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The Role of International Atomic Energy Agency (IAEA) In The Practice of Using Nuclear Energy For Peaceful Purposes In Indonesia

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Abstract

Nuclear energy is the last alternative energy to be used on a large scale since the creation of the first nuclear fission since the end of world war II. In addition to its widely used to mitigate climate change and sustainable environmental goals, nuclear energy is also for some views considered as a symbol of a major country. To ensure its use for peaceful purposes, in 1957 the International Atomic Energy Agency (IAEA) was established, which consists of many countries in the world including Indonesia. Therefore, this article seeks to determine the IAEA's role as an international organization in the practice of using nuclear energy for peaceful purposes in Indonesia. To examine this topic, the researcher used the International Organization in International Relations as a theoretical framework. The data and information used in this research were obtained through library research. This article found that, as an international organization, the IAEA serves as a consulting body as well as a supervisor in the practice of the use of nuclear energy for peaceful purposes in Indonesia, one of which can be seen through the CPF (Country Programme Framework) document between the IAEA-Indonesia which has been signed 5 (five) times.

Key Words: IAEA, Nuclear Energy, Indonesia, Internasional Organization, Country Programme Framework

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INTRODUCTION

The discovery and exploitation of new sources of energy has been central to human progress from the early struggle for biological survival to today's technological world. The first step was learning to control fire, with wood or other biomass as the fuel. This was followed by the harnessing of wind for ships and windmills, the use of water power from rivers, and—mostly much later—the exploitation of chemical energy from the burning of coal, oil, and natural gas. Nuclear energy, which first emerged in the middle of the 20th century, is the latest energy source to be used on a large scale (Bodansky, 2004).

After World War II ended in 1945, scientists and engineers began work to make nuclear fission an abundant and inexpensive source of energy (though others went on to make nuclear weapons even scarier). All fission reactors work on the same basic principle, although they use different types of fuel, different ways of controlling reactions, and different ways of converting reactor heat into electricity (Cooper). For information, to be able to produce nuclear energy, it is necessary to nuclear reactors. A nuclear reactor is a device or installation run on nuclear fuel that can produce a controlled chain core reaction used for power generation, or research, and/or radioisotope production (Koesrianti, 2016).

In fact, renewed interest in nuclear energy arises from the desire to find alternatives to expensive oil and natural gas as well as the perception of nuclear energy as a readily deployable option for making the rapid and dramatic reductions in carbon dioxide emissions necessary to mitigate climate change. Energy security and climate change are invariably mentioned as the top two reasons for pursuing nuclear energy today (Squassoni, 2009). Also, Nuclear energy is often regarded by countries as a symbol of great prowess, rather than simply as a way to produce electricity (Squassoni, 2009).

The rapid advancement of technology and technological science as it is today, making the use of nuclear energy as a response to human energy needs are widely done by countries in the world. In order to ensure its use in peaceful purposes, in 1957 the International Atomic Energy Agency (IAEA) was established. The International Atomic Energy Agency is the world's central intergovernmental forum for scientific and technical co-operation in the nuclear field. It works for the safe, secure and peaceful uses of nuclear science and technology, contributing to international peace and security and the United Nations' Sustainable Development Goals (IAEA, 2016). As of 7 April 2021, the IAEA already has 173 member states out of a total of states in the world. This includes Indonesia, which joined since the early formation of the IAEA in 1957 along with 55 other countries (IAEA, 2016).

For Indonesia, the increasing use of conventional energy resources will certainly face the problem of increasingly limited conventional energy resources in Indonesia as well as the environmental impacts caused. Meanwhile, energy imports will threaten Indonesia's future energy resilience and sovereignty. Thus the use of nuclear energy technology is an important and urgent alternative to the fulfillment of Indonesia's future energy needs (Harto & Rosita, 2014). Nuclear energy technology is able to meet energy needs massively and continuously. This is perfect for improving Indonesia's industrialization capabilities in the future. Thus, to meet the massive and continuous energy needs, there is no other option to replace the role of the use of conventional energy resources except the use of nuclear energy (Harto & Rosita, 2014). Therefore, this research seeks to provide an understanding of the role of the International Atomic Energy Agency (IAEA) in the Practice of Using Nuclear Energy for Peaceful Purposes in Indonesia.

