

# Assessment of Nigeria National Position on Nuclear Power Development in the Country

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## Abstract

Nuclear power programme requires a cautious planning, preparation and investment to establish. However, the decision to launch a nuclear power programme has to be based on a precise well-informed national position. For effective national position development for a new nuclear power programme, it is significant for wide consultation with the country's energy organizations, nuclear institutes and utilities, as well as with other technical organizations, to ensure that all necessary information is available to make a well-informed decision. The aim of this paper is to assess the Nigeria national position for nuclear power programme. Both secondary and primary sources of data were collected for the study. Secondary data were collected from related literatures and past studies across the World. Primary data was collected from questionnaire with the use of purposive sampling technique. The questionnaire were analysed using descriptive statistics in the form of percentages. The study found that majority of the respondents agreed that Nigeria needs nuclear power and that key stakeholders were not properly consulted in the creation of national position and as a result the four components for the creation of national position were not strictly adhered to, thus one of the reason for failure to establish a commercial nuclear power in the country. The study concluded and recommended that appropriate consultation with key stakeholders should be carried out for proper documentation of national position.

**Keywords:** *National Position, Nuclear Power, Nuclear Energy, Nigeria*

## 1. Introduction

Nigeria electricity situation today is abysmal as over 80% of the population produce their own electricity with the help of other off grid energy sources, to recompense for irregular power supply (Iseolorunkanmi, 2014). For solving the nation's power generation miseries, one of the solutions that have been offered is the development of nuclear power programme. Nuclear option has to be developed in this country because nuclear power is clean, compact, reliable, competitive, safe and essentially inexhaustible (Comby, 2006). Similarly, because Nigeria's existing thermal plants are operating below capacity due to poor maintenance and persistent disruptions to gas (fuel) flow.

In order to initiate a nuclear power programme, a cautious planning, preparation and investment is needed and the decision has to be based on a precise well-informed national position. Amid other concerns, the national position is established on a comprehensive energy planning (IAEA, 2007; 2015). Moreover, nuclear power programme needs large investment in human, financial and time resources which is not exceptional because it is different to other sources of energy. The difference been in the nuclear safety, security and safeguards problems connected with the possession and handling of nuclear material in addition to long term obligation required by a nuclear power programme (IAEA, 2012).

As a result of these core differences between a nuclear power plant and a conventional power plant, a country embarking on it is required to answer key questions regarding the development of a nuclear power programme, and these answers have to be communicated in a clear and transparent manner. Questions with regards to

nuclear and radiation safety, nuclear security, spent fuel and nuclear waste management, human resources, siting, funding, financing, nuclear liability, environmental considerations, public acceptance and emergency preparedness, among others, will likely be raised during the initial discussions. Hence, throughout the process of establishing the national position, the country may deliberate these issues in addition to the infrastructure required to sustainably, securely and safely proceed with nuclear power development (IAEA, 2016).

Furthermore, for effective national position development for a new nuclear power programme, it is significant for wide consultation with the country's energy organizations, nuclear institutes and utilities, as well as with other technical organizations, to ensure that all necessary information is available to make a well-informed decision. This consultation have to involves energy experts, nuclear experts, economists, politicians, policy makers, utilities, members of industry, academics, legal experts and other stakeholders, particularly the media and general public. Thus, the creation of the national position offers the basis for the future development and implementation of the nuclear power programme. This is so because a national position provides a sound answer to the question of why nuclear power is being chosen (IAEA, 2016).

According to IAEA (2016), national position is said to be the product of a process that establishes the governmental strategy and commitment to develop, implement and maintain a safe, secure and sustainable nuclear power programme. This process will result in a national decision which communicates clearly the country's national policy as well as the commitment to proceed according to the international obligations, norms and standards. The national position consider among other things (IAEA, 2016):

- The political, social, economic, environmental and development objectives of the country;
- The national energy policy, comprising the possible role of nuclear power in the energy mix;
- The need for national stakeholder involvement, communicated at the local, regional and international levels;
- The vital national nuclear infrastructure, including appropriate international legal treaties and conventions.

