

Nuclear Power Plant Flexibility at EDF

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Abstract

Based upon existing experience feedback of French nuclear power plants operated by EDF (Electricité de France), this paper shows that flexible operation of nuclear reactors is possible and has been applied in France by EDF's 58 reactors for more than 30 years without any noticeable or unmanageable impacts: no effects on safety or on the environment, and no noticeable additional maintenance costs, with an additional unplanned capability load factor estimated at only 0.5%. EDF's nuclear reactors have the capability to vary their output between 20% and 100% within 30 minutes, twice a day, when operating in load-following mode. Flexible operation requires sound plant design (safety margins, auxiliary equipment) and appropriate operator skills, and early modifications were made to the initial Westinghouse design to enable flexible operation (e.g., use of "grey" control rods to vary reactor core thermal power more rapidly than with conventional "black" control rods). The nominal capacities of the present power stations are sufficient, safe and adequate to balance generation against demand and allow renewables to be inserted intermittently, without any additional CO₂ emissions. It is a clear demonstration of full complementarity between nuclear and renewable energies.