Nuclear Power Acceptance Among University Staffs and Students

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Abstract. The need to consider alternative energy sources becomes very real. Nuclear has been identified as an alternative electricity source. However, media reports seem to indicate that there is a resistance among peoples with regards to harnessing nuclear for energy. This study was conducted to assess the acceptance level of university staff and students towards nuclear energy by asking them to answer a questionnaire. The questionnaire was constructed in a way to gauge their background knowledge on the energy situation of the country, the risks involved with regards to nuclear energy and also what aspects need to be improved in order to have a safe integration of nuclear energy into the national energy mix. The overall result of the questionnaire indicated high level of support for nuclear energy. The main areas of concerns however, were waste management, control and governance and also nuclear accidents. These should be identified as fields that require extra attention. However, the positive result obtained from this survey should not be construed as overall strong support in general. There might be different outcomes if the survey was conducted on to the general population as compared to the university students and staff that were involved in this research.

1. Introduction
China and India are the leading countries in Asia with regards to nuclear electricity and they anticipates an increase in generation capacity [1]. As the energy security of Malaysia heads towards an uncomfortable situation over the next 5 years, it is imperative that policy makers look to diversify the energy mix. Currently, more than 60 percent of Malaysia’s electricity is generated from Gas and the remainders come from coal and hydroelectric sources. Considering that almost all of the coal used for electricity generation is imported, a serious question with regards to energy security lingers [2, 3]. It has been projected by the Economic Planning Unit at the Prime Minister’s department, that Peninsular Malaysia will face an energy shortage situation post 2019. At this point onwards, it is projected that the demand for energy will outpace the ability to supply energy [4]. Malaysia began its nuclear journey since 1972 and the Atomic Energy Licensing Board (AELB) was established in 1985 [5, 6]. The environmental benefits over the lifecycle of a nuclear power plant in term of the Green House Gas emissions is 100 times lower than that of Gas and Coal power plants [7]. It is also 10 times lower when compared to Solar PV and Biomass power plants [8]. There are some challenges with regards to nuclear safety, while there are initiates from several universities to offer undergraduate and postgraduate nuclear related courses for capacity building [9].

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The objective of this report is to look into the possibility of deploying nuclear energy in Malaysia and to gauge the acceptance level of respondents towards nuclear power plants.

2. Methodology
The One of the objectives of this study is to gain an understanding of the attitude of students and staffs of Universiti Tenaga Nasional towards nuclear energy and its utilisation in electricity generation. For this purpose, a questionnaire of 8 sections, which comprised of 16 questions was constructed and electronically distributed to the respondents. This questionnaire was adapted from an earlier published survey by [10] to suit the Malaysian locality. The first section of this questionnaire looks into the demographics of the respondents. The questions asked in this section are on the gender and the age of the respondents. The purpose of this section is to establish if the response provided by the respondents might correlate to either category. In the second section, the questionnaire asks respondents to choose their preferred choice for electricity generation. This is followed by questions first on their general support for the usage of nuclear power for electricity generation and then a specific question on their support for nuclear energy in Malaysia. The questionnaire then proceeds to investigate on the perceived risks by the respondents on nuclear energy for electricity generation in the fifth section. Among the risks that were presented to the respondents included nuclear waste management, general maintenance and management risks, nuclear accidents, attacks and natural disasters. This section is included to understand the main factor that the respondent considers as critical aspects to be managed in order for nuclear energy to be utilised for electricity at minimum risk. The sixth section of the questionnaire touched on climate change. It was designed to drive the thought process of the respondent to consider the possibility of supporting nuclear energy for electricity if they considered or believed that it could assist in reducing the impacts of climate change. The preceding section focussed on energy security and whether nuclear energy could be utilised to improve the energy security situation of the country. Lastly, the survey ends by asking the respondent again on their support for nuclear energy for electricity. However, in this section the respondent is asked first on their support for nuclear energy and then followed by a specific question on whether they support nuclear energy to be implemented in Malaysia for electricity generation. Out of the total emails sent containing the link for the electronic questionnaire, there were 142 respondents. The outcome of the questionnaire is then compiled and presented into chart form to be analysed. The result of the questionnaire is presented in the following section.

