Review of the Project Group:
Group Code: 52

Full title: Safety and thermal hydraulic analysis of the AP1000 Reactor

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)	2	The main parameters of the reactor are well stated. We understand that the main innovation made on this reactor is that the primary circuit pumps are directly connected to the steam generators. Nevertheless, after reading the documentation on this reactor I learnt that the AP1000 uses a modular design, which means that the reactor is constructed in modules in a factory and then transported to the site for assembly. This approach reduces the construction time and cost of the reactor and improves quality control. Unfortunately, the report does not account for this improvement. Note: remove “the” in the second line of the paragraph 2.4
2. *Describe* Operational principles of the power plant. (Task 2, ILO1, ILO2)	2	While the description of the general operation of the reactor by the control rods and boron, as well as the start-up and shutdown procedures, is well explained, there seems to be some ambiguity about the mechanical shim. In addition, the relationship between the different types of control rods and their respective impact on core parameters needs to be clarified.
3. *Explain* Safety features of the power plant. (Task 3, ILO1, ILO2)	3	It gives a good account of the innovations made on the reactor. In particular, the passive safety systems that allow the reactor to cool down without human intervention or in case of a power failure. Also reports on the reduction of the core melt frequency. There is no description of redundant safety systems. It may be necessary to add this section depending on the teacher's expectations.
4. *Calculate* Selected core parameters (Task 4, ILO3)	1	The calculations in the report are well-explained, but a few elements are missing. Firstly, the calculation of heat flux at the core center is not explained. Additionally, the meaning of the symbols Δpf, Δpl, and Δpg is missing, which can make it difficult for readers to understand the calculations. Finally, the calculation of axial temperature distribution is not explained with a formula. In regard to the figures, it is recommended that Figures 13 through 16 be plotted with the same scale in order to facilitate comparison. The idea to plot the different contributions in the pressure drop of the different terms is also a good one. However, Figure 12 is incorrect, except at zero power. When the fraction of nominal flow decreases, there is a more significant heat transfer from the fuel to the coolant, which causes the water to boil, resulting in a two-phase flow, as explained in the report. However, the pressure drop calculation only considers one-phase flow, as the report uses the correlation for one-phase flow. As

		such, it is important to note that the pressure drop is more significant due to the two-phase flow, which should be noticed in Figure 12 below 100% of the fraction of nominal flow. Finally, while the calculation of the void coefficient is explained, it is not plotted. It would be useful to include a plot of the void coefficient, as it could serve as support to justify the correlation used in the report.
5. *Calculate* CHF margins in a hot channel (Task 5, ILO4a)	2	Stylistic comments: • Ensure that the paragraph on page 16 is not separated from the accompanying figures. • The sentence referring to "Figure 18" appears to be missing the word "figure." Other comments : Once again in this section, the calculation of pressure drop does not take into account the two-phase flow. Additionally, it would be helpful to understand how the temperature distribution is calculated. While the justification regarding the unrealistic presence of two-phase flow seems reliable, it would be beneficial to include a calculation of the peaking factor to support this claim. Please clarify “the valid correlation range” used.
6. *Calcaulte* Maximum cladding and fuel pellet temperature (Task 6, ILO4b)	2	To enhance the clarity of the presentation, it would be beneficial to display Figure 22 as a 2D plot instead of a 3D plot with only one radial position. Additionally, please specify the temperature limits for both the fuel and the clad. Consider including a plot of the temperature as a function of the radial position to illustrate how the temperature changes across the various layers. It is good to mention the abrupt change in temperature observed in the clad due to the modification of the heat transfer coefficient h correlation. This finding is surprising and raises questions about the validity of the correlation modification.