NAST STATEMENT ON NUCLEAR POWER IN THE PHILIPPINES

The increasing need coupled with a rising price of energy and environmental concerns associated with fossil-fuel use and other traditional sources of energy in the country generates a strong clamor for a cleaner and more sustainable alternative sources. The current administration is considering nuclear energy as a long-term option. In 2017, the Nuclear Energy Program Implementing Organization (NEPIO) was set-up in the Department of Energy (DOE) to coordinate efforts and activities toward nuclear power development in the Philippines. Given these developments, it is necessary to revisit the country's nuclear energy plan.

Nuclear power is not new in the Philippines, as the Bataan Nuclear Power Plant (BNPP) is a testament to a once-promising energy venture that was mothballed for enviro-political reasons. The BNPP would have been the first operational nuclear power plant in Southeast Asia, but was abandoned in 1985. The Philippine government nonetheless continues to spend for its annual maintenance costs of some ₱ 40-50 million pesos.

GLOBAL TRENDS IN NUCLEAR POWER

There are 445 nuclear reactors in the world which are currently in operation and another 57 under construction. A total of 30 countries are involved in nuclear energy production including the US, France, China, Japan and Russia. The global capacity of nuclear power has progressively decreased due to changes in Western government policies and the shutdowns of reactors in Japan, Germany and the US. There is, however, an increase in global nuclear generation by 1.4 % in 2016 largely attributed to China's 23% rise. The nuclear power's share in total generation mix fell to 11% in 2015 but still corresponds to nearly a third of the world's low carbon electricity production.

In the ASEAN region, the primary demand for energy grew by 70% between 2000 and 2016. Three-fourths of the region's energy production are based on fossil fuels. Vietnam is most serious about nuclear power as manifested by its agreement with Russia and Japan to build two plants. Thailand, on the other hand, has not pursued its nuclear program since 2014, while Indonesia will open to nuclear energy after 2025. The Malaysia Nuclear Power Corporation states that the country will wait until 2030 for a similar facility of its own.

NUCLEAR ACCIDENTS

Safety of nuclear power plants is essential for public acceptance. During the period 1957-2011, there were 12 major nuclear accidents as rated by International Nuclear Events Scale (INES), a classification based on the gravity and seriousness of the impact. The 1986 Chernobyl incident in Ukraine (USSR) is the only accident listed as Level 7, which the IAEA described as severe with widespread health and environmental effects. The Fukushima Incident in 2011, which resulted in reactor shutdown after a major earthquake, was classified at INES Level 5, accident with wider consequences.

MODULAR NUCLEAR REACTORS

It has been reported that 17 advanced water-cooled reactor designs and technologies have been developed recently, and are now commercially deployable. These designs have enhanced technical improvements related to safety, operation and reliability with better economic competitiveness. Significant advances have also been made in the development of small- and medium-sized modular reactors which are designed to generate up to 300 MW(e). They can be constructed in short schedules and offer flexible power generation for a wider range of users and applications. The economic effect of the cheaper cost of investing in modular nuclear reactors will attract potential investors as the price of electricity is expected to significantly go down.

ENVIRONMENTAL IMPACTS OF MAJOR ENERGY SOURCES

Global warming poses detrimental effects to the environment primarily due to combustion of fossil-based fuels. The increased retention of heat energy in the atmosphere from greenhouse gases, complex climatic interactions involving cloud formation, surface albedo and the reaction of natural carbon sinks make it difficult to accurately forecast the long-term trajectory of average temperature. The precautionary principle makes it incumbent to manage GHG emissions to reasonably safe levels based on the best available scientific data.

Climate change can have various harmful consequences, ranging from sea level rise, ocean acidification, and disruption of weather patterns (and human activities such as agriculture that depend on climatic predictability). Disruption of weather patterns at the local scale is difficult to predict in general, but include the possibility of increased frequency or intensity of storms, changes in average precipitation level, and other manifestations. Various secondary effects may result from localized weather changes, including the spread of crop pests and diseases. In many cases there are potentially serious socio-economic consequences that will require implementation of climate change adaptation strategies.