In Nigeria, nuclear energy has received support. The National Energy Policy of 2003 clearly calls for the development of nuclear power and utilization of uranium resources in Nigeria (National Energy Commission, 2003). The Draft National Energy Master Plan of June 2007 reiterates the government's support for nuclear energy (National Energy Commission, 2007). Similarly, both the administrations of Obasanjo (1999-2007) and Yar'adua (2007 - 2009) had looked to nuclear power as a possible solution to the country's energy miseries. For instance, Obasanjo in 2007 called upon the Nigeria Atomic Energy Commission (NAEC) to meet with other stakeholders in energy sector to pursue nuclear energy option for Nigeria (National Energy Commission, 2007).

All the above provide the political level needed to establish a national position as stipulated by IAEA (2016); however, essential action on policy goals has been less forward-thinking. This is so because NAEC which is saddled with the responsibility of nuclear power programme has not been able to establish a clear strategy or harmonized the required stakeholders for nuclear power development. Evidence of this can be seen in NAEC plans for commissioning one 1,000 Mw nuclear power plant in 2017, which did not happened (Osaisai, 2007). This failure can be attributed to faulty national position. Therefore it is the intention of this research to assess the

Nigeria national position for nuclear power programme if it does exist. Similarly, the study also compares the document with international standards with a view of providing necessary recommendations.

## 2. Components of a National Position

A national position is formed from four different components/fundamentals which are (IAEA, 2016):

- i. **National policy development:** The assertion to embark on a nuclear power programme is usually made at the political level during the creation of a country's national energy strategy. This is informed by energy planning and comprises its potential role in achieving economic and social developmental objectives. The officials of Government who bring about the national policy will initiate the discussion concerning the introduction of a nuclear power programme in relation to these goals, and the role of nuclear power as a potential source of energy.
- ii. **Energy analysis and planning:** This is the performance of broad quantitative and qualitative valuations of future demands for energy services and supply choices in such a way that is reliable with the country's long term socioeconomic development goals. The main purpose under this fundamental is to broadly and accurately assess the potential role of nuclear energy in the country's future energy combination in addition to gather information about the security, economic and environmental implications and trade-offs of different energy demand and supply futures.
- iii. **Prefeasibility study:** The results of the above fundamental (i.e. energy analysis and planning) need to be accompanied by further financial, technical, social and economic assessment with regard to the introduction of a new nuclear power programme. It may be performed by various bodies or individuals and will offer political decision makers with an up-to-date viewpoint on the infrastructure and organizations that are essential to support a nuclear power programme.
- iv. **Engaging the public and relevant stakeholders:** To formulate national position for nuclear power programme; it is important to engage actively the public and other relevant stakeholders in its development as well as implementation. Effective stakeholder involvement and communication strategies lead to a more viable national position, while guaranteeing wider support for the development of a new nuclear power programme.

Moreover, the resources commitment for a nuclear power programme is characterised in phases. IAEA (2015) in its Milestones publication recognised three different phases in the introduction of a nuclear power programme. There are:

- Phase 1: Considerations before a decision to launch a nuclear power programme is taken;
- Phase 2: Preparatory work for the construction of a nuclear power plant after a policy decision has been taken;
- Phase 3: Activities to implement a first nuclear power plant.

The publication stated further that at the completion of each phase is marked by a specific milestone at which the progress of the development effort can be appraised and a decision made to move on to the next phase.

Consequently, there are three milestones and the development of effective national position marked the achievement of milestone 1 (IAEA, 2016).

According to Bastos (2019), countries in the first group (phase) are showing willingness to go into nuclear energy production but have many issues to deal with. He stated further that one of the issues is national position and that countries in this stage are volatile; the reason which has made it difficult for those countries to carry along all the stakeholders that are involved in the generation, distribution and transmission of electricity to their people.

Nigeria falls between the first and the second phases. This is based on the decision of the country to go into nuclear energy programme, together with its commitment to have two nuclear power located in two out of its 36 states. The federal government had signed an agreement with Moscow to generate nuclear power two years ago. However, the agreement is believed to be a mere paper work as no meaningful practical step has been taken since then (Bastos, 2019). All these can be attributed to faulty national position. Therefore, it is against this backdrop that this study assesses the Nigerian national position for nuclear energy programme based on the four fundamentals discussed above.

### 3.0 Materials and Methods

The data collection method used in this research work is from both secondary and primary sources. The secondary data collection sources involve the application of research materials like journals, text books, periodicals, newspapers, reports (especially IAEA) and others. Primary source of data for this research was the questionnaire. The designed questionnaire was in three parts i.e. section A, B and C.

