Mitigating the Risk of Nuclear Disaster after a Natural Disaster

Group 15: NASA Lunabotics – Mining Competition

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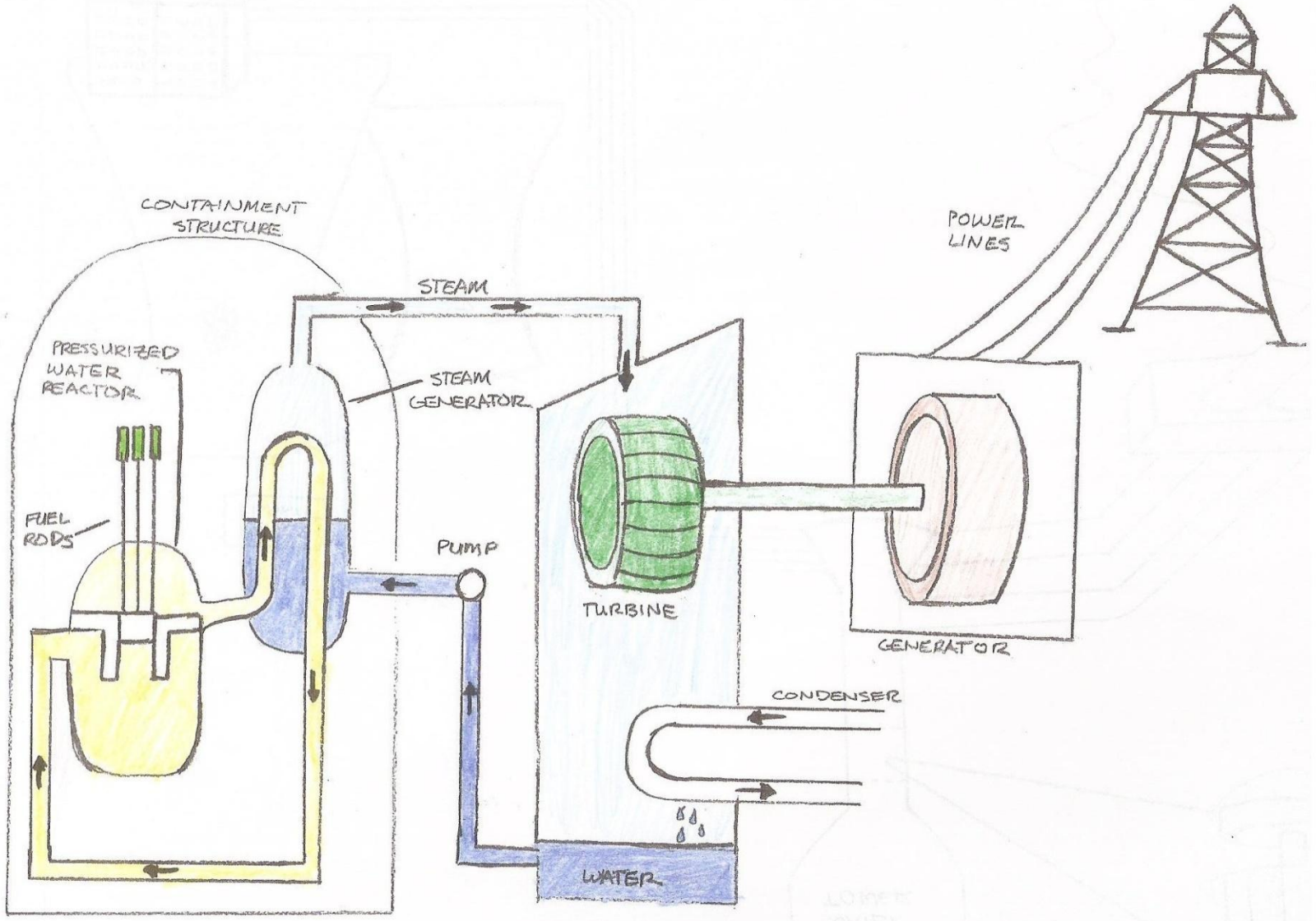
Background

In the event of a natural disaster, nuclear power plants pose an obvious risk. Currently there are multiple fail safes in place.

1. Nuclear fuel has a melting point of 2800°C.
2. Fuel rods made of Zircaloy with a failure temperature of 1200°C.
3. Pressure vessel made of thick steel designed to withstand at least 7MPa.
4. Hermetically sealed containment structure.
5. Secondary concrete structure.

