regard. ASEAN Countries also **Commit** to the common goal of stabilising atmospheric greenhouse gas concentrations in the long run, at a level that would prevent dangerous anthropogenic interference with the climate system . Connecting to nuclear power they also agreed to **Intensify** ongoing cooperation to improve energy efficiency, and the use of cleaner energy, including the use of, renewable and alternative sources, based on the Cebu Declaration and the Joint Ministerial Statement of the 1st EAS Energy Ministers' Meeting on 23 August 2007 by:

[14] **Climate Action**, OpCit, pg 42

a. Working towards achieving a significant reduction in energy intensity;

d. Enhancing regional cooperation to develop cost effective carbon mitigation technologies, cleaner fossil fuel technologies including clean use of coal, and to produce environmentally-friendly and sustainable biofuels; and

e. Cooperating for the development and use of civilian nuclear power, in a manner ensuring nuclear safety, security and non-proliferation, in particular its safeguards, within the framework of the International Atomic Energy Agency (IAEA), for those EAS participating countries which are interested.

Indonesia ratified Climate Convention with Law no 6 year 1994 , and ratified Kyoto Protocol through Law number 17 year 2004. In this regard Indonesia has to followed standards and policy from those. IAEA as the United Nations Body has some rules and standard to follow. Indonesia has the safeguard agreement with the IAEA "Application of safeguards in connection with the Treaty on Non-Proliferation of Nuclear Weapons" in 1980, and 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-Proliferation of Nuclear Weapons 1999. Regarding to this, Indonesia should use nuclear for peace, reported all nuclear activities in Indonesia, and followed all IAEA Safety standard.

4. CONCLUSION

Indonesia has to reduce its carbon emission, because Indonesia becomes one of the three largest emitters of greenhouse gases in the world, as a result from

deforestration and forest fire. Nuclear, as a new energy similar with gas and wind energy, is one of clean energy comparing with coal. Some studies demonstrate that the fuel life cycle emissions of nuclear energy and renewables energy are similar and are orders of magnitude lower than the emissions from fossil fuels.