Section A deals with demographic characteristics of the respondents with four items i.e. Q1 on (highest level of qualification), Q2 on (profession), Q3 on (number of years employed in the organisation) and Q4 (work experience). Section B deals with issues of Nuclear Power Development with five questions, Q5 (need for nuclear power), Q6 (suitability of nuclear option for the country), Q7 (a recognise body to coordinate nuclear power programme), Q8 (decentralisation of nuclear programme among nuclear regulatory bodies) and Q9 (necessary government backing for nuclear power programme). Section C deals with Issues of National Position with four questions, Q10 (needed infrastructure to establish a national position), Q11 (if key stakeholders properly consulted), Q12 (if national position established communicated effectively) and Q13 (components of National Position with four items). Furthermore, all questions or items especially in section B and C of the questionnaire were measured by means of a 5-point Likert-type scale with 1 (strongly disagree) and 5 (strongly agree) or 1 (strongly disbelieve) and 5 (strongly believe). From 150 questionnaire distributed, 124 were received.

In order to cover the main objective of this study which is to assess the Nigeria national position for nuclear power programme, the administered questionnaire were targeted on the politicians and elected officials, professionals and technical community as well as the public. For larger coverage, the politicians and elected officials across the country were considered while from the professional and technical angle, government institutions related to energy/nuclear power generation and regulations such as NAEC, NNRA, energy commission and nuclear research centres were considered. For the public angle, consideration was first given to

individuals and institutions relevant to nuclear power before other populace. These institutions include ministry of science and technology, ministry of environment, ministry of power. The authors recruit the services of three volunteers who were trained and equip to help in questionnaire distribution. In this study, adults aged 18+ were targeted and surveyed over the period July and August 2019.

Moreover, the respondents for the study were purposely selected to ensure that persons with knowledge of nuclear power programme were the ones included in the study. This is due to the sensitivity of the issues examined and also because the capability and consistency of the respondents' is required. Furthermore, Purposive sampling technique can be more precise with regards to effort, cost and time needed to find respondents than randomization (Seidler, 1974; Snedecor, 1939); hence, one of the reasons for its selection. For equity, questionnaire were distributed equally among the key stakeholders in nuclear power program that is 50 for politicians and elected officials, 50 for professionals and technical community and 50 for the public. A total of 124 questionnaires were received from 150 distributed (34 from politicians and elected officials, 42 from professionals and technical community and 48 from the public). A response rate of 82.7% and according to Dillman (2000) and Takim et al. (2004), response rates from questionnaire survey can be from 20% to 30% at minimum; therefore having 82.7% (124 respondents) response rate for this study is well above the expected response rate.

#### 4. Results and Discussions

This section deals with results presentation and discussions. However, before carrying out the analysis, the responses from the questionnaires were subjected to two test i.e. reliability and validity. Forza (2002) posited that these tests are necessary to evaluate the quality of a research instrument. The results from reliability test using Cronbach's alpha shows the score of 0.872, hence indicate that the constructs of the questionnaire have internal consistencies. This is so because Swafford et al., (2006a) maintained that a Cronbach's alpha of 0.70 or higher is usually used to establish reliability of a construct. For this study, validity is boosted because most of the items for the questionnaire were obtained from the background of the study and also, questionnaires completed were examined for consistency and completeness before data analysis. On this basis O'Leary-Kelly and Vokurka (1998) maintained that the instrument can be said to be of good construct validity.

Analysis of demographic characteristics of respondents as presented in Table 1 shows that all level of education as well as majority of respondents spent over 5years in their various organisations. This shows majority of the respondents know a lot about their organisation and hence, put the study into better perspective to achieve the main aim of the research.

**Table1: Demographic Characteristics of Respondents**

Demographic characteristics		Frequency	Percentage
Highest level of Qualification	PhD	11	8.9
	Master Degree	30	24.2
	Bachelor/HND	68	54.8
	Diploma	1	.8
	Professional Qualifications	9	7.3

	Others	5	4.0
Profession	Engineering	33	26.6
	Planning/management	37	29.8
	Nuclear Physicist	6	4.8
	Others	48	38.7
Number of Years Spent in Organisation	Less than a year	14	11.3
	1-5yrs	31	25.0
	6-10yrs	39	31.5
	Over 10yrs	40	32.3
Work experience in nuclear related jobs	Less than a year	9	7.3
	1-5yrs	12	9.7
	6-10yrs	45	36.3
	Over 10yrs	58	46.8

On the need for nuclear power in the country, Table 2 shows that majority of the respondents 36.3% agreed for its establishment and this was closely followed by respondents (35.5%) who were undecided. This high undecidedness of the respondents might be attributed to high risk of nuclear power operations.

