

# Advanced Analysis and Control of Modern Power Transmission Grids

**Key words:** advanced/robust control/observation, power converters, HVDC, renewable energy, inter-area oscillations, small-signal/transient stability

## **Context:**

The modern power systems contain more and more power electronics. Indeed, all renewable generation sources are connected to the grid by converters. Also, the reinforcement of the grid is frequently done with High-Voltage Direct Current (HVDC) lines which consist of 2 power converters into a back-to-back connection and a DC cable. This tendency will be extended in future in order to ensure the transition towards decarbonized energy systems as formulated, for example, in Europe.

This new technology based on power electronics is active in the sense that it provides several degrees of freedom for the power and voltage control. Dynamics involved are also different from the ones in the classic power systems. This brings new challenges in observation and control.

## **Research subjects:**

- Control of HVDC for AC grid transient and small-signal stability improvement
- Estimation of the dynamics of grid connected generators (using only grid available measures)
- Modelling of new elements of the grid (renewable and decentralized generation)

## **Competences needed:**

The candidate should have experience in advanced (robust) automatic control/analysis or estimation. Knowledge on power systems/power converters would be a plus.

## **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://chaire.rte.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.

## **Schedule:**

Recrutement: asap

Duration : 12months with possibility of extension

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