Contingency-Constrained Unit Commitment in Meshed Isolated Power Systems - DTU Orbit (10/12/2018)

Contingency-Constrained Unit Commitment in Meshed Isolated Power Systems
This paper presents a mixed-integer linear optimization problem for unit commitment and economic dispatch of power generators in a meshed isolated power system. The optimization problem is referred to as the optimal reserve planning problem (ORPP). The ORPP guarantees that the system frequency is kept above a predefined limit in the event of a contingency. The minimum frequency constraints are formulated using novel sufficient conditions that take into account the system inertia and the dynamics of the power generators. The proposed sufficient conditions are attractive from both a computational and a modelling point of view. We compare the ORPP to a unit commitment problem that only considers the stationary behavior of the frequency. Simulations based on a Faroe Islands case study show that, without being overly conservative, potential blackouts and power outages can be avoided using the ORPP. In the particular case study, the cost increase associated with the additional security provided by the ORPP is less than 3%.

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