



SEMINAR

**“Designing Future Power Systems:
The generation expansion problem”**

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ABSTRACT

The strong decarbonization targets in the power sector are boosting an unprecedented transformation process in this sector which will require to face a number of challenges. The first challenge that power systems must handle is the fast incorporation of large capacities of new generation technologies, especially those based on wind and solar photovoltaic (PV) power. These technologies are based on renewable and weather-dependent sources and provide an intermittent power output. The second challenge that future power systems must face is the electrification of energetic processes that do not use electricity so far. It is expected that in the incoming years, heating and low-temperature industry processes be electrified, as well as the transportation sector. The main character in this electrification process is the electric vehicle, which may change the consumption profiles of power systems. Fortunately, there are several tools that can be used to ease this transformation process. First, new electricity storage technologies are expected to play a relevant role in future power systems. Specially, electrochemical batteries are experiencing a technological revolution that make them suitable for providing different services as energy arbitrage and local and grid support. The increasing participation of consumers in the operation of power systems is also another tool that can be used to facilitate the operation of future power systems. In particular, small-size consumers are expected to increase their participation in demand-side management programs to modify their consumption patterns according to the needs of the operation of the system. Therefore, the mathematical models used to design future power systems have to be able consider all these particularities. In this seminar, the generation expansion problem is described and the strengths and weaknesses of current models are pointed out. Additionally, some recent models are presented, and some results are discussed.