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# Optimization analysis of Pressurized Water Reactors in the framework of the introduction of renewable energies in the french energy mix.

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In the actual context of energetic transition, the increase of the renewable energies contribution (as wind farms, solar energy, or biomass) is a major issue. For example, the part of intermittent renewable energies is forecast to be around 30% of the total production in 2030, against 6% today. On the other hand, their intermittent production may lead to an important imbalance between production and consumption. Indeed, the peak production may reach 3 or 4 times the average production if the conditions are satisfactory but the production can drop to 0 at worst. Consequently, the others ways of production must adapt to those variations, especially nuclear energy which is the most important in France. Nuclear power plants which take part in the response of the power variations, operate in the so-called load following mode. This work is included in the study of the effects on the nuclear power plants of a large introduction of renewable intermittent energies : how to optimize the power plants toward a larger manageability, meeting the safety constraints. The pressurized water reactors (PWR) 1300MW operated in the "G"mode are selected as they are the most likely to perform the load-following among the french nuclear fleet. In a first step, a multi-physics PWR model will be designed using the control parameters such as the control rods or the soluble boron, and the main values of interest of the reactor will be computed. In a second step, the management will be improved using a multiobjective optimization approach which minimizes the different values of interest.

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