Argonne NATIONAL LABORATORY

GTMax: A New Deregulated Power Market Analysis Tool

Opportunity

In many countries, the trend toward restructuring, privatization, and deregulation is fundamentally changing the way electricity markets are functioning. Markets are unbundled, and new market agents are entering the arena. Now agents can access a new range of products and instruments, including firm and non-firm contracts, spot market transactions, and emergency intertie agreements.
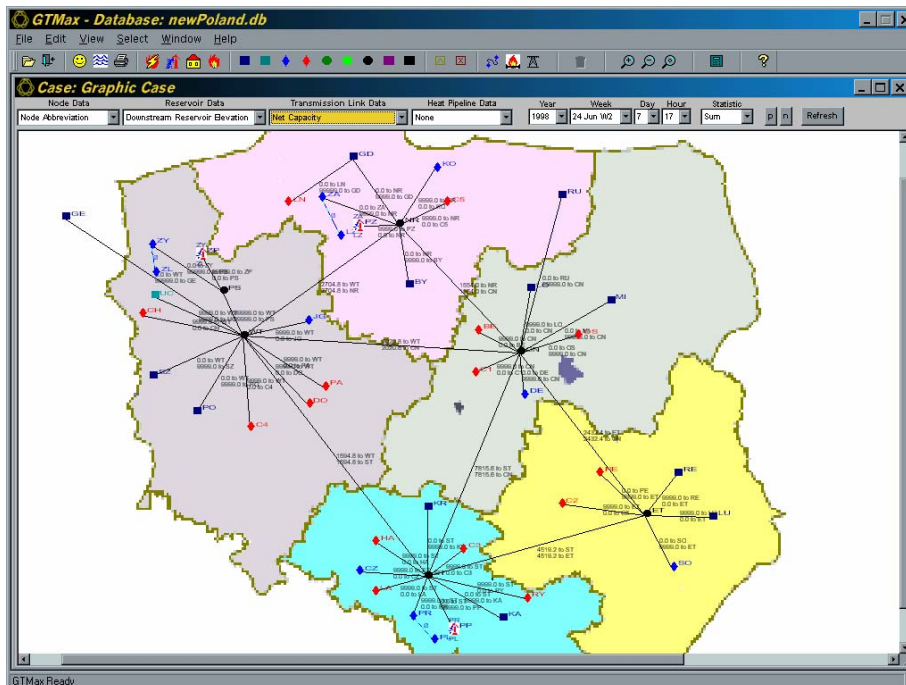
System operators and managers at generation companies around the world must consider many complex and changing physical, environmental, economic, and institutional constraints when determining how to best use their assets and resources.

Also, the economic, financial, and reliability benefits of power and energy transactions with neighboring systems and countries will increasingly be of vital interest.

Approach

Argonne National Laboratory has developed the Generation and Transmission Maximization (GTMax) model to study the complex marketing and operational issues in today's deregulated power markets. GTMax helps generation companies and utilities maximize the value of their system assets, taking into account firm and non-firm contracts, independent power producer (IPP) agreements, bulk power transaction opportunities, and limitations of energy and transmission resources.

Sample GTMax Screen Showing System Representation

Decision and Information Sciences Division

Center for Energy, Environmental & Economic Systems Analysis

Capabilities

GTMax simulates regional or national generation and transmission systems. The model maximizes net revenues while ensuring that market transactions and system operations are within physical and institutional limitations. In simulating multiple systems, GTMax identifies utilities and assets that can successfully compete in the market by tracking hourly energy transactions, costs, and revenues.
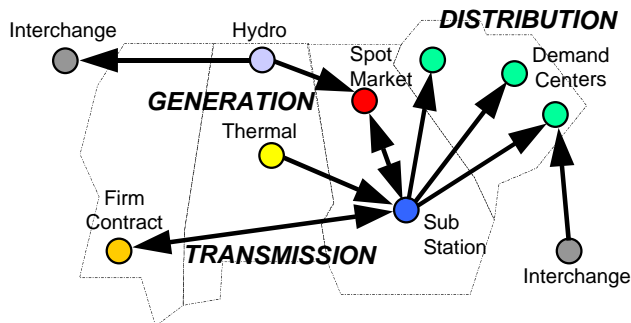
GTMax has a user-friendly geographical information system interface. Users can point and click on a map of utility power plants and other system components to modify input data and obtain optimization results. A map displays hourly energy flows from supply resources such as generators and IPP firm contract purchases to load centers and spot market delivery points. Energy and financial results are also output in easy-to-understand tables and graphs. GTMax is designed to assist the user in building a network representation of any power system of interest.

Some Issues Addressed by GTMax

- Which units will be dispatched in the new market and which will be stranded?
- How much power will be generated?
- How much power can be sold each hour during a particular period?
- When should I consider buying and/or selling power in the spot market?
- What is the marginal value of water in my hydro reservoirs?

- What is the value of demand side management programs?
- What is the projected available transmission capability each hour in the region?
- Will my investment in power or transmission assets provide an attractive return?

Applications

The model is currently used by:
- A large US utility company to determine hourly, weekly, and seasonal power and energy offers to customers and fine tune hourly resource generation patterns, spot market transactions, energy interchanges, and power wheeling
- The Bureau of Reclamation to compute the economic and financial costs associated with environmental restrictions on hydropower operations
- A large US energy marketing office to identify operational strategies that optimize the value of company resources while taking advantage of market opportunities
- A large international power merchant to assess the financial viability of two transmission line projects in the Balkans
- The Polish Energy Market Agency to estimate the competitiveness of small gas-fired cogeneration in Poland's newly restructured energy markets
- A large US utility company to compute available transmission capabilities for future postings on regional Open Access Same-time Information Systems (OASIS)

Summary

- Maximizes company revenues
- Optimizes hydro and thermal generation
- Considers firm contracts and IPP agreements
- Estimates regional energy economic clearing price
- Simulates spot market transactions
- Quantifies operational costs/revenues of an IPP
- Models energy exchange agreements

Learn more about the Center for Energy, Environmental & Economic Systems Analysis at:
http://www.dis.anl.gov/ceeesa

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