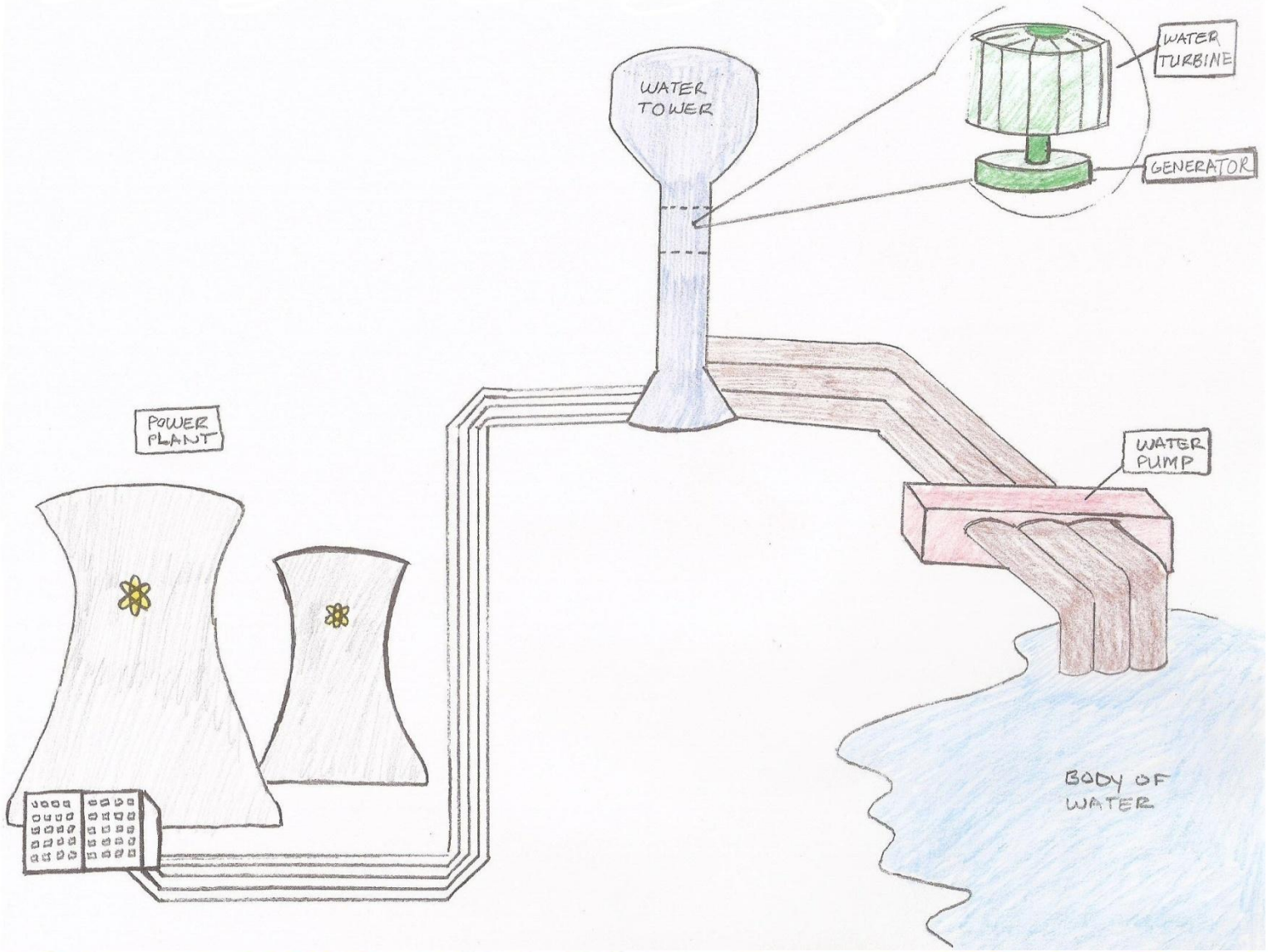
Current System



Improvements to be Made

- The Fukushima Nuclear Power Plant employed the “Defense in Depth”
  - One of the generators failed.
  - Unable to monitor water levels or the temperature of the fuel rods.
- Prevention:
  - Replace the generator with a self-generating power source.
  - Water level and fuel rod temperature sensors.
  - Easy to replace, off site components.

Proposed System



Benefits of Proposed System

- Easy to replace the water pump.
- Requires no permanent generator.
- Can work indefinitely with external pump.
- Simple system, easy to repair.
- Readily available technology.

Questions?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