

Japan fukushima nuclear power plant disaster engineering essay



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This case study assignment is about Japan fukushima nuclear power plant disaster on 11th march 2011 which is a the largest nuclear disaster since Chernobyl disaster of 1986. From this case studies the awarenes in safety factors are the priority in industrial management and manufacturing. It is also improving a knowledge in handling, managing, preventive, maintaining the safety factors and handling any crisis on a industrial management.

INTRODUCTION

Fukushima Daiichi Nuclear disaster on March 11th which is happened due to earthquake and following by tsunami at Japan. This Nuclear disaster which release radioactive materials due to nuclear meltdown caused by equipment failures at Fukushima nuclear power plant.

This power plant with six boiling water reactors is designed by General Electrics and maintained by Tokyo Electric Power Company. From this 6 Reactors, Reactor 5 and 6 is under cold shutdown and Reactor 4 had been de-fueled for planned maintenance purpose. Reactor 1, 2 and 3 is shutdown automatically immediately after earthquake and emergency Generator system activated automatically to control electronics and coolant system.

However this generator system is failed to continuously operate due to tsunami following earthquake flooded this generator system located at low-lying room and causing power failure for the critical pumps which should function continuously to circulated coolant water through a nuclear reactor for few days to avoid it from melting down after being shutdown. This failures causing reactors overheated due to high radioactive will be produced in first few days of shutdowns.

Identifies whether the Fukushima nuclear disaster is natural or man-made. Clearly explain your justification.

Fukushima Daiichi nuclear plant disaster was " a profoundly man-made disaster", said in a report by a Japanese parliamentary panel. The disaster should have been foreseen and prevented and its effects mitigated by a more effective human response. From this report both the government and plant operator Tepco's response. It also blamed the cultural conventions and a reluctance to question authority.

The nuclear power plant was badly damaged after the 11 March 2011 earthquake and tsunami causing power failure to generator for cooling systems to reactors, leading to meltdowns and this is the reason of release of radioactivity. It is also mentioned that More than tens of thousands of residents were displaced from an exclusion zone around the plant for safety purpose. Special rescue team works to bring reactors under control. The reactors is back to stable condition in December 2011 report by Tepco.

Fukushima Nuclear Accident Independent Investigation Commission appointed a team to examine the handling of the crisis and make recommendations. In this investigation included 900 hours of hearings and interviews with more than 1, 000 people to make some conclusion. After few months of investigation, it is concluded that the disaster " was the result of collusion between the government, the regulators and Tepco" founded in the failure of regulatory systems.

There is some of errors and wilful negligence had left the plant unprepared for the earthquake and tsunami. They effectively betrayed the nation's right
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to be safe from nuclear accidents. Therefore, we conclude that the accident was clearly 'man-made.'" This kind of risky power plant should not ignoring international safety standards. From this data the Fukushima nuclear power plant disaster can be concluded as a 'man-made disaster. Even the power plant is damage and causing generators failures which causing the power failures for reactors cooling system pump happened due to natural disaster, the lack in the safety system is taken as the main reason of this disaster.

Japan is one of the main country that facing mostly all kind of the natural disaster frequently. So building or operating a nuclear power plant should be well prepared in safety wise that always alert and ready to face any disasters at anytime which still can having a preventive from the release of radioactive. Neglecting of the safety rules or insular attitude can causing a lot of unnecessary things especially in nuclear power plant projects.

Carefully observed the industrial process and operation of the Fukushima nuclear plant.

The Fukushima Daiichi Nuclear Plant was run by the Tokyo Electric Power Company and this nuclear plant has six units which called as boiling water reactors.

Before the earthquake when happen at year 2011, The nuclear power plant was running reactors 1, 2 and 3. At that same time reactors 4, 5 and 6 were being shut down for routine inspections. When the earthquake caressed, the reactors 1, 2 and 3 were shut down automatically which system was for safety. After the emergency shutdown, all the operating units maintained normal cooling immediately.

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The natural disaster effect the station and need to cut off all the electricity from the Japan's national electricity grid. In this case, Japan's national electricity grid just can use diesel generators for the alternating current (AC) power for backup.

The backup AC power which were been used for cooling the no. 1 units 4 nuclear reactors, which have been knocked out by tsunami. This tsunami was flooding most of the generators and electrical switchgear rooms. As for unit 6, an air-cooled diesel at its generator manage to cope up with the tsunami and provided a backup power to cool both units 5 and 6 which allows these units to be free from the fuel damage.