Literature Review

As a supporting material for research, this research conducted literature studies on a number of previous studies and other literature related to the role of the IAEA in the practice of the use of nuclear energy for peaceful purposes in Indonesia. Koesrianti (2016) in a book entitled *Dua Sisi Nuklir: Senjata Nuklir dan Kesejahteraan Manusia* stated that the use of nuclear since the beginning of its discovery can be seen through two sides, namely for human welfare and on the other hand misused by the state as a nuclear weapon that can be an instrument of threat to other countries. In general, the writing by Koesrianti (2016) contains an understanding of the use of nuclear energy for peaceful purposes, the role and function of the IAEA, the role and function of the National Nuclear Energy Agency (BATAN), the role of the IAEA in "Atom for Food", the misuse of nuclear energy by the state, to accountability, the regulation of international law, and the validity of the threat of the use of nuclear weapons and the resulting losses. The writing by Koesrianti (2016) is important for researcher in understanding the use of nuclear energy on two sides and its position on the international level. In contrast to the writings by Koesrianti (2016), this research will focus on the IAEA's role in the practice of using nuclear energy for peaceful purposes in Indonesia.

Pratiwi (2013) in a journal article entitled *Peran IAEA (International Atomic Energy Agency) dalam Menyikapi Tindakan Korea Utara dalam Pengembangan Tenaga Nuklir untuk Tujuan Tidak Damai* stated that in the case of nuclear use in North Korea, The IAEA has performed its role as an international nuclear agency by conducting direct monitoring of nuclear development originally intended for North Korean power plants up to imposes sanctions on nuclear weapons tests that violate its use for peaceful purposes as intended and violate the Nuclear

Nonproliferation Treaty. This resulted in North Korea's withdrawal from the IAEA, as well as from the IAEA Nuclear Nonproliferation Treaty. The journal article by Pratiwi (2013) is important for researcher in understanding the IAEA's role in overseeing the use of nuclear energy in its member states for peaceful purposes and fully compliant with the nuclear nonproliferation treaty that has been enacted and ratified by the relevant country. In this case, North Korea violated it. In contrast to the journal article by Pratiwi (2013), this research will focus on the use of nuclear energy for peaceful purposes in Indonesia which is inseparable from the iaea's role as an international nuclear organization, not only in supervising but also in providing support in the form of nuclear science and technology.

Amijaya (2018) in a journal article entitled *Peranan International Atomic Energy Agency (IAEA) melalui The International Fact Finding Expert Mission of the Fukushima dalam Penangangan Kerusakan Reaktor Nuklir di Jepang Pasca Tsunami 11 Maret 2011* stated that the use of nuclear energy for peaceful purposes one of which can be used as a nuclear power plant (PLTN). The development of nuclear power plant is faced with trauma after the nuclear disaster that hit Japan in 2011. In response to the disaster, the IAEA played a role in handling and monitoring further damage to nuclear reactors in Japan by conducting detailed investigations to minimize radiological and other damage that could be caused by the disaster, and also being an international nuclear forum specifically intended as a meeting of the world's countries to discuss the nuclear disaster in Japan, its impact, and the strategy of procurement of established nuclear power plants in the future to prevent the same happening over again. This research being important for researcher in understanding the IAEA's role as an international nuclear organization focused on the use of nuclear for peaceful purposes, urging that the procurement of nuclear facilities in all countries of the world be reviewed in order to conform to the latest aspects of nuclear power and minimal risk. This is according to the researcher by remembering that the procurement of well-established nuclear facilities and guaranteed minimal risk is a necessity by each relevant country while adjusting to potential future threats. Because, Japan itself as a technologically well-established country, remains not guaranteed to avoid the risk of nuclear disaster. The journal article by Amijaya (2018) is important for researcher in understanding the importance of procurement of domestic nuclear facilities that are minimally risky in all aspects. In contrast to Amijaya's (2018) journal article, this research will focus on the IAEA's role in the practice of using nuclear energy for peaceful purposes in Indonesia.

METHOD & THEORETICAL FRAMEWORK

This research employs library research by seeking relevant literature in International Relations about international organisations and nuclear issues. Data are obtained from open-source journals that can be accessed and from relevant Indonesian government policies related to this research topic.

International Organization

Archer (2001) defined international organization as a formal, continuous structure established by agreement between members (governmental and/or nongovernmental) from two or more sovereign states with the aim of pursuing the common interest of the membership (Archer, 2001). Furthermore, Archer (2001) stated that the role of international organizations can be identified by 3 (three) main roles, namely (Archer, 2001): (1) as an instrument, which its member states use to achieve certain objectives and notwithstanding the national interests of member states; (2) as an arena, in which case international organizations provide a meeting place for members to unite to discuss, debate, cooperate or disagree. Arenas are neutral, can be used for play, circus or fight; and (3) as an independent actor in international relations (Archer, 2001).

