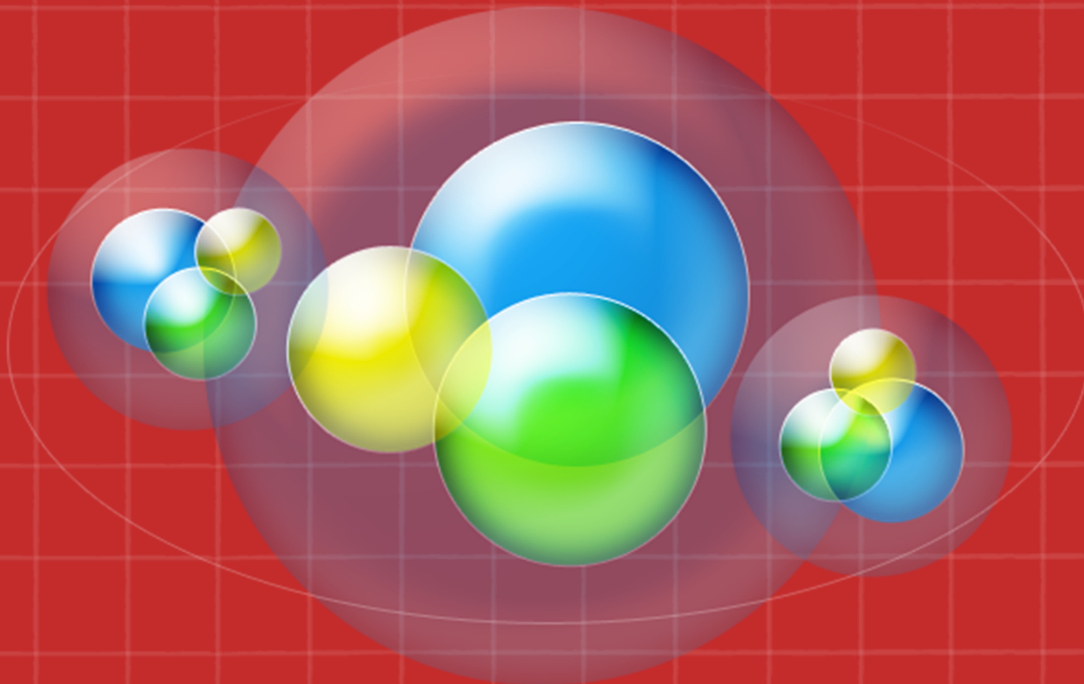

Nuclear Power:Windscale, Three Mile Island and Chernobyl

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Summary

- *LEVESON D section 1 ,2 and 4 consist of information in regards to what you should know about a nuclear plant. D1 is explanation on how a nuclear plant and reactor works. D2 explains the precautions for a Nuclear Power Plant. D4 explains Chernobyl which until 2 years ago was worst case nuclear of a nuclear meltdown the world has ever seen.*

What is a Nuclear Power Plant

In a nuclear-fueled power plant – much like a fossil-fueled power plant – water is turned into steam, which in turn drives turbine generators to produce electricity. The difference is the source of heat. At nuclear power plants, the heat to make the steam is created when uranium atoms split – called fission. There is no combustion in a nuclear reactor. There are ten parst to a nuclear power plant

What is a Nuclear Power Plant

- *Fuel:The fissionable material used in the reactor is called as fuel. The commonly used fuels are Uranium, Plutonium or Thorium. Uranium is mostly preferred as it has high melting point.*

- *Moderators:Only neutrons of a fairly low speed should be used to have controlled chain reaction. To slow down the speed fast moving neutrons produced during the fission process, moderators are used. Moderator reduces the speed of the neutron by absorbing its energy but not absorb neutron. Graphite, Heavy water and Beryllium are common moderators.*

- *Control Rods:These rods absorb neutrons and stop the chain reaction to proceed further. These are made up of steel containing a high percentage of material like cadmium or boron which can absorb neutrons. When control rods are completely inserted into the moderator block then all the neutrons is absorbed and reaction comes to halt.*

