Argonne
NATIONAL LABORATORY

USING ARGONNE'S WATER POWER MODELING TOOLS
Enabling Decision-Making and Project Planning

## Argonne's models are used in more than 40 countries

Argonne helps to:

☐ Optimize the utilization and management of water and hydropower resources through modeling and simulation of complex water resource and hydropower operations.

☐ Transfer Argonne-developed models to users worldwide — GTMax, EMCAS, CHEERS models.

GTMax
GENERATION AND TRANSMISSION MAXIMIZATION
GTMax optimizes power system operations, power exchanges with other systems, and market transactions.

How does GTMax help users?

☐ **GTMax** helps to maximize revenues by optimizing hydro and thermal generation, water flows, and reservoir management.

☐ **GTMax** simulates regional and national electricity systems, helping plant owners, utilities, and grid operators maximize the value of hydropower by optimizing plant operations and market transactions.

☐ **GTMax** simulates spot market transactions and quantifies operational costs.
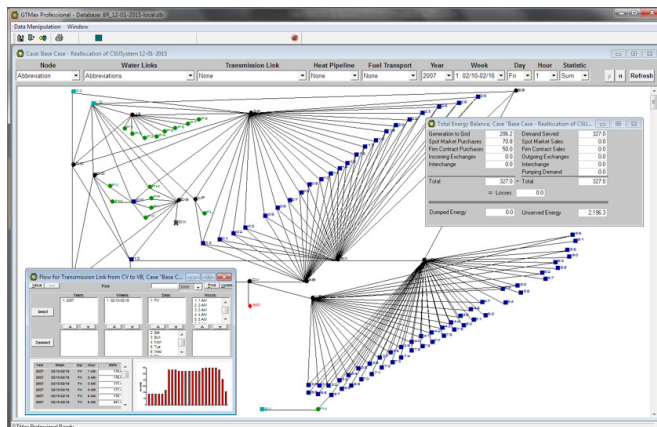
### ARGONNE'S WATER POWER MODELING AND SIMULATION TOOLS PERFORM:

☐ Production cost modeling, optimization of power system operations, and investment decision-making.

☐ Optimization of hydropower plant and reservoir management.

☐ Integration of variable energy resources and storage.

☐ Electricity market, economic, and environmental analyses.

GTMax — Generation and Transmission Maximization

CHEERS
CONVENTIONAL HYDROELECTRIC AND ENVIRONMENTAL RESOURCE SYSTEMS

CHEERS has unique capabilities to simultaneously optimize water, power, and environmental functions.

How does CHEERS help users?

☐ **CHEERS** helps operators manage water and power systems by producing day-ahead and real-time operation schedules.

☐ **CHEERS** produces schedules to guide *when*, *where*, and *how* to:

○ Release water from storage, serve customer loads and manage energy exchanges.

○ Produce/buy/sell energy and ancillary services.

☐ Typical **CHEERS** results include:

○ More efficient water use and cost-effective transactions.

○ Less generator ramping, and fewer unit starts and stops.
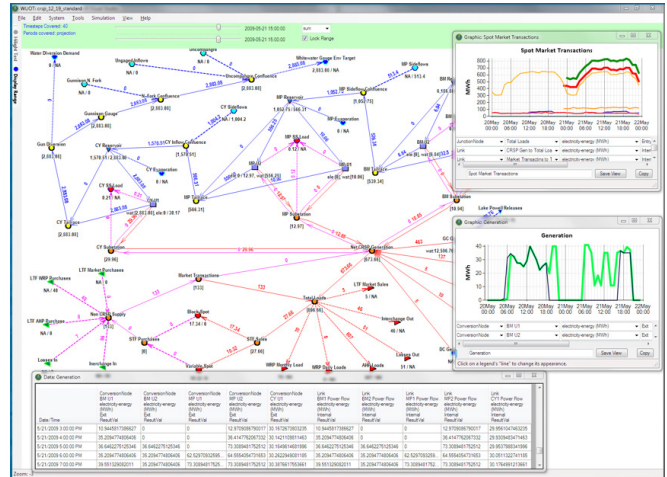
CHEERS — Conventional Hydroelectric and Environmental Resource Systems

EMCAS
ELECTRICITY MARKET COMPLEX ADAPTIVE SYSTEMS

EMCAS uses advanced agent-based simulations to analyze restructured power markets affecting pumped-storage and hydropower plant operations.

How does EMCAS help users?

☐ **EMCAS** simulations use agent learning and adaptation based on performance and changing conditions.

☐ **EMCAS** evaluates market strategies, analyzes market participants with decentralized decision-making, and captures user-specified market rules affecting system behaviors.

☐ **EMCAS** simulations are used for:

○ Price forecasting, resources/asset evaluation, and portfolio analysis.

○ Power analysis, volatility/risk analysis, and market monitoring/design.
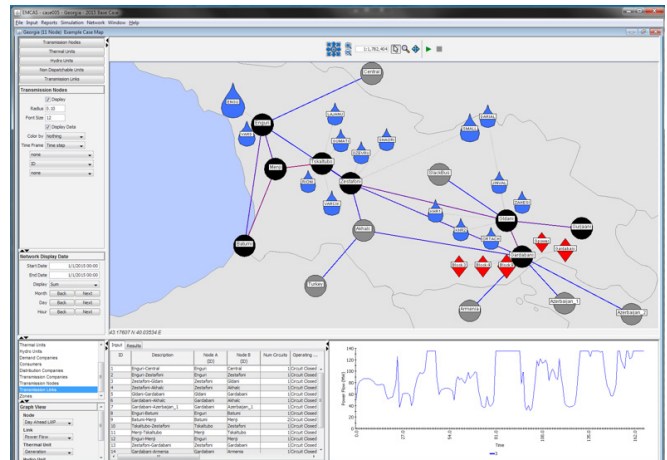
EMCAS — Electricity Market Complex Adaptive Systems

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