InnoGrid2020+

The European Research & Development Dissemination Seminar

23 - 24 February 2012

OPTIMATE

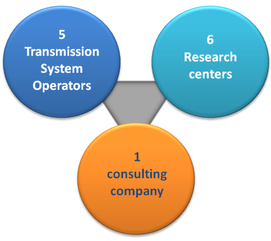
Project supported by the European Commission under the 7th Framework Programme

An Open simulation Platform to Test Integration in MArkeT design of massive intermittent Energy

The OPTIMATE simulation platform aims at:

- assessing future electricity market designs which allow for the most efficient integration of large intermittent generation capacities:
  - ✓ reducing system balancing and congestion issues
  - ✓ based on a portfolio approach of Market players
- analyzing the impacts of RES-E integration into the electrical system with a focus on four market issues:
  - ✓ Costs & benefits related to Power Exchanges, both Day-Ahead & Intra-Day
  - ✓ Costs & benefits related to electrical flows and congestions
  - ✓ Costs & benefits related to balancing markets and imbalance settlements
  - ✓ The resulting CO_2 emissions

The consortium



TSOs

- RTE (France) (Technical Director)
- EnBW Transportnetze AG (Germany)
- Red Eléctrica de España (Spain)
- Elia (Belgium)
- 50Hertz Transmission (Germany)

Research Centers

- ARMINES/ENSMP (France)
- Katholik University of Leuven (Belgium)
- RISOE (Denmark)
- Universidad Pontificia-Comillas (Spain)
- EUI/Florence School of Regulation (Italy)
- University of Manchester (U.K.)

Coordinator

Technofi (France)

Simulation platform capabilities

➔ Multiple market players behaviour

⇒ From monopolistic…
…to several competing players

⇒ Market player portfolios from one-type-of-generation…
…to mixed generation

➔ Market homogeneity

⇒ From one homogeneous market design…
…to many market design variants

⇒ Market area perimeter from many interlinked areas…
…to one single market area

➔ Exchange barriers

⇒ From optimal capacity computation/ allocation Flow-based)…
…to suboptimal (NTC)

⇒ From highly-meshed network…
…to poorly-meshed network (reality is in-between)

➔ Information transparency

⇒ From full transparency…
…to large publication delays

⇒ From advanced learning for all players…
…to no learning at all

Platform options

- ➢ Market design variants: ≈40
- ➢ TSO operation modes: ≈30
- ➢ Actors strategy variants: ≈10
- ➢ Scenario variants: unlimited

Platform work flow

- ➢ Input scenario: 2.5 GB
- ➢ Lines of codes: ≈300 000
- ➢ Output scenario: 10 GB

A first simulation platform available for ENTSO-E use by end 2012 !

InnoGrid2020+

The European Research & Development Dissemination Seminar

23 - 24 February 2012

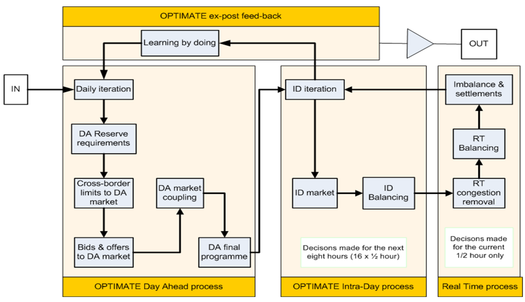
OPTIMATE

Project supported by the European Commission under the 7th Framework Programme

An Open simulation Platform to Test Integration in MArkeT design of massive intermittent Energy

Simulation core

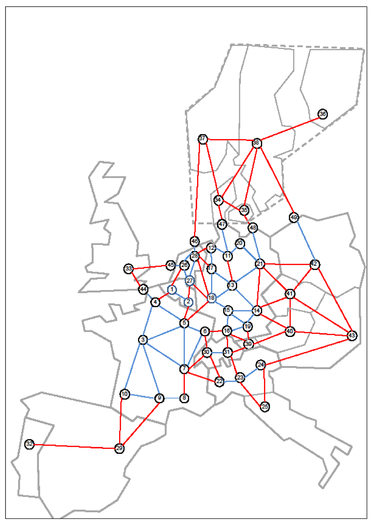
- European markets and systems description (from Day Ahead to Real Time)
  - **Market mechanisms**
    - Market coupling
    - Bilateral exchanges
    - Continuous markets
  - **TSO operations**
    - Balancing
    - Congestion removal
    - Reserve constitution
  - **Market players behaviour**
    - Large range of actions: bids creation, perimeter balancing, profit maximization…
    - Agent-based: improved market players' strategy modeling



Simulator architecture

Representative scenario building

- Aggregated network definition
  - Clusters
  - Critical branches, NTCs
- Market players and assets
  - Generation and load capacities
- Generation, exchange and load initialization
  - Derived from long-term optimum
  - Based on forecast/realized time series



Aggregated network definition

Simulation platform validation

- A web-based platform available to all Consortium partners for simulation
- Allows for assessment and comparison of various designs under near perfect and real market conditions
- Impacts of the studied market design options on the three pillars of the EU energy policy
- Three studies performed to validate the platform robustness when dealing with massive renewable generation integration
  - Renewable support schemes (DTU RISOE + COMILLAS University)
  - Day-ahead, intraday and balancing designs (EnBW Transportnetze AG + Red Eléctrica de España)
  - Cross-Border capacity management (European University Institute)

Feel free to visit our website

www.optimate-platform.eu