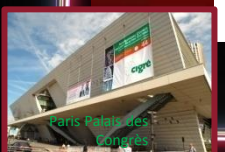
SC C1 2014 SESSION

PS2/ Q2.3 Ricardo Perez (Brazil)

# OPTIMIZATION TOOLS TO DETERMINE PRELIMINARY PLANS + OPERATIONAL FLEXIBILITY DEMANDED BY INCREASING RES

PSR



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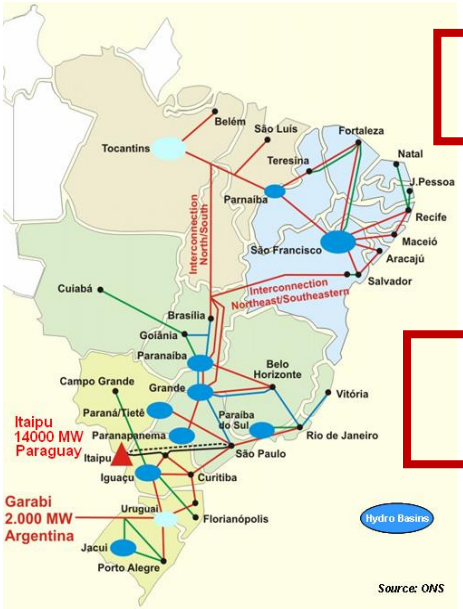
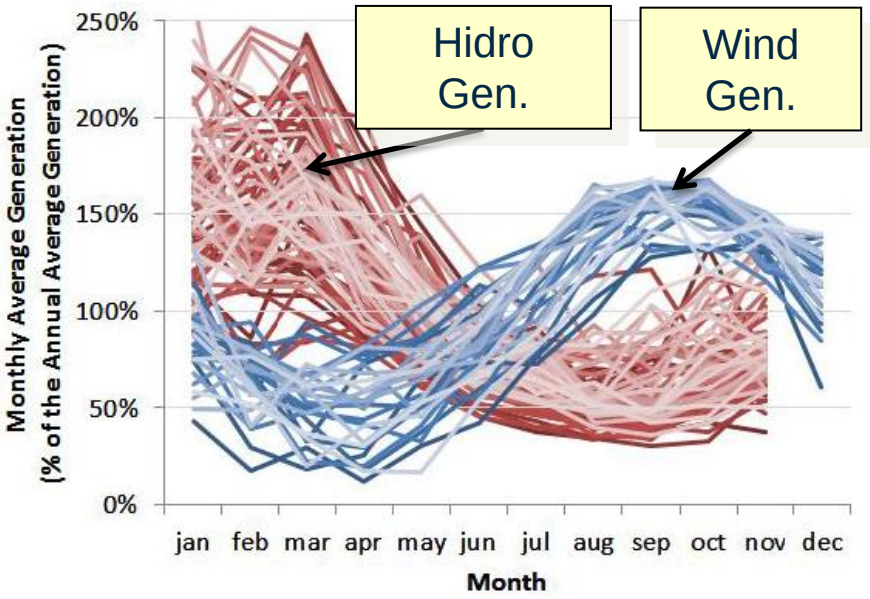
- There are several reasons to explain why transmission system loading is less than 100%:
  - Reliability;
  - Uncertainties associated with the demand growth forecast;
  - Different economic dispatch scenarios ➔ input data associated with RES;

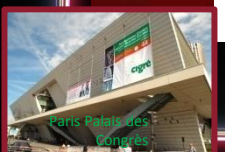



**Long Distances**

**Exacerbated Uncertainties**




- The conjunction of these facts leads to high investments to meet different dispatch scenarios and low loading throughout the year.