What is a Nuclear Power Plant

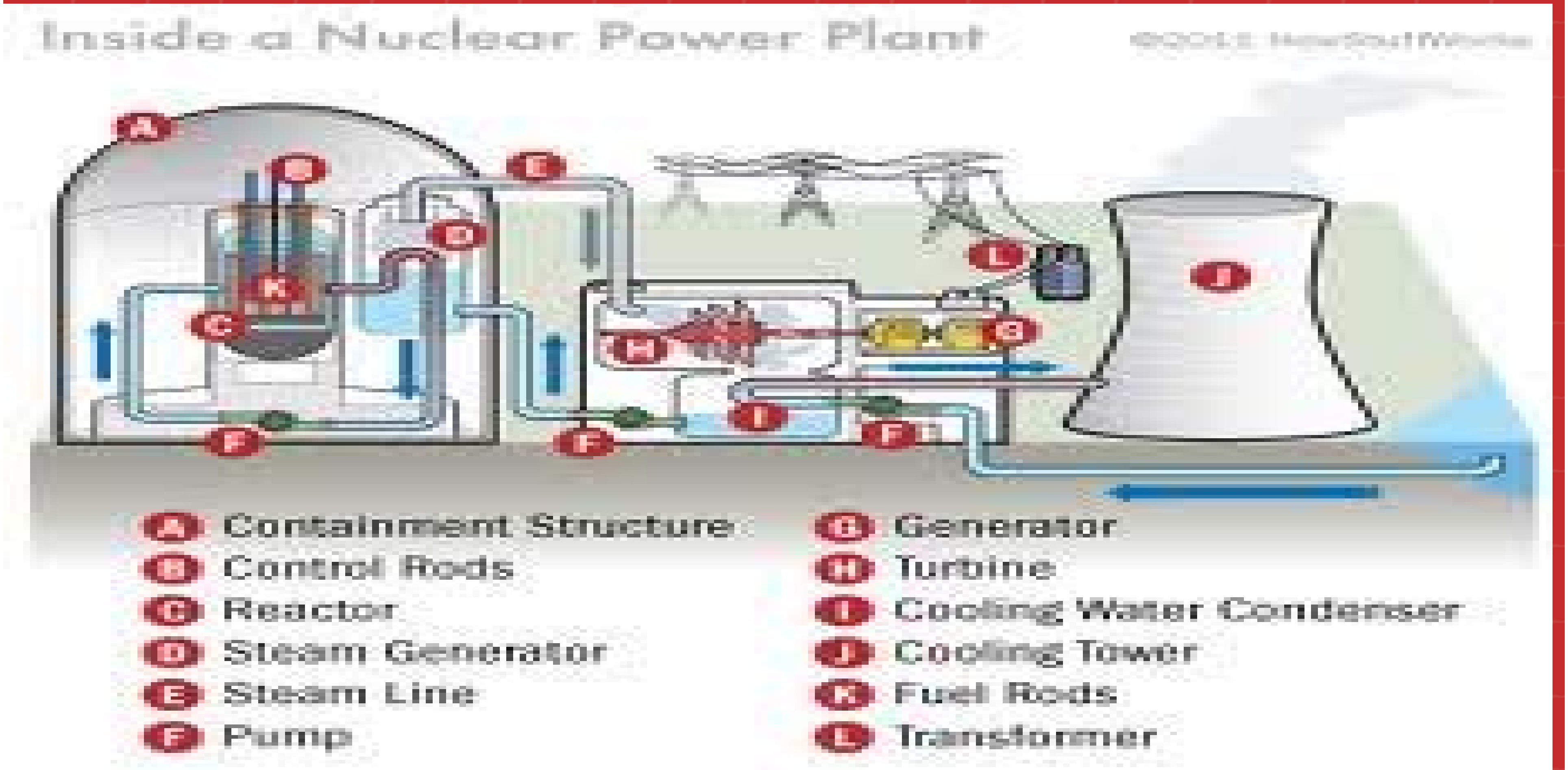
- *Shielding-:Shielding prevents radiations to reach outside the reactor. Lead blocks and concrete enclosure that is strong enough of several meters thickness are used for shielding.*

- *Coolant:The coolant is substance in a pipe to the steam generator where water is boiled. This is where heat-exchange process occurs. Heat is absorbed by the coolant that is produced in the reactor. Typical coolants are water, carbon dioxide gas or liquid sodium.*

