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The continuous exchange among the inertia-based rotating masses frequently can cause electromechanical oscillations in electrical power systems. Unfortunately, the occurrence of these phenomena cannot always be averted. Actually, the Transmission System Operators (TSOs) keep the phenomena under constant control, monitoring the electromechanical oscillations continuously, estimating their fundamental parameters (e.g. frequency, damping factor/ratio, amplitude and phase), and determining the actual dynamic stability margins. The WAMPAC systems allow a real time tracking of electromechanical oscillations in large interconnected systems and proper implementation of wide area control logics. In case of detection of potential unstable phenomena (e.g. estimating a damping ratio lower than a certain threshold value), all the necessary countermeasures have to be implemented to restore secure and stable operating conditions: for instance, generators re-dispatching, tie line flow adjustments, load reductions, network topology changes etc.

The Italian Defence System consists of several coordinated Special Integrity Protection Schemes (SIPSs) to safeguard the security and integrity of the Italian power system upon detection of a contingency that may lead the same system in an unsecure state. The defence system detects the occurrence of a contingency for instance affecting a critical section, calculates the quantity of generation or interruptible load to disconnect (below or above the so-called critical section) to avoid overloads of the critical section by directly send a command to the actuator device called UPDM or UPDC respectively curtailing generation and load. Additionally, new defence logics have been developed like the oscillatory stability logic which is devoted to counteracting oscillatory instability phenomena by directly disconnecting the generation units having the highest participation factor. It deals with the first application in execution by the Italian WAMPAC.
Detailed description of the algorithms adopted for the identification of low damped oscillatory phenomena, and related choice of the optimal tuning parameters is something too specialistic that often does not provide a contribution to the general comprehension of the operational rules and procedure.
Such an application refers to the development of an oscillatory stability logic that safeguards the Italian power system against undamped interarea oscillations. The mathematical framework of the detection technique based upon Dynamic Mode Decomposition is provided together with a proper warning/alarming criterion for the control room operators. The goodness and the efficacious of the implemented logic is verified against a real event occurred in the Italian power system.

Intellectual Property Protection

- Detailed description of the algorithms adopted for the identification of low damped oscillatory phenomena, and related choice of the optimal tuning parameters is something too specialistic that often does not provide a contribution to the general comprehension of the operational rules and procedure.
- Triggering criteria and adopted countermeasures in the case of dangerous situation identification can instead be more usable in understanding how the control room operator react.

-→In this case intellectual property, independently if from an external supplier or developed internally to the company, can be preserved.