Backup batteries at the plant were designed use for generate direct current (DC) power for eight hours. However, when this caused the control room for units 1 and 2 went fall into darkness due to without emergency lighting, luckily units 3 and 4 still have emergency lightning. This caused happen due to the tsunami flood that was interrupting the flow of both the AC and DC power, began to have problems cooling the reactors. Hence, seawater were used to cool down the reactor cores as the AC was no longer available to provide power for the primary and secondary cooling systems, and the batteries which were used for backup cooling and control systems were also out of service.

At that moment, to prevent the restart of the nuclear chain reaction, neutron-absorbing boron was added to the seawaters for cooling water levels in the reactor cores did not rise up, but remained low for many days which caused the reactors to overheat.

In the emergency moment, they use hydrogen to generate in the containments of unit 1 until unit 3. This large amount of hydrogen is caused by the chemical reaction between the fuel's zirconium cladding and high-temperature steam. The hydrogen that flow from the containments into the reactor buildings caused large explosions in units 1, 3 and 4. The Japanese safety regulators estimated that each unit need to use around 800 - 1000 kilograms of hydrogen. The hydrogen explosions caused to restore cooling system.

Evaluate the impact of the Fukushima nuclear disaster to the society, ecology, sociology and health.

3. 1 Impact to the Society

Because of the nuclear disaster, around 170, 000 - 200, 000 of people who were living in Fukushima need to move out from their house immediately, which order are come out from Japan government. All the residents officially evacuated on 13 March 2011.

Due to the evacuation, the daily life for the people who live in Fukushima are totally change. All the residents lost their houses and also lost their important properties. This was because these residents that were evacuate, were asked to stay inside, close doors and windows and turn off their air conditioning by the NHK on the 12 March 2011, and reported by The Guardian. They were also advised to cover their mouths with masks or towels and not to drink the tap water.

3. 2 Impact to the Ecology

The nuclear power caused mutations in some butterflies. The increase in mutations among the offspring of pale blue butterflies that were collected in Fukushima was founded by a team of Japanese scientists. Besides, some abnormalities were also seen on these butterflies. The abnormalities that were found on the butterflies include plaid and leg tarsus, dented eyes, rumped and underdeveloped wings.

3. 3 Impact to the Sociology

One of the largest effects to the sociology caused by the Fukushima nuclear disaster was most of the nuclear reactors were need to close immediately and not only in Japan, all of the nuclear power plant in worldwide also will effect. All of the people in worldwide want all the nuclear power plant shut down immediately due to they were also worry that the same issues will happen in their own country.

The protests against nuclear power plant operation action has been started in France, Germany, India, Italy, Spain and more countries. Germany permanently shut down eight reactors and guarantees to close by year 2022. By the Japanese Prime Minister and the President of Taiwan has been a dramatic reduction in Japan's reliance on nuclear power.

Besides having the protests against to close the nuclear power plants, the nuclear disaster also gives an effect on the schools due to the radiation. In non-evacuation zone because of radiation concerns, in the hot summer, the children are retained in a building and to ensure that all windows are closed. Albeit in an area, they also found an important issue was difficult to breathe, and all children must be wearing masks, because they are afraid of radiation invasion.

Businesses were also effect by the plant owner due to the nuclear disaster.

The shares of the plant owner fall up to 62% within four days after the disaster and a slight 14% recovery after that. However, the shares felled further, reaching a 34-year.

3. 4 Impact to the Health

According to the report made by the Ministry of Health show that the nuclear disaster is a great impact on the human body, and also according to U. C. Berkeley's McKone, much of the damage regarding stress was really effect the psychological stress with not knowing and of being relocated.

This means that people face pressure is from dislocation caused. Some people face the pressure because they are worried about is the invisible and unclear toxic substances, which may lead to physical illness, such as heart disease. Besides that, because of pressure it will also change people's behavior.

Besides, some of the urine samples from children at the city of Minamisoma in the prefecture Fukushima show that radioactive cerium was found around 104 cases. According to the director of Makoto Akashi of the National

Institute of Radiological Sciences, this test proves the internal exposure in the children of Fukushima.

Outline the action taken by Tokyo Electric Power Company (TEPCO), government and the regulatory body during the occurrence of the Fukushima nuclear disaster.

Instruction issued that people within a 20 km (12 mi) zone around the Fukushima Daiichi nuclear plant must leave, and urged that those living between 20 km and 30 km from the site to stay indoors by Prime Minister Naoto Kan. The latter groups were also instructed to evacuate. More than 50,000 people were evacuated during 12 March. The figure increased to 170,000-200,000 people on 13 March, after officials voiced the possibility of a meltdown.