3. Results and discussion
The demographics of the respondents is summarised in Table 1. There were 142 respondents, with a majority of 70% male respondents. The respondents were mainly aged between 18 - 25 years old with 62% of the respondents being students.

| Gender/Age/Occupation | Quantity, N | Percentage, % |
|------------------------|-------------|----------------|
| Male                   | 99          | 69.7%          |
| Female                 | 43          | 30.3%          |
| 18 - 25                | 85          | 59.86%         |
| 26 - 35                | 29          | 20.42%         |
| 36 - 45                | 20          | 14.08%         |
| 46 - 55                | 6           | 4.23%          |
| 56 and above           | 2           | 1.41%          |
| Students               | 88          | 62%            |
| Staff                  | 54          | 38%            |
The respondents were asked to indicate their preference of energy sources for electricity generation in the first section of the questionnaire. Across the option of fossil fuels for electricity generation, natural gas was the most favored source of energy at 9%, compared to 1% for diesel and coal each. Across all options, renewable energy was the most preferred choice for fuel source. Solar electricity was chosen by 40% of the respondents, followed by 22% choosing hydroelectricity at 22%. Nuclear energy was chosen by 17% of the respondents.

![Figure 1. Preferred Source of Energy for Electricity Generation](image)

A question was asked to the respondents on their awareness of any other ASEAN member nation having nuclear electricity as part of their energy mix. This was to gauge their regional awareness of nuclear development. The outcome was somewhat balanced with 47% of respondents claiming to be aware of some ASEAN member countries already having nuclear electricity in their energy mix. The remaining 52% were unaware of this. Currently, no ASEAN country has any operational nuclear power plants yet. However, Vietnam is the most advanced stage when it comes to building a nuclear power plant [9]. Respondents were asked of their opinion and general support for nuclear energy to be used in electricity generation. In principal, 44 percent of respondents expressed support for nuclear energy while 22 percent were opposing the idea. The remaining 26 percent were unsure whether to support or oppose nuclear power for electricity. Another 7 percent had no opinion on the matter.

Interestingly, when the question was modified a little to ask whether the respondents would support nuclear energy for electricity in Malaysia, the amount of support dropped from 44 percent to 41 percent while the opposition increased from 22 percent to 31 percent. The number of people who were unsure remained at 26 percent.

| Table 2. Support for Nuclear Power for Electricity Generation |
|---------------------------------------------------------------|
| Choose the option that most closely indicate your level of support for nuclear power plants for electricity generation | Quantity, N | Percentage, % |
| a) In general, I support the use of nuclear power for electricity generation | 63 | 44.37% |
| b) In general, I oppose the use of nuclear power for electricity generation | 32 | 22.54% |
| c) I am not sure whether I support or oppose the use of nuclear power for electricity generation. | 37 | 26.06% |
| d) I have no opinion on the matter | 10 | 7.04% |

| How do you view the future of Nuclear Power Plants in Malaysia |
|---------------------------------------------------------------|
| a) We should build Nuclear Power Plants in Malaysia | 59 | 41.55% |
| b) We should not build Nuclear Power Plants in Malaysia | 45 | 31.69% |
| c) I am not sure | 38 | 26.76% |
| d) I have no opinion on the matter | 0 | 0.00% |
3.1. Prediction Results
Respondents were asked on the perceived risk and benefits of implementing nuclear power for energy generation. There were three options presented for this question. First, the optimistic option where one sees that the benefits of nuclear power outweighs the risk. This option was selected by 24 percent of respondents. Most of the respondents, 36 percent were more balanced to say that the benefits and risk of implementing nuclear power are approximately the same. The pessimistic view that the risk of nuclear power is higher than the benefits was selected by 32 percent of respondents. A remainder of 8 percent had no opinion on the matter.

A list of potential risks was presented to the respondents. This was to find out, what risk aspect that they consider the most critical to be addressed. The options provided were waste mismanagement risk, quality risks due to construction and/or maintenance, risk of being attacked, governance and regulatory enforcement risk, natural disaster and nuclear accidents.

Waste handling appears to be the risk aspect that most respondents were concerned of. This option was selected by 30 percent of the respondents. Respondents were secondly concerned over nuclear accidents with 26 percent selecting this option. Next, 20 percent of respondents were concerned with regards to control, regulation and legal enforcement of operating standards. They were least concerned over potential attacks on the power plants with only 3 percent selecting the option.