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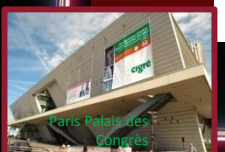
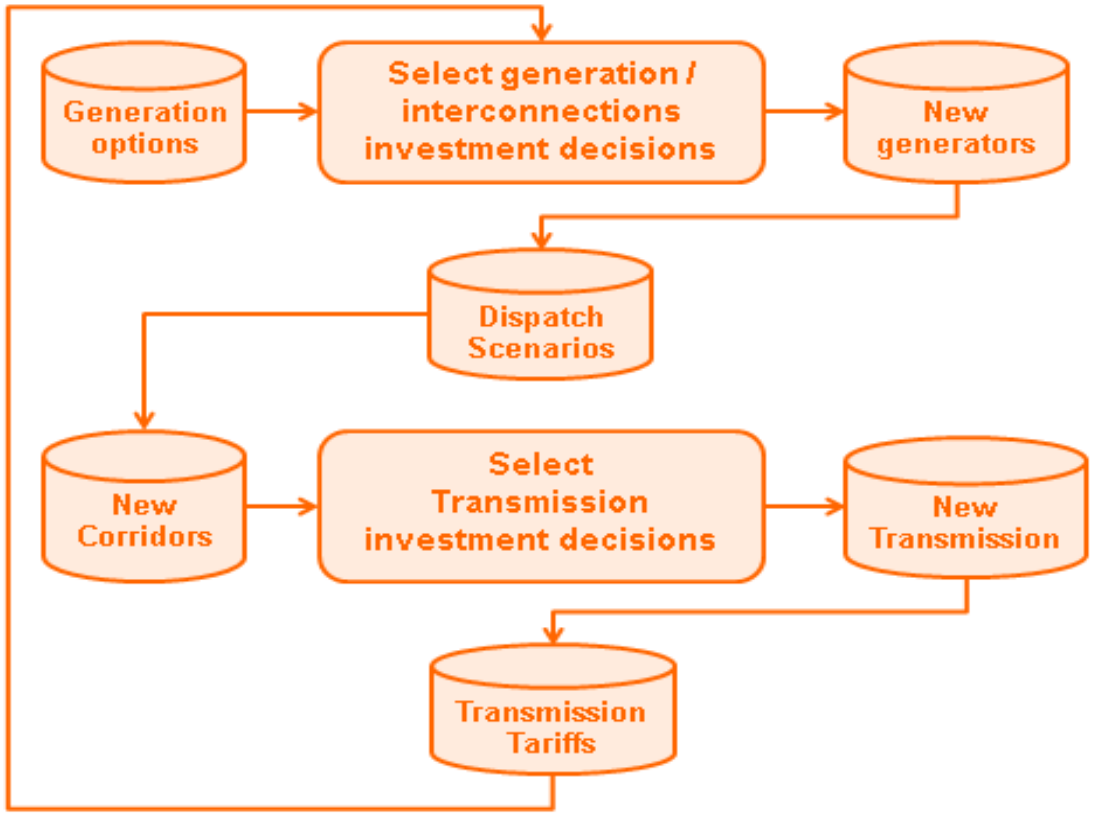
- Optimization tools could be more intensively used in the future in order to establish a preliminary expansion plan taking the generation expansion plan and also the dispatch scenarios into account;
- Uncertainties and stochastic input data are represented by likely dispatch scenarios obtained using production cost simulation tools;
- The objective function should be carefully selected:
  - Minimize the investments in the transmission system;
  - Reliability Criteria may be used:
    - (i) N-1 or (ii) Investments + Penalty Cost*Unserved Energy ➔ in this case the model decides the best trade-off

- Systems with increasing RES demand Operational Flexibility to reduce investments
- As electrons do not respect contracts, only Kirchhoff, FACTS and D-FACTS devices should be seen as key solutions for active power control ➔ Transmission Expansion Options having these devices should also be evaluated in the CBA analysis;
- FACTS and D-FACTS devices ➔ they may also be taken into account by optimization tools



• Iterative Approach:




• The Network Expansion Tool provides an optimized network expansion and allocation of grid costs to generators as inputs;

• Convergence is reached when no further updates to generation and transmission expansion are needed between iterations ➔ feasible least-cost solution.