# Eigen-Computation in Modern Power Transmission Grids

**Key words:** eigen-computation, uncertainty quantification, parametrization, inter-area oscillations, small-signal/transient stability

**Context:**
Power systems are large-scale (usually around 40000 state variables) multi-physics systems. We are interested in oscillatory modes which correspond to some specific phenomena which have particular signatures (in eigenvectors, for example). Algorithms which exploit these signatures should be developed.

**Research subjects:**
As these oscillations depend on several parameters of the system (load level, topology, …), the computation should be enriched at, at least, two levels:

- Parametrization in order to cover a large set of situations
- Quantification of the uncertainty connected to the location of the production, the intermittence of the energy, the mathematical aggregation of the dynamic model

**Competences needed:**
The candidate should have experience in numerical computation and/or in statistics. He/she should be able to implement the new algorithms in professional languages (like, e.g., C++) in order to integrate them in industrial numerical platforms.
Knowledge on power systems would be a plus but it is not mandatory. The candidate should only be motivated to discover this field with the help of experts from the recipient team.

**Framework:**
This work is proposed in a general framework of collaboration with RTE – the French Transmission System Operator – and ENTSO-E and it is thus connected to real needs of the interconnected power systems. Realistic tests and validations of the theoretic developments mentioned above should be done on (large-scale) grid models and scenarios provided by RTE and ENTSO-E. The Control of Power Grids chair ( http://chairerte.ec-nantes.fr/ ) which exists between Ecole Centrale Nantes and RTE R&D guarantees the direction and the financial founding of this work. The work will be carried out in Nantes-France.

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