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Robust frequency constrained uc using data driven logistic regression for island power systems

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Abstract-

In the current practice of short-term power scheduling, online power reserves are used to address generation mismatches and contingencies. Neither online inertia nor the speed of the committed units is considered in the scheduling process. With the increasing injection of uncertain renewable energy sources, this practice is starting to fall short, especially in island power systems, where the primary frequency response is already scarce, and any contingency leads to potentially poor frequency response. This paper introduces a data-driven linear constraint to improve the post-fault frequency quality in island power systems. A coherent initial data-set is obtained by simulating the system frequency response of single outages. Then logistic regression is employed as a predictive analytic procedure to differentiate the acceptable and unacceptable incidents. To compare the conventional methods with the proposed approach and also to handle the uncertain nature of renewable energy generation, an adaptive robust unit commitment formulation is utilized. Results for the island power system of La Palma show that depending on the chosen cut-point on the logistic regression estimation the proposed method can improve the frequency response quality of the system while reducing the operation costs.

Index Terms-

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