Meanwhile, its function, Archer (2001) stated that international organizations function in (Archer, 2001): (1) performing the task of articulation of interests and aggregation in international affairs; (2) contributed substantially as instruments, forums, and actors to the normative activities of the international political system; (3) recruitment of participants in the international political system; (4) socialization aimed at instilling an individual's loyalty to the system in which he or she resides and to obtain acceptance of the prevailing values of that system and its institutions; (5) rule making; (6) rule application; (7) rule adjudication, as the adjudication of regulations in the country is carried out by the judiciary - court of law, arbitration panel, court and so on, in the international level of regulatory adjudication process one of which is carried out by the International Court of Justice (ICJ); (8) conduct certain activities in the international political system that are useful but not directly involved in the conversion function of the system or in its maintenance and adaptation. They are invaluable in communication and information; (9) perform a number of operational functions in the specifications of each field (Archer, 2001).

As an international organizations, the IAEA is a formal and continuous international organization, consisting of 173 countries in the world as of April 2021,

and was formed with the aim of achieving common interests regarding the use of nuclear for peaceful purposes within the country of each member state. Based on its role, the IAEA is an instrument as well as an arena for each member state with its own national interests to jointly discuss and to decide an agreement on achieving common goals in terms of safe and sustainable use of nuclear energy within the country in addition to carrying out its functions in the international political system regarding the use of nuclear energy for peaceful purposes.

DISCUSSION

Indonesia is one of the largest archipelagos in the world that has 17,508 islands, situated between 6 degrees northern latitude and 11 degrees southern latitude and spreading from 97 degrees to 141 degrees eastern longitude and it is located between two continents – Asia and Australia/Oceania. This strategic position greatly influences the country's culture, social, politics and economy (IAEA, 2014). As to other countries, for Indonesia, energy has an important and strategic role in the achievement of social, economic and Environmental goal in the national sustainable development. Energy Demand is projected to continually increasing as a result of the economic growth and the increase of population. Therefore, Energy Management has to be well-implemented in order to meet the energy supply assurance both for the present and future needs (The President of The Republic of Indonesia, 2014).

In October 2014, the Government of Indonesia enacted Government Regulation No. 79 of 2014 in regard to the National Energy Policy (NEP). NEP is a comprehensive policy which covers both the supply and the demand sides. It serves as the main guideline in national energy management to achieve the security of domestic energy supply (IAEA, 2017). Through this policy, Indonesia targets to reduce dependence on gasoline and increase the use of renewable energy. This includes national energy policy targets with clear targets for the share of each type of primary energy in achieving an optimal primary energy mix from 2025 to 2050.

As stated in The Government Regulation of The Republic of Indonesia No. 79 of 2014 on National Energy Policy (NEP), As stated in the government regulation of the republic of Indonesia nO 79 of 2014 on National energy policy, optimal Primary Energy mix shall be achieved (The President of The Republic of Indonesia, 2014): (1) the role of the New Energy and Renewable Energy at least 23% (twenty three percent) in 2025 and to be at least 31% (thirty one percent) in 2050 provided that its economical fulfilled; (2) the role of oil shall be less than 25% (twenty five percent) in 2025 and to be less than 20% (twenty percent) in 2050; (3) the role of coal at least 30% (thirty percent) in 2025, and 25% (twenty five percent) at the minimum

in 2050; and (4) the role of natural gas at least 22% (twenty two percent) in 2025 and at least 24% (twenty four percent) in 2050 (The President of The Republic of Indonesia, 2014) (See Figure 1).

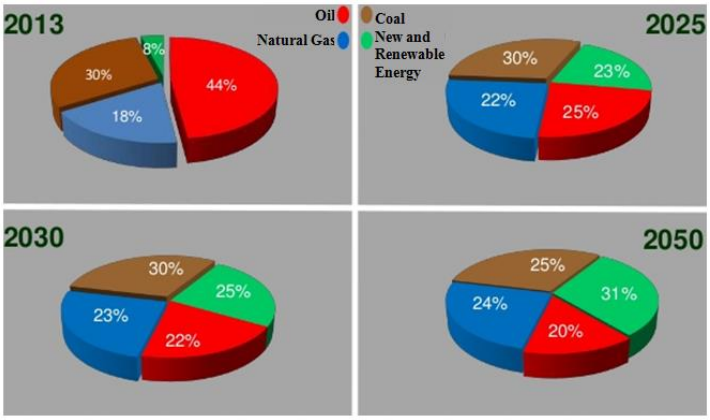

Figure 1. Energy Mix Target

Source: (IAEA, 2017)

In NEP 2014, nuclear energy is categorized into a new energy group, i.e. energy derived from new technologies. Because utilization of nuclear energy requires high safety and security standards and also considering the impact of nuclear radiation hazards on the environment, nuclear energy utilization is regarded as the last option. However, in-depth studies which have been conducted regarding the technological development of nuclear energy for peaceful purposes, fulfilling the needs of the growing energy demand by supplying national energy on a large scale, reducing carbon emissions and the urgent national interest suggest that nuclear energy can be utilized (IAEA, 2017).