LONG-TERM PROJECTED ENERGY DEMAND

The Philippines' energy supply remains unstable. An annual growth of 4.4% is expected by 2040 under a BAU scenario. This is due to power generation and industrial processing demand, with coal and oil comprise the large portion of the energy mix as natural gas reserves decrease. The energy demand is projected to rise by 10.191 MW between 2016 and 2030, representing a 70% increase from the current demand. Additional capacity of 43.765 MW will be needed by 2040 owing to the predicted increase in alternative energy for transport such as electricity and compressed natural gas. Moreover, the dependence on imported fossil fuels makes the country vulnerable to world energy price volatility. By comparison, the cost of generating nuclear energy is less sensitive to nuclear fuel price due to the larger component contributed by its capital cost. Nuclear is an important base load power generation source as demonstrated in many countries with operational nuclear plants.

PHILIPPINE CLIMATE CHANGE GOAL

The commitment of the Philippine government to bring down the greenhouse gas emissions (GHG) by 70% will bank on the government's nuclear energy initiative. Coupled with strong programs on carbon-less energy production, considerable GHG reductions can expectedly be achieved. As the country heavily relies on fossil-based fuels, energy from nuclear fuel can be a viable solution to mitigate the effects of climate change. Global demand for energy is predicted to increase by 2030 and so is the carbon emission.

CONCERNS ON NUCLEAR ENERGY

Nuclear energy appears as an attractive source of energy given the above reasons. However, there are also major issues that will have to be considered. The Philippines being in a tectonically active region, will have to conduct a thorough evaluation of potential sites for the power plant and waste storage. The published IAEA safety standards for earthquakes, volcanic activity and other hazards in siting nuclear power plants should be adhered to. The trajectories of radioactive particles, atmospheric and oceanic, and density of population of whom will require evacuation, in cases of emergency must be also considered in site selection.

RECOMMENDATIONS

The Academy recommends that the Government:

- Pursue a diversified energy mix to include nuclear energy;
- Develop a comprehensive national nuclear energy program with NEPIO as the lead group with active stakeholder involvement;
- Begin a long term capacity-building program for nuclear scientists and engineers, and operational and maintenance technicians; and
- Examine all alternative uses of the BNPP as non-energy and energy, inter-agency asset, which is a socially- and scientifically-rich asset of the DOST, DOT, and DepEd.

Specific actions to be pursued include as follows:

- Certify as urgent the passage of the proposed Comprehensive Nuclear Law
- The Department of Energy should formulate a regulation on the operation, ownership, effects on EPIRA, among others of nuclear power
- Establish a National Institute for Nuclear and Inter-disciplinary Energy Studies with funding provision of at least PhP 20 million per year for 5 years to undertake, among others:
    - An economic, financial, and risk analyses on any proposed nuclear power plant project.
    - A comprehensive assessment of its environmental, economic, and social impact.
    - A Life Cycle Assessment (LCA) study of the environmental performance of a nuclear power system from cradle to grave.

- Set-up a university consortium for nuclear science and energy, for example, UPD (Nuclear Science and Engineering), DLSU (Energy and Sustainability), USC Cebu (Economic and Social Impact), MSU-IIT (Nuclear Technology); and CLSU (Agriculture Sciences).
- Allocate at least ten (10) DOST scholars every year for 5 years to study MSc, PhDs, and postdocs in nuclear science and engineering in top universities abroad.

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The National Academy of Science and Technology, Philippines (NAST PHL) is an attached agency to the Department of Science and Technology (DOST) mandated to recognize outstanding achievements in science and technology and to serve as reservoir of competent scientific and technological manpower for the country (Presidential Decree No. 1003-A, December 17, 1976). By virtue of Executive Order 818 (July 16, 1982), the Academy was formally charged with the function of advisory body to the President and the Cabinet on policies concerning science and technology in the country.

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