

Enclosure**Legislative Council Panel on Environmental Affairs
Views from The Hong Kong Institution of Engineers on the
Impacts of the Development of Nuclear Energy
for Local Power Generation of Hong Kong****General**

In response to the invitation from the captioned Panel, the Hong Kong Institution of Engineers (HKIE) is pleased to provide views below on the impacts of the development of nuclear energy for local power generation on Hong Kong for consideration of the Panel.

Developing Energy Sources to Combat Climate Change

2. It is clear that Hong Kong has to make serious endeavour in addressing the issues of climate change and global warming. However, achieving the Greenhouse Gas emission reduction target by 2020 merely through energy saving is simply inadequate. The viability of extensive employment of renewable energy in our region is still far from feasible. Clearly benefits attained through these measures are definitely useful and should be promoted. However, it remains that for near to medium term, alternate modes must be considered.
3. First and foremost, the revamping of our present fuel mix of coal, gas and nuclear energy should be re-examined. The geographical limitation of Hong Kong as an island city does not allow us to have that kind of luxury of freely relocating our power plants to commensurate with the type of fuel used for power generation. Coal and gas are imported for our own generation. Nuclear power has been imported as a finished commodity for decades with proven reliability. In this regard, importing more nuclear energy is a sensible approach if we wish to drastically revamp our fuel mix within our peculiar topology.
4. The consideration of the optimal proportion of fuel mix is not static as it is necessary to account for the daily and seasonal electricity load pattern and in the priority of the safety, security, economic and environmental concerns of electricity supply in Hong Kong. The utility companies in Hong Kong have in them vast data in power systems study and should be consulted.
5. To secure a stable power supply, the HKIE proposes that nuclear power plants shall provide most of our base load. Gas and perhaps coal (which is later converted to gas) are to provide part of the base load and to meet seasonal demand. The electricity generated from pumped storage power stations in Southern China can meet the system daily peak demand. With this arrangement, the cleanest energy output of nuclear plants can be operated at full base load for maximum economy and minimum emission.

Nuclear Power

6. The HKIE wishes to respond in greater detail in our submission to tally with the emphasis lodged by the Administration to have nuclear power taking on half of Hong Kong's future energy consumption.

7. Nuclear energy is a relatively safe and reliable source of energy supply with a low environmental footprint. It is less polluting when compared with other conventional energy sources on condition that it is implemented with a proper nuclear waste disposal setting¹. Until the technology of renewable energy supply is developed beyond its infancy stage and with topographical constraints being suitably overcome, nuclear power would be a good source of energy supply. In addition, nuclear energy can be deployed in a large scale to meet the electricity demand in Hong Kong at a competitive cost.

8. Scientific statistics and analysis suggest that nuclear power generation has an accident rate of only 10^{-12} , which is far lower than that of other traditional energy generation methods, such as coal mining and offshore petroleum exploration.

9. Notwithstanding that the overall risk remains low, it is never humane to be complacent as the outspread of an incident could be far reaching and long lasting to cause irreparable loss to both livestock and properties. In this connection past serious nuclear accidents, such as the Three Mile Island accident and the Chernobyl disaster, were put under microscopic analysis. Both involved serious human error. Since then the design and operation of plants have been inducted with a more robust construction with less manual intervention.

10. The recent Fukushima accident, according to the available information obtained so far, is not the robustness of the plant itself that is in question. The structure withstood an unexpected scale of earthquake. However, the effect of tsunami was beyond the design parameters. It is a combination of the failure of several emergency power backups and the blockage to site by debris left by the wake which led to the painful consequence. It is expected that a comprehensive contingency plan should be put in place to prevent similar failures happening at the Fukushima power plant.

11. The Fukushima accident not only imposes an acute warning to the address of worldwide nuclear safety, it also inspires a more in-depth investigation into beyond design basis events and common mode catastrophes. Nevertheless, without identifying the root cause of the Fukushima accident, it would be a premature assumption that similar accident would/would not occur again in other nuclear power plants.