In order to ensure the use of nuclear science and technology for peaceful purposes, in 1957 was established the world's central intergovernmental forum for scientific and technical co-operation in the nuclear field (IAEA, 2016). The establishment was also intended as a response to the deep fears and expectations generated by the discoveries and diverse uses of nuclear technology. The Agency's genesis was U.S. President Eisenhower's "Atoms for Peace" address to the General Assembly of the United Nations on 8 December 1953 (IAEA, 2016). The IAEA is strongly linked to nuclear technology and its controversial applications, either as a weapon or as a practical and useful tool. The ideas President Eisenhower expressed in his speech in 1953 helped shape the IAEA's Statute, which 81 nations unanimously approved in October 1956 (IAEA, 2016).

The Agency was set up as the world's "Atoms for Peace" organization within the United Nations family. From the beginning, it was given the mandate to work with

its Member States and multiple partners worldwide to promote safe, secure and peaceful nuclear technologies. The objectives of the IAEA's dual mission – to promote and control the Atom – are defined in Article II of the IAEA Statute (IAEA, 2016):

> *"The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. It shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose."* (IAEA, 2016)

The role and function of the IAEA is as an intergovernmental forum for scientific and technical cooperation in the peaceful utilization of nuclear technology around the world. With the aim to realize international peace and security and to realize the World's Millennium Goals in the social, economic, and environmental quality improvement (Koesrianti, 2016). The use of nuclear for peaceful purposes itself refers to international nuclear treaties that have been ratified by many countries in the world, such as the IAEA Safeguards Agreement, the Treaty on the Non-Proliferation of Nuclear Weapons, and other additional related protocols.

There are 3 (three) pillars set out in the IAEA Statute, namely (Koesrianti, 2016): (1) Safety and Security; (2) Science and Technology; and (3) Safeguards and Verifications (Koesrianti, 2016). In achieving these three pillars, the IAEA has three main missions or functions, namely (Koesrianti, 2016): (1) Inspection of member state nuclear energy facilities that are manifestly used for peaceful purposes; (2) Establish certain provisions and standards to ensure that all member states' nuclear energy facilities are stable; and (3) Serves as a network center for scientists in finding and implementing nuclear technology for peaceful purposes (Koesrianti, 2016).

In fact, Indonesia has been a member of the IAEA since 1957 and has played an active role in global efforts to develop and utilize nuclear technology for peaceful purposes. During this membership period, Indonesia has signed five CPF documents (Ministry of Foreign Affairs Republic of Indonesia, 2020). The CPF document is a medium-term strategic plan that will serve as a reference in the implementation of technical cooperation in the use of nuclear technology for peaceful purposes (Ministry of Foreign Affairs Republic of Indonesia, 2020). A Country Programme Framework (CPF), prepared by a Member State in collaboration with the Secretariat, defines mutually agreed priority development needs and interests to be supported through technical cooperation activities. A CPF reflects national development plans and priorities, country specific analyses and

lessons learned from past cooperation, and also takes into consideration the United Nations Development Assistance Framework (UNDAF) of the country and the Sustainable Development Goals, as appropriate. This ensures that the application of nuclear technologies is integrated with existing development initiatives and plans, and supports the identification of areas where such technologies might be usefully deployed. A CPF generally covers a period of four to six years (IAEA, 2016).

Reported through IAEA (2016), CPFs are characterized by (IAEA, 2016): (1) A close dialogue between Member States and the IAEA as partners, ensuring greater ownership of the programme; (2) The linking of the project selection process to well defined national development objectives and priorities to ensure the relevance of IAEA's support and the sustainability and impact of technical cooperation activities; (3) Great emphasis on national competencies and capabilities in order to optimize the role and participation of Member States in the programme; (4) Opportunities to contribute to the global development agenda and build partnerships between the IAEA, national and regional institutions, the UN and other international organizations (IAEA, 2016).

