

# Electrical Energy, Operational-Production

---

## Mathematical models

In the short term, accurate optimization models are used to define scheduling of the power plants, and network coordination, over typically one day to one week horizon with one hour or tens of minutes discretization. If the electricity system is a market based one, then generation is separated from transmission (e.g. the so called unbundling) and different problems are solved by different actors, basically generation companies (*GenCo*), Transmission System Operator (*TSO*) and Market Operator (*MO*) but there are also [Distribution System Operator \(\*DSO\*\)](#), traders and other possible actors. Alternatively if one speaks about monopolist systems, then many problems are solved in a centralized manner by a single centralized entity since the paradigm is quite different.

In the following table a primer of the most important class of problems is presented. As noted before we distinguish the monopolist systems from those market based.

|                             |                                     |   |   |  |
|-----------------------------|-------------------------------------|---|---|--|
| <b>Monopolist Systems</b>   | Single Bus Economic Dispatch (SBED) | <a href="#">Security of Transmission</a>    | <a href="#">Single Bus Unit Commitment (SBUC)</a> | <a href="#">Security Constrained UC (SCUC)</a> |
| <b>Market based Systems</b> | GenCo: Max Profit ED/UC             | <a href="#">MO: Energy Markets clearing</a> | TSO: Balancing Markets clearing                   | <a href="#">Optimal Power Flow (OPF)</a>       |

### Contributor:

Dr. Fabrizio Lacalandra, QuanTek