

Under frequency load shedding aware unit commitment in island power systems

M. Sarvarizadeh Kouhpaye; M. Rajabdorri; E. Lobato Miguélez; L. Sigrist; B. Kazemtabrizi; M. Troffaes

Abstract-

The transition from fossil fuels to renewable energy sources in power systems has resulted in lower system inertia and deteriorated frequency response characteristics. The challenge becomes even more pronounced in island power systems, where low inertia and limited frequency control capacity are already issues. Despite the existing preventive measures to maintain frequency limits, under-frequency load-shedding (UFLS) remains a crucial corrective action. In small isolated power systems, even with high amounts of reserve, big outages will lead to inevitable UFLS due to scarcity of inertia and primary frequency control capacity. Using a data-driven regression tree method, this paper introduces a novel UFLS-aware unit commitment formulation that can accurately estimate the amount of resulting UFLS for every possible outage. The estimations are then utilized to relax the reserve requirement constraint and lower the operation costs. The proposed formulation enables co-optimizing operation costs and UFLS to minimize the total cost. Additionally, the response speed of generating units is considered, ensuring timely reserve delivery. The efficacy of the proposed method is demonstrated through simulations on the model of a Spanish island power system, highlighting potential reductions in operation costs and system security improvements.

Index Terms- Under-frequency load-shedding; Unit commitment; Island power systems; Machine learning; Logistic regression; Regression tree

Due to copyright restriction we cannot distribute this content on the web. However, clicking on the next link, authors will be able to distribute to you the full version of the paper:

[Request full paper to the authors](#)

If your institution has an electronic subscription to International Journal of Electrical Power & Energy Systems, you can download the paper from the journal website:

[Access to the Journal website](#)

Citation:

Sarvarizadeh, M.; Rajabdorri, M.; Lobato, E.; Sigrist, L.; Kazemtabrizi, B.; Troffaes, M. "Under frequency load shedding aware unit commitment in island power systems",