¹ Nuclear power produces waste but which only forms a few percent of the spent (used) nuclear fuel. A 1000 MW nuclear power station typically produces per year some 75-300 cubic metres of solid nuclear waste and about 1 tonne of highly radioactive waste contained within some 25 tonnes of used nuclear fuel (Source: Radioactive Waste Management, World Nuclear Association, 2009 and Daya Bay Performance, Hong Kong Nuclear Investment Company website, www.hknuclear.com). This small waste quantity should be stringently kept away from the environment with multiple layers of barriers for a very long period to allow its radioactivity to fall to original ore level in a few thousand years. The long storage period is not particularly onerous as many ancient artifacts and man-made structures have lasted quite well in the last few millennia and having an engineering solution is not an issue.

Proposed Strategies on Using Nuclear Power

12. The HKIE supports the Government to pursue a proactive but prudent approach in developing the use of nuclear power in long term. In line with this trend of development, the following concerns and initiatives should be taken into high consideration for formulating updated strategies on the issue:

Safety Review and Monitoring

13. The HKIE supports the idea of conducting an extensive safety review on both existing and future nuclear power plants conducted by the global nuclear industry regulatory authorities. Specifically, the Hong Kong Government should initiate and work in close collaboration with operators in the Mainland in monitoring the safe operation of neighbouring nuclear power plants.

14. Hong Kong should cautiously re-examine the existing nuclear power plant design with consideration given to withstand extreme weather conditions or even natural disasters. Regular reviews should be conducted to ensure the feasibility of the present contingency response measures. The existing substandard nuclear power plants should either be decommissioned or substantially upgraded to observe the latest operational, environmental and safety standards.

Environmental Concern

15. Thorough and comprehensive environmental impact assessment and audit should be conducted at planning and operational stages for current and future nuclear plants. Environmental data within the surrounding region of the operating nuclear power plants should be collected from time to time with a transparent disclosure for public monitoring.

Institutional Strengthening and Capacity Building

16. Sufficient well-trained operational personnel and advanced equipment like inspection robots are of paramount importance to effectively tackle emergency situations during nuclear accidents. To strengthen human expertise in future design of and operating nuclear power plants, the HKIE hence wishes to reiterate the pressing need to launch an undergraduate degree programme in nuclear studies to foster talents serving in the field of nuclear engineering. More funding assistance should also be granted to universities in conducting researches relating to safe and clean nuclear waste treatment or disposal.

Disaster Management and Emergency Planning

17. The HKIE suggests that the Hong Kong Government should establish close collaboration and maintain an effective communication mechanism with the global nuclear management authorities / monitoring experts.

18. In case of any non-remedial nuclear accidents, the taking-over of the damaged power plants by delegated authority should be pursued so that prompt decisions and actions could be taken to safeguard public interest and environmental safety as the

first priority in a timely manner.

Public Education and Awareness

19. The misunderstanding over the nuclear radiation in the wake of the recent Fukushima accident has revealed the inadequate knowledge about the issue among the citizens in Hong Kong. The HKIE urges the Government to co-operate closely with universities and professional bodies in promoting a better understanding and awareness in the application of nuclear energy.

20. To take the matter forward, pertinent measures should be taken to enhance community preparedness against emergency situations. Community-wide drills should be exercised on a regular basis so as to get the public familiar with the necessary coping skills during unexpected incidents.

Conclusion

21. The key considerations for any source of electricity generation for Hong Kong remain basically the same, that it should be reliable, environmental friendly, safe and affordable. The HKIE believes that Hong Kong should adopt a liberal attitude towards any form of primary energy source and energy conservation initiative that fulfils the set criteria.

22. As an integral part of China, Hong Kong has an obligation to be in-line with China's commitment in meeting the world's carbon density standard and other environmental protection initiatives. As such, we should thoroughly examine the available options, including nuclear power generation, which could facilitate in achieving the goal. As China is embarking on an active nuclear power programme with considerable numbers of nuclear units located in Guangdong Province, Hong Kong should grasp the opportunity to actively participate in ensuring the sophisticated and safe design as well as operation of nuclear power plants.

23. It is important for the community to understand that each fuel type has its own advantages and drawbacks, and that an appropriate mix of different fuel sources is required to meet the safety, reliability, affordability and environmental friendliness objectives of our energy needs. In this connection, the HKIE is prepared to strive for further collaboration with the Hong Kong Government in achieving optimal development of using nuclear energy in Hong Kong.