The IAEA is in this case a consulting body as well as a supervisor in the practice of the use of nuclear energy for peaceful purposes in Indonesia. This role can be seen through the extension of the CPF document between the IAEA and Indonesia which signifies the succession of the IAEA's role domestically and Indonesia's commitment to the use of nuclear energy for peaceful purposes. The CPF document extension was conducted for the period 2021-2025 on 23 September 2020 at the Headquarters of the International Atomic Energy Agency (IAEA) in Vienna, Austria (Ministry of Foreign Affairs Republic of Indonesia, 2020). This CPF document for 2021-2025 covers six areas of cooperation: radiation safety and security, food and agriculture, health and nutrition, water resources and the environment, energy and industry, and capacity building. The CPF refers to national development programs and priorities, and accommodates elements in the Sustainable Development Goals (Ministry of Foreign Affairs Republic of Indonesia, 2020).

The cooperation on the use of nuclear technology for peaceful purposes between Indonesia and the IAEA has provided real benefits for Indonesia, including the use of radiation mutation technology for the breeding of food plant varieties (rice, soybeans, green beans, sorghum, peanuts and bananas) which have a positive impact on increasing income of user farmers, diagnosing and treating diseases using radiation technology, and the use of irradiation technology by the national industrial sector (Ministry of Foreign Affairs Republic of Indonesia, 2020). Through technical cooperation with the IAEA, Indonesia has also succeeded in increasing the capacity of its human resources and research facilities so that it

becomes the IAEA's collaborating centre for food and non-destructive testing, as well as playing an active role in providing assistance to other member countries to increase capacity and technological mastery (BATAN, 2020).

Indonesia itself is a country that has a greater depth of experience and infrastructure in nuclear technology than any other country in southeast Asia (World Nuclear Association, 2021). Small-scale nuclear projections for example, In April 2016 BATAN's website showed that it was planning to build a test and demonstration high-temperature gas-cooled reactor (HTR) of 10 MWt as a RDE. The IAEA has supported this through a technical cooperation project focused both on design review with BATAN and on licensing with BAPETEN (World Nuclear Association, 2021). Earlier in November 2009 the IAEA undertook an integrated nuclear infrastructure review (INIR) mission to Indonesia. Against 19 parameters, "no actions needed" on six, "significant actions needed" on three, and the rest "minor actions needed". In respect to IAEA milestones, the country is at the first: "ready to make a knowledgeable commitment" (World Nuclear Association, 2021). For information, the practice of using nuclear energy within the country must conform to the standardization set by the IAEA.

Furthermore, in the practice of using nuclear energy for peaceful purposes in Indonesia, together with the IAEA, external monitoring of radiation safety implementation is carried out by the Nuclear Energy Regulatory Agency (BAPETEN) (Kepala BATAN, 2007). Another peaceful use of nuclear practice in conjunction with the IAEA is the use of nuclear to measure and analyze airborne pollutants. Together with the IAEA as an international nuclear organization, this use has succeeded in making the City of Bandung, Indonesia achieve the title of *ASEAN Environmentally Sustainable City* in 2017 (IAEA, 2018). Even in terms of health, research and supervision in its use in Indonesia is inseparable from the role of the IAEA. One of them is related to the prevention of excess radiation that can cause cancer.

Actually, the IAEA's support is not focused on delivering nuclear power equipment, but rather on the transfer of knowledge and expertise. High-quality technical training helps countries to build on the country's own expertise so that it can train future generations of nuclear specialists (IAEA, 2018). This is by remembering nuclear science and technology help countries to reduce poverty and hunger, generate electricity, manage water resources, treat diseases such as cancer and respond to climate change – and much more (IAEA, 2018).

CONCLUSION

The use of nuclear energy for peaceful purposes in Indonesia is inseparable from the iaea's role as an international organization specifically engaged in nuclear science and technology. Also with Indonesia's ratification of a number of international nuclear treaties such as the Nuclear Nonproliferation Treaty, iaea safeguards agreement, and other additional nuclear-related protocols. The use of nuclear for peaceful purposes itself can be interpreted as the use intended to achieve prosperity, not for weaponry. In this regard, the IAEA serves as a consultant and supervisor who provides training support, transfer of science and technology, and supervision over the use of nuclear energy within the country such as for environmental, food, health, and other aspects of national development in order to comply with the iaea's established standards. This role is in line with the iaea's three main pillars contained in the IAEA statutes relating to safety and security, science and technology, and safeguarding and verification. Indonesia's cooperation framework with the IAEA itself has been established since Indonesia's membership in the IAEA in 1957, one of which can be seen through the CPF document which is a reference in the technical cooperation practice of the use of nuclear technology in Indonesia with the IAEA for peaceful purposes. Most recently, CPF was agreed between IAEA-Indonesia in September 2020 for the period 2021-2025.

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