3.2. Conditional Support for Nuclear Power
The questionnaire was designed to investigate if there were any conditions that might influence the support level of respondents for nuclear power. For this purpose, respondents were asked on several questions with regards to climate change and also energy security. First, they were asked on their opinion on the seriousness of climate change.
A strong majority of 85 percent of respondents agreed that climate change is a serious issue. The remainders were almost equally distributed in saying it is not serious, it is not real and have no opinion on the matter. It is believed by 56 percent of the respondent that human activities are the main contributor of climate change. Only 8 percent of respondents believe it to be a natural phenomenon. Immediately after these two questions, the respondents were asked again on their support for nuclear power for electricity. This time, the focus was to ask the respondents if they would support nuclear power for electricity if it could reduce the effect of climate change. The support level jumped by 21 percent from the initial feedback. This indicates that the respondents were supportive of reducing the impact of climate change.
The respondents were then asked on their opinion on whether Malaysia will face energy security issues in the next 50 years. Further, they were asked whether they would support nuclear energy if it could resolve the national energy security concern for the coming 50 years.

![Figure 7. Respondent Opinion on Causes of Malaysia Energy Security](image)

![Figure 8. Respondent Support for Nuclear Power Plants if it can Increase Energy Security](image)

This time the support level for nuclear power plants jumped by 15%. At this juncture, one could summarise that if the respondents are made aware of the positive implications of nuclear energy, there would be increased support for the implementation of the technology. Towards the end of the questionnaire, the respondents were asked whether in principal they support nuclear energy. For this question, 69 percent of respondents supported this idea. At the beginning phase of the questionnaire, only 44 percent of respondents supported nuclear power plants for electricity generation.

When the respondents were asked again on their opinion whether nuclear power plants should be built in Malaysia, 54 percent of respondents had positive opinion compared to only 41 percent in the initial stage.

4. Conclusion
From the literature review, it could be construed that Malaysia will face serious energy security issues in the coming 5 years. As such, it is impediment that the nation diversifies its fuel mix for energy generation. Nuclear could be considered as a viable option as it is more secure, cleaner and it is also a mature technology in a global sense.
Table 3. Support for Nuclear Power for Electricity Generation

| In principal do you support nuclear power plants for electricity generation in peaceful and politically stable foreign countries | Quantity, N | Percentage, % |
|---------------------------------------------------------------|-------------|---------------|
| a) Yes                                                         | 98          | 69.01%        |
| b) No                                                          | 34          | 23.94%        |
| c) No opinion                                                  | 10          | 7.04%         |

| In principal do you support nuclear power plants for electricity generation in Malaysia |
|---------------------------------------------------------------------------------------|
| a) Yes                                                                                 | 78          | 54.93%        |
| b) No                                                                                  | 48          | 33.80%        |
| c) No opinion                                                                          | 16          | 11.27%        |

The benefits of using nuclear power plants should be viewed in terms of economy, society and the environment. For the economy, it will lower energy prices and increase energy security. Hence development will occur at a rapid pace, job creation will be seen and investments will increase. The job creation benefits the society. Additionally, the opportunity for higher education will be increased in order to meet the demand of the new sector. As nuclear is much cleaner than gas and coal power sources, the environment will benefit as well. There will be reduction of greenhouse gas emission, particulates and smog.

However, the challenge is to ensure a proper framework mechanism to manage nuclear power and nuclear waste is put in place. The public is greatly concerned on the nuclear waste management system.

A survey was conducted to gauge the general level of acceptance for nuclear power in Malaysia. 142 respondents were engaged. The backgrounds of the respondents were mainly engineering and science. From the survey, the level of support for nuclear is quite high. In general, 41 percent of the respondents supported in principal the use of nuclear power plants in Malaysia. However, when asked whether they would support nuclear power plants in Malaysia if it reduced the impacts of climate change, the support level increased to 65 percent. When this question was asked again, but in the aspect of energy security, the support level was at 55 percent.

The respondents are mainly concerned on nuclear waste management, lack of control and enforcement and also nuclear accidents. As such, these are the areas that must be focused on and be addressed. In conclusion, among the learned group, there is enough understanding on the benefits and challenges of nuclear energy. As such, these groups knows enough to support nuclear energy. The government should engage the public and educate them in order to get more public support.

Proper framework and mechanisms should be established in order to ensure proper management of nuclear power when it becomes available. For the long run, in view of energy security issues and greenhouse gas reduction, the government should embark on a nuclear power journey.

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