- *Turbines:Steam produced in the boiler is now passes to a turbine. The force of the steam jet causes the turbine to rotate. Heat energy (steam) is converted to mechanical energy (moving turbine).*

- *Generator:The generator consists of coils that change the mechanical energy into electric energy. The turbine moves and the change in magnetic flux cause electricity. This is transmitted to substations for distribution of*
- *electric power.*

What is a Nuclear Power Plant



- *There are two types of nuclear reactors*

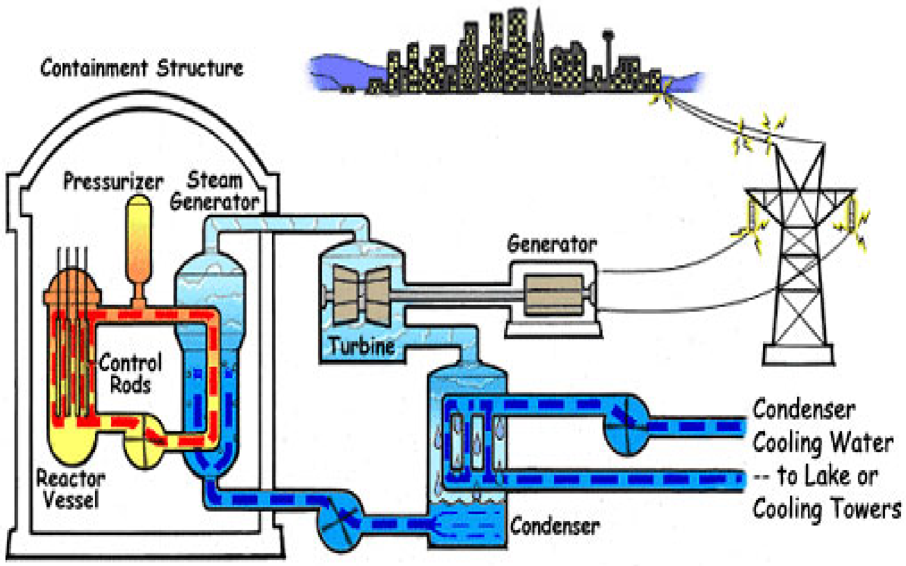
What is a Nuclear Power Plant

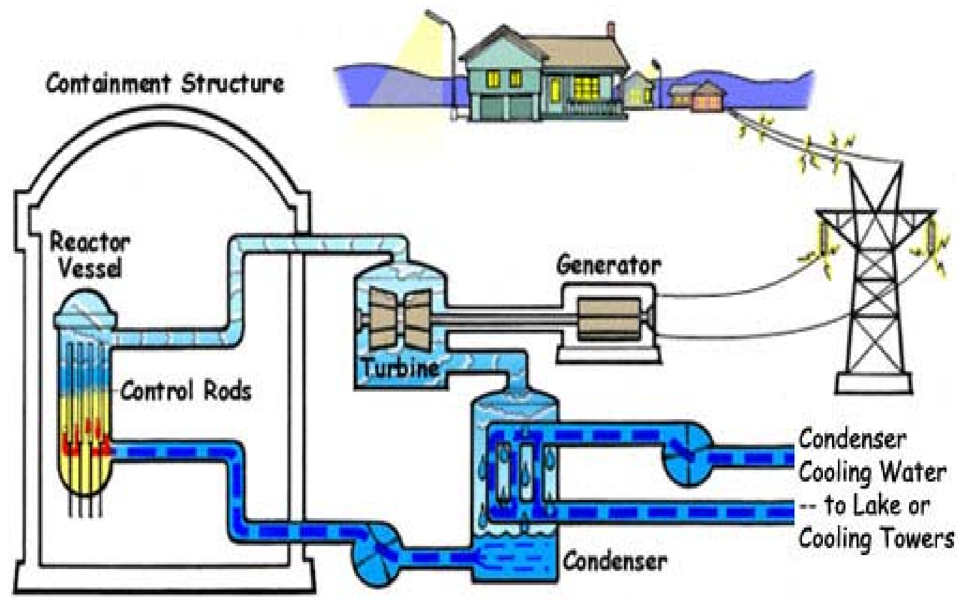
Pressurized Water Reactor

Pressurized Water Reactors (also known as PWRs) keep water under pressure so that it heats, but does not boil. This heated water is circulated through tubes in steam generators, allowing the water in the steam generators to turn to steam, which then turns the turbine generator. Water from the reactor and the water that is turned into steam are in separate systems and do not mix.

