GUROBI OPTIMIZATION | The World's Fastest Solver

Industry Solution Sheet: Electric Power

Challenges and Capabilities

The key players in the electricity market – such as transmission system operators (TSOs), distribution system operators (DSOs), and regional security coordinators (RSCs) in Europe, and independent system operators (ISOs), electric distribution companies, and regional transmission organizations (RTOs) in the U.S – face significant operational challenges including:

- Keeping supply and demand in balance in real-time across the electrical grid.
- Delivering power to consumers in the most efficient, affordable, and reliable manner possible.
- Ensuring compliance with complex and constantly changing industry regulations.
- Gaining visibility and control over their transmission and distribution networks and generating long-term grid plans – with a time horizon of up to 30 years.

On top of these operational challenges, these organizations must also grapple with profound industry changes such as:

- The shift towards better market integration, greater energy efficiency and renewable energy utilization, and reduced greenhouse gas emissions.
- Ever-increasing competition among electric power companies.
- The rise of "prosumers."

To overcome their challenges and adapt to these major industry changes, electricity market players must be able to digitally transform their operations – and to achieve this, they need to leverage the most cutting-edge technological and mathematical tools.

Without a doubt, mathematical optimization is one of the essential tools for companies in the electric power industry today.

For decades, major power companies have been utilizing mathematical optimization to manage the flow of energy across their electrical grids, ensure the security of supply, and optimally align generation and distribution with demand across their integrated networks. Now, these companies are expanding their use of mathematical optimization to many other areas like trading.

With mathematical optimization technologies, electric power companies can make optimal (and often automated) decisions that enable them to satisfy demand, safeguard supply, and achieve long-term sustainability and efficiency targets.

Mathematical optimization technologies can help electric power companies handle the challenges, complexity, and changes in their industry landscape today and in the future.

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Opportunities for Optimization

Mathematical optimization is used by leading transmission and distribution grid operators today to optimize many different strategic, tactical, and operational planning and decision-making processes including:

Construction and Sizing of New Infrastructure

- Grid Network and Development Planning
- Optimal Grid Design
- Layout Optimization of New Power Plants

Planning and Operations

- Operational Planning & Security Analysis
- Network Modelling
- Optimal Capacity Operation
- Predictive Maintenance
- Resource Planning
- Unit commitment
- Smart Grid Operations
- Dispatch and Redispatch
- Optimal Power Reserve Management
- Outage Planning

Financial Planning and Management

- Energy Trading and Pricing Optimization
- Portfolio Management
- Risk Management
- Smart Asset and Inventory Management

Business Benefits

Electric power companies utilizing mathematical optimization technologies are able to realize numerous business benefits including:

- Better resource utilization
- Greater energy efficiency
- Reduced costs
- Improved grid stability
- Fewer outages and security issues
- Increased operational efficiency
- Enhanced market integration
- Better, more sustainable energy mix
- Greater customer participation

Example Customers

Here is a selection of Gurobi customers that use mathematical optimization to revolutionize their electric power transmission and distribution operations:

TSCNET Services, 50hertz, BNetzA, TenneT Taking power further, nationalgrid, NYISO, TRANSNET BW, TEA The Energy Authority, PSE, DIGSILENT, amprion, FGH