

Closure of “Applying Stochastic Optimal Power Flow to Power Systems with Large Amounts of Wind Power and Detailed Stability Limits”

by

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We thank the authors of the discussion in [1] for raising the issue of cascading events and correlated blackouts. Our method in [2] was designed as a stochastic version of the security-constrained optimal power flow (SCOPF), in which the system should be operated to remain stable in some sense (deterministic or stochastic) after any single pre-selected contingency occurs.

To a certain extent, the method in [2] is able to handle correlated events because it uses the joint probability of the system being outside of different types of stability limits. It entails that, for example, the correlation between exceeding the thermal stability limits of several lines at the same time is taken into account. The correlations between outages are, however, not considered as for now.

The focus of the method in [2] has been to appropriately model the uncertainty stemming from variations in uncertain power injections / consumptions such as the loads and wind power productions. In particular, the non-Gaussian nature of the wind power forecast errors was captured.

The other source of uncertainty, namely the probability distribution of occurrence of the considered contingencies, is an input to our method. Therefore, we believe that the method can account for correlated outages if given the right probability distributions of and correlations between these outages. As of now, the method does not consider the costs of possible corrective actions for bringing back the system to a stable operation point in case of instability. Therefore, the costs of being outside the stability limits are not considered, but we plan to include these in future work.

As indicated by the discussants in [1], the resulting solution could then be assessed by using Monte Carlo simulations that account for dependent outages.

References

- [1] O.A. Mousavi, R. Cherkaoui, “Discussion on Uncertainty Management in Power Systems”, 2013 IREP Symposium-Bulk Power System Dynamics and Control – IX (IREP), August 25-30, 2013, Rethymnon, Greece.
- [2] C. Hamon, M. Perninge, L. Söder, “Applying Stochastic Optimal Power Flow to Power Systems with Large Amounts of Wind Power and Detailed Stability Limits”, 2013 IREP Symposium-Bulk Power System Dynamics and Control – IX (IREP), August 25-30, 2013, Rethymnon, Greece.