Review of the Project Group:
Group Code: ABWR 21
Full title: ABWR - Team 21(Coefficient for the total core heat output of the reactor to be used in calculations for Task 4, 5, 6 is 0.95)

Intended learning outcome (ILO)	Grade (0-3)	Explanation for the grading of the evidences of achieving respective ILO. Suggestions for improvements and other comments
1. *Collect information on* General design specification of the nuclear power plant with selected reactor type (Task 1, ILO1, ILO2)	3	The following data are written with reference to ILO1. • The ABWR can generate up to 1,350 MW of electricity and is characterized by its high efficiency. • 872 fuel assemblies • Height of approximately 21 m and a diameter of 7.4 m for this size of reactor. • 10x10 array of 78 full length fuel rods, 14 part length rods, and two central water rods • Core Damage Frequency (1.6×10^{-7} per year) • The quarter of care and the cage configuration are shown. • The ABWR plant has a rated thermal output of 3926 MW and an electrical output of more than 1350 MWe. The following info are written with reference to ILO2. • Using the information about the ABWR, the ABWR design now uses internal pumps for refrigerant circulation instead of external loops, resulting in a simpler and safer system with improved work efficiency and less radiation exposure during maintenance. The new design eliminates the need for external recirculation pipes and jet pump, providing more space within the primary containment container and eliminating a potential source of radiation. Internal pumps are more responsive to operator demands and mains load transitions thanks to the solid-state variable frequency power supply. • Also, the boiling reactor has a single loop circulation system where coolant flows upward through the core, producing a steam-water mixture that is separated into water droplets and steam via moisture separation. The resulting steam is sent to the steam line, which transports it to the main turbine, where it generates electricity by turning the turbine generator. • Mentioned the evolution of BWR containment. • Mentioned the evolution of the GE BWR Comments * No Release Frequency

<table>
<tr><td></td><td></td><td>* Data can be tabled</td></tr>
<tr><td>2. Describe Operational principles of the power plant. (Task 2, ILO1, ILO2)</td><td>3</td><td>The following info are written with reference to ILO1.
ABWR degisn has boosted the generator output by almost 5 MWe and reduced the capacity of the condensate and size requirements for both the high- and low-pressure heater areas.
The overall design of figure 7 has made optimal use of these improvements to maximize plant output and reduce cost.
Using the information about the ABWR,The Steam and Power Conversion (S&PC) System uses steam generated by the reactor to produce around 1350 MWe of electrical power. The system includes various components, such as the main turbine generator system, main condenser, turbine bypass system, and condensate cleanup system. The steam produced in the reactor goes through high-pressure and low-pressure turbines, combined moisture separator/reheater, and condenser before being condensed and deaerated. The condensate boost pumps deliver the feedwater through the low-pressure feedwater heaters to the reactor feed pumps. The heat rejected to the main condenser is eliminated by a circulating water system that discharges it to the power cycle heat sink.
The following info are written with reference to ILO2.
To modify the thermal power and steam flow rate, the re-circulation flow rate or control rod position can be adjusted.
Automatic load following above 65% power is accomplished by changing only the re-circulation flow. Below this level, control rods are used to regulate the power.
Startup and shutdown of the reactor
During plant startup, the reactor is brought to criticality by withdrawing control rods. The Reactor vessel is then heated and pressurized while increasing reactor power by further withdrawing control rods.
At full power operation, the turbine operates in a “turbine follow-reactor” mode, accepting the steam generated by the reactor.</td></tr>
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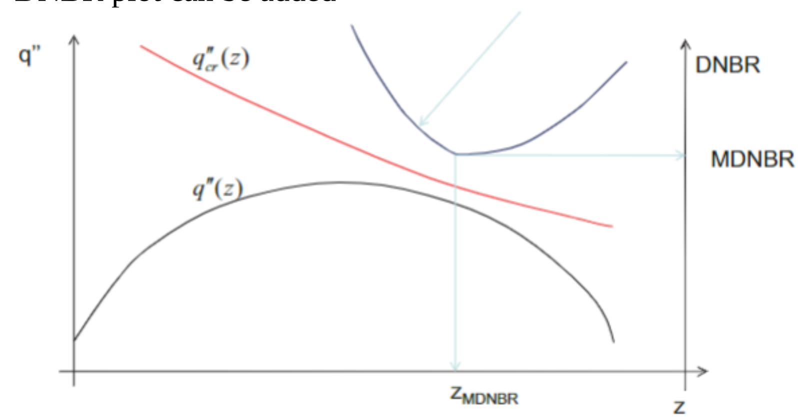
		• Any operational path that changes the power and flow from one condition to another can be traced on this map through control rod maneuver or re-circulation flow change. • Automatic load-following operation
3. *Explain* Safety features of the power plant. (Task 3, ILO1, ILO2)	3	The following info are written with reference to ILO1. • Mentioned Emergency Core Cooling Systems (It is positive that it is supported with visuals along with details and sub-titles.) (Subtitels:High Pressure Core Flooder,Reactor Core Isolation Cooling,Residual Heat Removal,Automatic Depressurization System) • Mentioned other Safety Systems (Standby Gas Treatment System (SGTS), Atmospheric Control System (ACS), Flammability Control System, Standby Liquid Control System (SLCS), Emergency Diesel Generator (EDG)) • Core Damage Frequency (1.6×10^{-7} per year) The following info are written with reference to ILO2. • As an extra, Improvement to operation and maintenance (Mentioned the Fine motion control rod drives which are not in BWR but are in ABWR, it was nice to understand the difference) • The mentioned Safety features are supported by visuals.
4. *Calculate* Selected core parameters (Task 4, ILO3)	3	The following info are written with reference to ILO3. • From the formulas "The axial pressure drop, the axial coolant enthalpy distribution, the axial void fraction distribution, the axial coolant temperature distribution, the flow characteristic of the core " mentioned. • Each formulas and multipliers explained well Comments *The explanation made after the graphs can be improved (For example, why is the final down rate not the same in the pressure drop graph?) * No Release Frequency
5. *Calculate* CHF margins in a hot channel (Task 5, ILO4a)	3	The following info are written with reference to ILO4a. • The theory mentioned mathematically explained. • MCPR mentioned. • Nice comparison with hot channel • x_{cr} and x_{ex} explained well • $L^{*}_{B} = L_B/0.0254$, L_B is the boiling length to dryout,

		• $A = 1.055 - 0.013$ pR−600 400 $2 - 1.233G_R + 0.907\ G^2{}_R - 0.285\ G^3{}_R$ • $B = 17.98 + 78.873G_R - 35.464G^2{}_R$ • $G_R = G/1356.23$, G is the mass flux in kg/m2. s • $p_R = p/6894.757$, p is the pressure in Pa. These parameters explained well Comments * $Q_t$ot can be written as Q_{tot} theory part *Critical heat flux, heat flux plot can be added *DNBR plot can be added  (Like this one)
6. *Calcaulte* Maximum cladding and fuel pellet temperature (Task 6, ILO4b)	3	The following info are written with reference to ILO4b. • The theory mentioned mathematically explained • Graphs explained • Mentioned Power density distribution in a pellet • Chen correlation explained well • T_{CO} and T_{GO} explained well • Mentioned that the result found was below the limit figure 21 and 22.("The maximum temperature of the clad is usually limited to around 1200°C to ensure its integrity and prevent accidents.") Comments * The explanation made after the graphics can be improved (example why there is a tiny jump in clad temp) *UO2 can be written as UO_2 in discussion part