Boiling Water Reactor

In Boiling Water Reactors (also known as BWRs), the water heated by fission actually boils and turns into steam to turn the turbine generator. In both PWRs and BWRs, the steam is turned back into water and can be used again in the process.





Precautions(Before)

1. Control of Radioactivity

This requires being able to control the neutron flux. Recall that in a nuclear reactor when a neutron is captured by a fuel nucleus (generally uranium) the nucleus splits releasing radioactive particles (or undergoes fission). Hence if we decrease the neutron flux we decrease the radioactivity. The most common way to reduce the neutron flux is include neutron-absorbing control rods. These control rods can be partially inserted into the reactor core to reduce the reactions. The control rods are very important because the reaction could run out of control if fission events are extremely frequent. In modern nuclear power plants, the insertion of all the control rods into the reactor core occurs in a few seconds, thus halting the nuclear reaction as rapidly as possible. In addition, most reactors are designed so that beyond optimal level, as the temperature increases the efficiency of reactions decreases, hence fewer neutrons are able to cause fission and the reactor slows down automatically.

Precautions(Before)

2. Maintenance of Core Cooling

In any nuclear reactor some sort of cooling is necessary. Generally nuclear reactors use water as a coolant. However some reactors which cannot use water use sodium or sodium salts.

Precautions(Before)

3. Maintenance of barriers that prevent the release of radiation

There is a series of physical barriers between the radioactive core and the environment. For instance at the Darling Nuclear Generation Station in Canada the reactors are enclosed in heavily reinforced concrete which is 1.8m thick. Workers are shielded from radiation via interior concrete walls. A vacuum building is connected to the reactor buildings by a pressure relief duct. The vacuum building is a 71m high concrete structure and is kept at negative atmospheric pressure. This means that if any radiation were to leak from the reactor it would be sucked into the vacuum building and therefore prevented from being released into the environment.

The design of the reactor also includes multiple back-up components, independent systems (two or more systems performing the same function in parallel), monitoring of instrumentation and the prevention of a failure of one type of equipment affecting any other.

Further, regulation requires that a core-meltdown incident must be confined only to the plant itself without the need to evacuate nearby residence.

Safety is also important for the workers of nuclear power plants. Radiation doses are controlled via the following procedures,

- *The handling of equipment via remote in the core of the reactor*
- *Physical shielding*
- *Limit on the time a worker spends in areas with significant radiation levels*
- *Monitoring of individual doses and of the work environment*

Precautions (Simple Version)

- *Extraction, transportation, storage, processing, and disposal of fissionable materials*
- *Safety of nuclear power generators*
- *Control and safe management of nuclear weapons, nuclear material capable of use as a weapon, and other radioactive materials*
- *Safe handling, accountability and use in industrial, medical and research contexts*
- *Disposal of nuclear waste*
- *Limitations on exposure to radiation*

What is a Nuclear Meltdown

Nuclear meltdown defined to mean the accidental melting of the core of a nuclear reactor and is in common usage a reference to the core's either complete or partial collapse.A core melt accident occurs when the heat generated by a nuclear reactor exceeds the heat removed by the cooling systems to the point where at least one nuclear fuel element exceeds its melting point. This differs from a fuel element failure, which is not caused by high temperatures. A meltdown may be caused by a loss of coolant, loss of coolant pressure, or low coolant flow rate or be the result of a criticality excursion in which the reactor is operated at a power level that exceeds its design limits. A meltdown is considered very serious because of the potential for radioactive materials to breach all containment and escape into the environment, resulting in radioactive contamination and fallout, and potentially leading to radiation poisoning of people and animals nearby.