Anti-nuclear stance in the months following the Fukushima disaster. The is order from Japanese government the aging Hamaoka Nuclear Power Plant be closed over earthquake and tsunami fears, and also would freeze plans to build new reactors. In July 2011, Mr. Kan said that "Japan should reduce and eventually eliminate its dependence on nuclear energy saying that the Fukushima accident had demonstrated the dangers of the technology". In August 2011, the Japanese Government passed a bill to subsidize electricity from renewable energy sources. An energy white paper, approved by the Japanese Cabinet in October 2011, says "public confidence in safety of nuclear power was greatly damaged" by the Fukushima disaster, and calls for a reduction in the nation's reliance on nuclear power.

TEPCO notified authorities, as required by law, of a " First level emergency". The Fukushima II plant, which was also struck by the tsunami, incorporated design changes which improved its resistance to flooding and it sustained less damage. Generators and related electrical distribution equipment were located in the watertight reactor building, so that power from the grid was being used by midnight. Seawater pumps for cooling were given protection from flooding, and although 3 of 4 failed in the tsunami, they were able to be restored to operation. In the late 1990s, three additional backup generators for reactors Nos. 2 and 4 were placed in new buildings located higher on the hillside, to comply with new regulatory requirements. All six reactors were given access to these generators, but the switching stations that sent power from these backup generators to the reactors' cooling systems for Units 1 through 5 were still in the poorly protected turbine buildings. All three of the generators added in the late 1990s were operational after the tsunami. If the switching stations had been moved to inside the reactor buildings or to other flood-proof locations, power would have been provided by these generators to the reactors' cooling systems.

After the diesel generators located in the turbine buildings failed, emergency power for control systems was supplied by batteries that were designed to last about eight hours. Further batteries and mobile generators were dispatched to the site, delayed by poor road conditions with the first not arriving almost six hours after the tsunami struck.

Attempts to connect portable generating equipment to power water pumps were eventually discontinued after numerous attempts, as the connection point in the Turbine Hall basement was flooded and because of difficulties <https://assignbuster.com/japan-fukushima-nuclear-power-plant-disaster-engineering-essay/>

finding suitable cables. TEPCO switched its efforts to installing new lines from the grid to the cooling systems. One plant generator at Unit 6 was restored to operation on 17 March, and external power returned to Units 5 and 6, on 20 March, allowing cooling equipment to be restarted.

Responders include International Atomic Energy Agency, World Meteorological Organization and the Preparatory Commission for the Comprehensive Nuclear Test Ban Treaty Organization, which has radiation detection equipment deployed around the world.

Many countries have advised their nationals to leave Tokyo, citing the risk associated with the nuclear plants' on going accident. International experts have said that a workforce in the hundreds or even thousands would take years or decades to clean up the area. Stock prices of many energy companies reliant on nuclear sources have dropped, while renewable energy companies have increased dramatically in value.

There has been a significant re-evaluation of existing nuclear power programs in many countries. What had been growing acceptance of nuclear power in the United States was eroded sharply following the 2011 Japanese nuclear accidents. World-wide, a study by UBS, reported on 12 April 2011, suggests that around 30 nuclear plants may be closed as a result Increased anti-nuclear sentiment has been evident in India, Italy, Germany, Spain, Switzerland, Taiwan, and the United States.

Every company that operates a nuclear power plant has committed to order new backup emergency equipment. More than 300 pieces of safety

equipment already have been installed or ordered. Operators of nuclear energy facilities have taken steps to make safe plants even safer.

5. 0 Propose effective preventive action to be strengthen by Tokyo Electric Power Company (TEPCO) in re-examine the nuclear plant safety

TEPCO must prepare more effective back up system for the reactors cooling process to avoid failures in power supply for the cooling system as happen in this disaster.

The safety audits and inspection must follow the safety procedure without any loop holes and should follow the worlds nuclear safety procedure.

Invent new system of power plant or construction other type of power plant such as hydro power plant, and solar power plant which is much more safety compare than nuclear power plant in future also can prevent this radioactive disaster.

TEPCO must consider the emergency response team is well trained, knowledgable and expert in handling all the system related equipment to ensure the immediate action taken during any emergency condition without any delay.

TEPCO also need to consider the location of power plant is in safe place to avoid unnecessary impact to the power plant and also to the location of back up system also need to be safe.

Conclusion

The conclusion from this nuclear power plant accident in Japan is that the human community, acting for itself and as trustees for future generations, must exercise a far higher level of care globally in dealing with technologies capable of causing mass annihilation, and should phase out, abolish and replace such technologies with alternatives that do not threaten present and future generations. This is also applicable to nuclear weapons as well as to nuclear power reactors.

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