However, this result is very much in line with literature because according to Comby (2006), to solve the nation’s power generation problems, one of the solutions that have been offered is the development of nuclear power programme. This is so because nuclear power is clean, compact, reliable, competitive, safe and essentially unlimited.

**Table 2: Need for Nuclear Power in the Country**

Option	Frequency	Percentage
Strongly Disagree	8	6.5
Disagree	27	21.8
Undecided	44	35.5
Agree	45	36.3
Total	124	100.0

On the issue of body to coordinate nuclear power programme in the country, Table 3 shows that majority of the respondents (i.e. 50.8%) agreed that there is a body to coordinate nuclear power programme. This result is in agreement with requirement for the development of nuclear power programme as stipulated by regulatory agency; the IAEA. According to IAEA (2009), to appropriately assess the introduction of nuclear power to a national energy policy, a country need to authorise a governmental body, such as a nuclear energy programme implementing organization (NEPIO), (and in case of Nigeria, national atomic energy commission) to carry out and complete the necessary studies so as to make a well-informed decision about whether to proceed with the development of nuclear power.

**Table 3: Body to Coordinate Nuclear Power Programme**

Options	Frequency	Percentages
Strongly Disagree	6	4.8
Disagree	19	15.3
Undecided	36	29.0
Agree	43	34.7
Strongly Agree	20	16.1
Total	124	100.0

Majority of respondents 58.9% agreed that the government should decentralise the body responsible for nuclear power programme in the country as presented in Table 4. Their reasons might not be far from the fact that NAEC which is burdened with nuclear power programme in Nigeria has not been able to come up with requisite plan to establish a commercial nuclear power in the country since its creation. This result agrees with literature.

**Table 4: Decentralisation of Nuclear Power Programme**

Options	Frequency	Percentage
Strongly Disagree	6	4.8
Disagree	12	9.7
Undecided	33	26.6
Agree	44	35.5
Strongly Agree	29	23.4
Total	124	100.0

On the issue of necessary government backing for the establishment of nuclear power programme, Table 5 shows that 70.1% of the respondents agreed that there is government backing. This result is very much in line with literature because right from the administration of Obasanjo down to present administration of President Buhari have shown commitments to the development of nuclear power programme. The reason President Muhammad Buhari attended the 4th nuclear security summit in Washington, United States. In the summit, he lobbied support from other member nations, for a Nigerian Nuclear Power Programme.

Hence, top government support is essential. IAEA (2016) posited that the creation of strong, high level government support, including the relevant public consultations, is a major first step to embarking on a nuclear power programme. Similarly, in the development of a new nuclear power programme, securing long term governmental policy backing is necessary. This is because a nuclear power programme is an obligation of at least 100 years, with a preliminary execution period of at least 10 to 15 years. Consequently, a country’s national policy needs to remain stable with such an obligation and to be communicated in a clear and transparent way. Also, a steady political, social and economic environment may nurture better support from international institutions and suppliers of reactor, which lead to a better chance of success (IAEA, 2016).

**Table 5: Necessary Government Backing for Nuclear Power Programme**

Options	Frequency	Percentage
Strongly Disagree	5	4.0
Disagree	14	11.3
Undecided	18	14.5
Agree	51	41.1
Strongly Agree	36	29.0
Total	124	100.0

On the issue of needed infrastructure for the establishment of national position, Table 6 shows that 66.9% of the respondents agreed the country have needed infrastructure for the establishment of national position. Needed infrastructure is essential because according to IAEA (2016), a suitable infrastructure is necessary for the safe, peaceful, secure, and sustainable application of nuclear power. Thus, member countries contemplating the introduction of nuclear power are faced with the challenge of building the necessary nuclear infrastructure for the first nuclear power plant.

