Chapter 5
CONCLUSION

5.1 Conclusion

From the analysis that had been performed in this study, several conclusion were drawn:

1. From the dam operational pattern analysis and flood routing, the lowest water level (LWL), normal water level, and highest water level (HWL) are obtained. The LWL is at 148 m, and this is used to define the area that can be used to place the FPV island. The normal water level is 194 m; this is the datum of the project. The HWL is at 198.8 m; it is used to check the safety of the mooring and whether the mooring can withstand the PMF condition. Also, the dam operational pattern analysis gives the hydropower power production, the largest production is at 11.74 MWac and the smallest is 5.74 MWac. Therefore, the projected capacity for FPV analysis is 6 MWac.
2. The FPV sizing is determined by the projected capacity; the result shows that 12,960 solar panels are used, making the width (Lx) 236 m and length (Ly) 291 m of the island. The anchoring footing is 102.5 m afar from the PV; it is calculated with the depth of 64 m from the datum at the area available for the island from the topography map and the angle of the mooring lines at 30°. The maximum water level is only 4.8 m higher than the datum, so the angle of the mooring lines in PMF condition is only 34.8°.
3. The tension of the mooring lines is the horizontal load from the wind load, wave load, and current load combined; it is 2,091.77 kN. For each side of the island, 132 mooring lines would be needed. The required anchor size is calculated for 2 types of soil, 1.81x1.81x0.5 m for clay with 44 anchors, one anchor holds 3 of the mooring lines on each side, and 2.32x2.32x0.5 m for sand with one anchor block per mooring lines. After checking with

the safety factor of 1.5, the designed anchor size on clay soil is 2.5x2.5x0.5 m and 3.0x3.0x0.5 m on sandy soil.

4. The PV only generates 14 GWh of energy, while the spilled water generates 78 GWh annually. This system's effectiveness is 48% larger than that of floating solar power plants in normal conditions, and the hybrid system is not effective. Nevertheless, FPV provides more stable additional energy. The small energy production by the solar panels is due to the geometric constrains at the lowest water elevation.

5.2 Recommendation

There is several things of uncertainty in this study, like cloudy skies, the project's soil type, sedimentation effect, et cetera. This uncertainty is either uncalculated or assumed. The next study should have calculated and considers the effects of the uncertainty. Other than that, the next study should be a feasibility study of the hybrid system where the levelized cost of electricity (LCOE) is calculated.

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