APS1018 History and Philosophy of Engineering – Final Team Projects, Fall 2013

Nuclear Technology: An Alternative Energy Plan for China

Nuclear energy is used in 31 countries as an alternative to conventional power sources. In France for instance, nuclear power provides 75% of the country's electricity requirements. The public has concerns about nuclear energy because of past accidents that have occurred, however in China which has serious environmental pollution, nuclear power is seen as a promising source of cost-effective and non-polluting energy. This report presents a proposal for construction of a nuclear power plant in China, including site selection, generating capacity, waste treatment and management systems.

Site selection:

The final location is proposed for the town of Yangkou, city of Rudong, Jiangsu province. In terms of natural requirements, this location meets the demand of lower earthquake risk and enough water supply, which has been explained within the report. This location is well suited to support the electricity demand from the cities of Nanjing and Shanghai. This area also achieves the demand of low population and good transportation that have been discussed in site selection, via the 221 Provincial Highway.

Generating capacity:

As calculated in our discussion, the nuclear electricity demand in 2020 is predicted to be 139GWh. Consider the two existing nuclear plants of Wuhu and Tianwan, with the generating capacity of 30GWh and 14GWh. The generating capacity of our proposed plant will be calculated as:

$$139\text{GWh} - 14\text{GWh} - 30\text{GWh} = 95\text{GWh}$$

The objectives of our report are to provide a comprehensive proposal to the Government of China for a new nuclear plant. Our proposal covers four parts: Accident case study; necessity analysis; construction details; and recommendations. We analysed the necessity of nuclear power in terms of future environmental demands and current state analysis, and based on our analysis we present a persuasive set of arguments in response to concerns and opposition that will potentially be raised by the public.

Three preeminent accidents that have occurred at nuclear generating stations have been reviewed, and the lessons learned have been factored into our proposals. We explain our recommendations for site selection, generating capacity and waste treatment. We also explain detailed requirements for construction, operational design, operator training and emergency planning.

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