

Retrofitting Lessons Learnt from Fukushima nuclear plant accident

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Abstract

It was concluded at the conference on World Energy Outlook 2011 in London, that global warming is the main threat for future generations. It is predicted that earth's temperature may rise by 6.4 °C in the next century compared to only 0.74°C in the past century. Maria van der Hoeven, director and representative of International Atomic Energy Agency (IAEA) at this conference stated that IEA insists that governments of the world invest in technologies which are CO₂ efficient. In a report published by IAEA called 'Climate Change and Nuclear Power 2011' concluded that nuclear power can battle the future climate change.

Iran is one of the few fortunate countries in the world which has access to vast uranium deposits while successfully has developed technology to enrich its uranium to produce nuclear rods to fuel its required nuclear energy for its future generations, however, considering that the existing Bushehr power plant was designed about half a century ago, it would be useful to learn from Fukushima plant disaster.

After two weeks of frequent seismic preshocks, on 11th March 2011 at 2.46 pm a magnitude 8.9 earthquake strike Japan's north-eastern coast, triggering a devastating tsunami and a series of aftershocks, the reactors automatically shut down with the earthquake. At 3.15pm a tsunami of 15m height which was twice the height of sea ward walls followed the earthquake directly from the east, the back up generators which provided water to stop nuclear rods from melting could not operate as they were submerged under water as they were located in the basement. Tokyo Electricity Company (Tepco), the owner of the plant, had already been warned by the scientists that the seaward walls were not tall enough and required retrofitting, but this was ignored, as the result the tsunami had over passed the wall¹.

On 12th March a state of emergency was declared about 170,000 people were evacuated from 18 km zone around the Fukushima plant. On 17th March Japanese helicopters dump tons of water over the plant in an attempt to cool reactors, but had no success. On 22nd March 2011 Japan expanded the exclusion zone around the plant and asked a further 130,000 residents to evacuate.

The paper investigates the retrofitting options which could have been applied to Fukushima plant to prevent the catastrophe which has resulted in possible contamination of 200 km² of North East of Japan for the next two decades.

Key words: Numerical Modelling, Disaster Resistance, Probabilistic Risk Assessment

Introduction

Fukushima Daiichi (FD) is situated at 240 km on the north of Tokyo, it was severely damaged by the earthquake of 8.9 in magnitude and tsunami which strike on 11 March 2011.

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