Top Two Nuclear Meltdown

Chernobyl is a catastrophic nuclear accident that occurred on 26 April 1986 at the Chernobyl Nuclear Power Plant in Ukraine .An explosion and fire released large quantities of radioactive particles into the atmosphere, which spread over much of the western USSR and Europe.
The Chernobyl disaster is widely considered to have been the worst nuclear power plant accident in history, and is one of only two classified as a level 7 event (the maximum classification) on the International Nuclear Event Scale (the other being the Fukushima Daiichi nuclear disaster in 2011).The battle to contain the contamination and avert a greater catastrophe ultimately involved over 500,000 workers and cost an estimated 18 billion rubles. The official Soviet casualty count of 31 deaths has been disputed, and long-term effects such as cancers and deformities are still being accounted for.

What Went Wrong

The four Chernobyl reactors were known to become unstable at low power settings,[10] and the engineers' experiment caused the reactors to become exactly that. When the operators cut power and switched to the energy from turbine inertia, the coolant pump system failed, causing heat and extreme steam pressure to build inside the reactor core. The reactor experienced a power surge and exploded, blowing off the cover lid of the reactor building, and spewed radioactive gasses and flames for nine days.
The episode was exacerbated by a second design flaw: The Chernobyl reactors lacked fully enclosed containment buildings, a basic safety installation for commercial reactors in the U.S

Consequences

Chernobyl was the result of human error and poor design. Of the approximately 50 fatalities, most were rescue workers who entered contaminated areas without being informed of the danger.

The World Heath Organization says that up to 4,000 fatalities could ultimately result from Chernobyl-related cancers. Though these could still emerge, as yet, they have not. The primary health effect was a spike in thyroid cancer among children, with 4,000-5,000 children diagnosed with the cancer between 1992 and 2002. Of these, 15 children unfortunately died. Though these deaths were unquestionably tragic, no clear evidence indicates any increase in other cancers among the most heavily affected populations.

Interestingly, the World Health Organization has also identified a condition called "paralyzing fatalism," which is caused by "persistent myths and misperceptions about the threat of radiation.” In other words, the propagation of ignorance by anti-nuclear activists has caused more harm to the affected populations than has the radioactive fallout from the actual accident. Residents of the area assumed a role of "chronic dependency" and developed an entitlement mentality because of the meltdown.

Consequences

Top Two Nuclear Meltdown

Fukushima Daiichi

This was an energy accident at the Fukushima I Nuclear Power Plant, initiated in greatest part by the tsunami portion of the Tōhoku earthquake and tsunami on 11 March 2011. The damage caused by the tsunami produced equipment failures, and without this equipment a Loss of Coolant Accident followed with nuclear meltdowns and releases of radioactive materials beginning on March 12. It is the largest nuclear disaster since the Chernobyl disaster of 1986 and the second disaster (along with Chernobyl) to measure Level 7 on the International Nuclear Event Scale, releasing an estimated 10 to 30% of the radiation of the Chernobyl accident.

What Went Wrong

When the 9.0-magnitude earthquake struck offshore on Friday March 11 the Fukushima Dai-1 plant on Japan's northeast coast was not badly damaged, and its emergency shutdown procedures went into effect. The first step went fine: To stop the nuclear fission chain reaction, control rods with neutron-absorbing properties were inserted among the fuel rods.

But even though the fission reaction came to a halt, the danger wasn't over. Radioactive byproducts of past fission reactions continued to generate heat inside the pressure vessel even though the reactor was no longer active, so cooling systems were supposed to kick in to circulate cold water and remove steam. But the tsunami that swiftly followed the earthquake swamped the coastal facility and damaged the generators and power systems that ran Fukushima Dai-1's cooling mechanisms.

Consequences and
Few Things you should know

- Fuki spills 300 tons of radioactive fluid everyday into the ocean
- War
- Sickness and Death
- Starvation
- Loss of land
- We will be eating radioactive fish by 2015
- Japan water is extremely polluted and will cause severe damage in the future to generation s of unborn children
- Chernobyl is still unhabitable and will be that way for a very long time
- End of Human Life

Conclusion

- *In conclusion I believe even with safety precautions and updated technology nuclear power should not exist. We as humans cause to many mistakes to handle that type of power. For example we just did a homework on the slide rule to calculator and that led to building collasping and death of countless of people. If we can not handle approximation I do not think we are ready nuclear power which can destroy this planet instantly. The most LEVESON D1 ,D2, and D4 talked about is that it only takes one mistake or a run of bad luck to destroy everything the eastern or western hemisphere. There is no amount of precautions that can help solve that type of problem.*