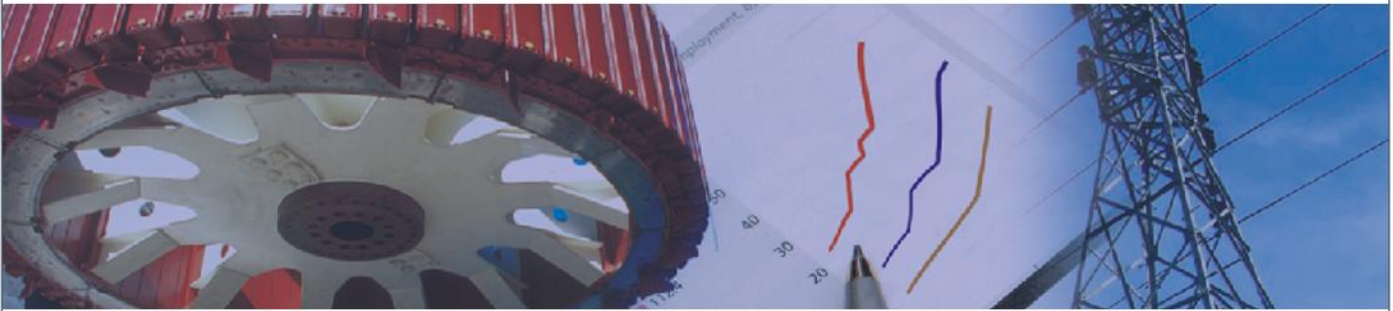


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## Overview

OPTGEN is a computational tool that determines the least-cost expansion plan for an electricity-natural gas multi-region system. The system operation is represented in detail, including, for example, inflow uncertainties, greenhouse gases emissions and minimum capacity constraints, among others. OPTGEN can be used by either planners (in centralized decision environments) or electricity regulators and investors (in competitive environments).

## Modeling aspects

OPTGEN is an integrated expansion model formulated as a large scale mixed integer-linear optimization problem, with the following features:

- Flexibility of investment and operation time steps (year, semester, quarter and month)
- Both continuous and integer decision variables
- Optional or compulsory projects
- Sets of associated and mutually exclusive projects
- Precedence of construction constraints
- Minimum installed capacity constraints for different groups of technologies and for different time intervals, allowing the representation of governmental energy policies
- Calculation of reference costs for candidate projects
- Greenhouse gas emissions modeling
- Fuel availability constraints
- Multiple scenario analysis
- Analysis and reinforcement of user provided expansion plans

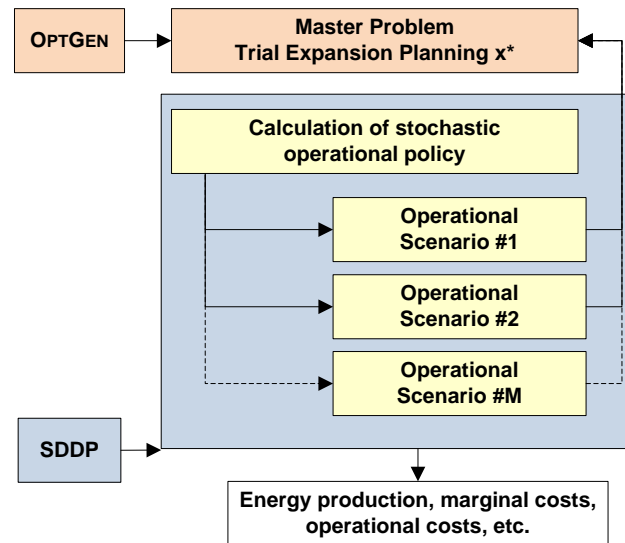
The solution is obtained by advanced techniques of mixed-integer programming and Benders decomposition.

## System characteristics

- Windows compatible user interface
- Integrated model for visualization of results and generation of graphs
- Input and output files in CSV format, making possible the edition with Excel
- Data import from either Super Olade's MODPIN or SDDP

## Integration with SDDP

OPTGEN can be integrated with the detailed transmission-constrained stochastic hydrothermal dispatch model SDDP.



## Recent applications

- Generation expansion planning studies that also includes regional interconnections links with Central America systems (Panamá, Costa Rica, Nicaragua, Honduras, El Salvador e Guatemala) for the horizon 2009-2023.
- Re-evaluation of the generation-transmission integrated studies with Bolivian system (10 years horizon period, 2009-2018).
- Expansion studies of Egypt-Sudan-Ethiopian interconnection system to provide an economic evaluation to justify the expansion of the interconnection and the construction of large reservoirs.
- Studies for the economic evaluation the construction of the second transmission line connecting all six Centro American countries (Panamá, Costa Rica, Nicaragua, Honduras, El Salvador e Guatemala) – SIEPAC II project.
- Evaluation of the generation expansion planning for the Dominican Republic, horizon of 10 years (2007-2016).
- Expansion planning studies in order to evaluate new methodologies for the Colombian system (10 years horizon (2006-2017)).
- Generation-transmission expansion planning of the Bolivian system, horizon from 2005 to 2015, assuming a detailed representation of the transmission system.
- Expansion studies for the Brazilian system, with 100 GW installed capacity, 85% of which is hydroelectric (117 hydro plants), 108 thermal plants and 9 interconnected regions.
- Venezuela's 2020 generation and transmission expansion plan with 13 interconnected regions
- SEETEC project to study the development and benefits of the Balkan regional energy market, with 8 interconnected countries, 30 GW demand (5 GW of forecasted increase by 2010).