The creation of the essential infrastructure needs continued governmental support to safeguard the vital managerial, technological, legal, regulatory, industrial and human capability which exist and will continue to exist throughout the entire period of the nuclear power programme and it include site selection, construction, operation and maintenance, spent fuel and radioactive waste management, decommissioning, and remediation of environment. As a result; a country needs to be in a position to show its submission to international legal instruments, nuclear security strategies, nuclear safety principles, and non-proliferation requirements essential for nuclear power programme implementation (IAEA, 2016).

**Table 6: Needed Infrastructure to Establish a National Position**

Options	Frequency	Percentage
Strongly Disagree	8	6.5
Disagree	14	11.3
Undecided	19	15.3
Agree	48	38.7
Strongly Agree	35	28.2
Total	124	100.0

On the issue of consultation with political decision makers and elected officials, the professional and technical community as well as the public and other stakeholders (i.e. the key stakeholders in nuclear power programme), Table 7 shows that 81.5% of the respondents says all the key stakeholders were not consulted in the development of national position. Consultation with key stakeholders is very essential based on IAEA standards for a national position to be relevant, however this result shows that it was not the case in Nigeria situation and hence, one of the reason nuclear power programme in the country have stalled over the years.

Furthermore, engaging the relevant stakeholders help provide informed answers to questions that arise during the creation of national position process and will also foster the necessary cooperation to build a national



position. This consultation may communicate not only the benefits and risks of nuclear power and its alternatives, but also the economic, social, industrial, environmental and safety implications that needed to be considered by the government (IAEA, 2016).

**Table 7: Consultation of Key Stakeholders**

Options	Frequency	Percentage
Yes	23	18.5
No	101	81.5
Total	124	100.0

IAEA (2016) maintained that a national position is formed of four distinct elements and on this Table 8 shows that 49.8% of the respondents agreed that the four distinct elements needed for the formation of national position were adhered to. However, looking at the percentage closely, it fall slightly short of the half percentage mark (i.e. 50%) which shows that lot of respondents do not believe that the four components were followed in the development of Nigeria national position for nuclear power programme. Furthermore, the result shows that three of the components (i.e. national policy development, energy analysis and planning and prefeasibility study) were agreed to by the respondents that nation position developed adhered to but on the last component (i.e. engaging the public and relevant stakeholders), the respondents disagreed that stakeholders were consulted in the development of national position.

**Table 8: Components of National Position**

Components	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
National policy development	18	17	15	40	34
Energy analysis and planning	30	16	9	41	28
Prefeasibility study	20	18	11	38	37
Engaging the public and relevant stakeholders	34	46	15	19	10
Total	102	97	50	138	109
Percentage	20.6	19.6	10.1	27.8	22.0

### 5. Conclusion

Since the 1970s, the Nigeria government have looked into the option of nuclear energy as an alternative source of energy supply but in recent times there has been a renewed interest for its development. This is bound out of some convincing reasons for pursuing a nuclear power program due to substantial challenges to achieving its objectives which include an insufficient national electricity grid, deficiency of technical capacity, an underdeveloped electricity market and history of success in large, government-managed projects. However, to ensure success in nuclear power programme, the very first step a country needs to have is sound national position which is establish with a robust, top government support as well as appropriate public consultations.

This is important for achieving the first milestone as stipulated by IAEA framework. National position offers the basis for the future development and implementation of the nuclear power programme.

This study revealed that the country needs the establishment of nuclear power and the body to coordinate nuclear power programme have been set up. Similarly, this research revealed that there is top government support for nuclear power programme as well as needed infrastructure for its establishment. However, the country faced challenges for developing its first nuclear power because of its faulty national position and this result due to failure to consult relevant key stakeholders. IAEA (2016) provided three key stakeholders necessary for establishing nuclear power programme which are political decision makers and elected officials, the professional and technical community as well as the public and other stakeholders. Of these stakeholders, the study revealed that third and last stakeholder was not properly consulted. Appropriate consultation is necessary because it provide stakeholders with a proper opportunity to express their opinion through a review process that is both transparent and accessible. This is very critical to the success of a new nuclear power programme. The study therefore recommended that proper consultation with all relevant stakeholders should be carried out to bring everyone up to date and the body needed for coordination of nuclear power programme should be up and doing as well as carry all relevant agencies and board along so as to ease the development of the country firsts commercial nuclear power programme in order to enhance the economy of the country.

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