Energy Consulting

GE Multi Area Production Simulation (GE MAPS*) Software

For Informed Economic Decisions

In the rapidly changing world of the electric power industry, one thing has remained constant—the need to accurately model the economic operation of the power system in order to make informed decisions. Whether your interest is in assessing the value of a portfolio of generating units or in identifying the transmission bottlenecks that most seriously constrain the economic operation of the system, you must capture the complex interaction between generation and transmission systems. GE Energy Consulting Group offers the GE MAPS Software program, which provides the detailed modeling your business needs. Choosing GE MAPS can bring these benefits and more to your production cost modeling:

- Thanks to our proprietary solver, GE MAPS is among the fastest production simulation programs available today. GE MAPS is also ready-made for high-performance computing (HPC) clusters via task parallelization, enabling simulations to run in a few hours, rather than days, increasing productivity and giving you the ability to consider more scenarios or a longer study horizon.
- Sub-hourly modeling for better estimation of intra-hour dispatch and reserve needs.
- An all-new graphical user interface for editing and validating data and easy interaction with Excel to export and import data.
- A Python API that lets users manage runs across multiple cores, inspect and change data automatically between runs for iterative simulations, and automate the creation of plots at the end of simulations. The API is a massive productivity enhancer and gives users improved control over runs and reporting.
- Modeling of energy storage and renewables.
- Available high-quality and complete datasets available for EI/WI/ERCOT and over 50 countries provide a starting point for your modeling and help you become productive months faster than if you have to assemble the data from scratch.

GE MAPS Modeling Detail

GE MAPS software integrates highly detailed representations of system load, generation, and transmission into a single simulation. This enables calculation of production costs in light of the constraints imposed by the transmission system on the economic dispatch of generation. Generation system modeling details of GE MAPS include multistep cost curves, unit cycling capabilities, emission characteristics, and market bids by unit loading block. The generation units, along with chronological hourly or sub-hourly load profiles, are assigned to individual buses on the system. The transmission system is modeled in terms of individual transmission lines, interfaces (which are groupings of lines), contingencies, phase-angle regulators (PARs), and HVDC lines. Limits can be specified for the flow on the lines and interfaces as well as operation of the PARs. GE MAPS models voltage and stability considerations through operating nomograms that define how these limits can change hourly as a function of loads, generation, and flows elsewhere on the system.

Hourly or sub-hourly load profiles are adjusted to meet peak and energy forecasts input to the model on a monthly or annual basis. Information on loads at each bus in the system is required for GE MAPS to accurately calculate electrical flows on the transmission system. This is specified by assigning one, or a combination of, several load profiles to each load bus. In addition to studying all of the hourly or sub-hourly periods in the year, GE MAPS can operate on bi-hourly basis to decrease runtimes. With these modeling options, GE MAPS simulates the loads in chronological order and does not use a simplified, and less trustworthy,. voltage and stability considerations through operating nomograms load-duration curve method that misses out on modeling path-dependent quantities such as minimum up-time and storage.

Based on this detailed representation of the entire system, GE MAPS performs a security-constrained dispatch of the generation by monitoring transmission system flows under both normal and contingency conditions.

Data for Informed Decisions

Making the right choices in today's environment requires increasingly more detailed information about the operation of the system. In addition to traditional production costing quantities of unit generation and costs, GE MAPS also generates the following output data:

- Hourly or sub-hourly, nodal or bus energy spot prices
- Hourly or sub-hourly line flows and congestion costs
- Unit revenues based on MW output and bus spot prices
- Hourly or sub-hourly emission quantities and removal and trading costs
- Identification of companies and generators responsible for power flows on lines

Generation	Transmission	Loads	Transactions
Detailed Representation	Tracks Individual Flows	Chronological by Bus	Automatic Evaluation
Secure Dispatch	Obeys Real Limits	Varying Losses	Location Specific

GE MAPS Applications

Because of its detailed representation of generation and transmission systems, GE MAPS can be used to study a wide variety of questions related to deregulated utility markets:

- The value and operation of a generation portfolio operating in a deregulated market
- Evaluating effects of energy storage and additional transmission
- Policy analysis (e.g. decarbonization)
- Resource changes (e.g. coal-to-gas switching, addition of renewables)
- The attributes of different proposed market structures and the development of pricing algorithms
- Budgeting for fuel and maintenance costs
- The possibility of one or more market participants exerting market power
- Evaluation of plan operation
- The location of transmission bottlenecks and associated congestion costs as well as transmission congestion contract (e.g. financial transmission rights) valuation
- The impact on total system emissions that result from the addition of new generation or new regulatory policies

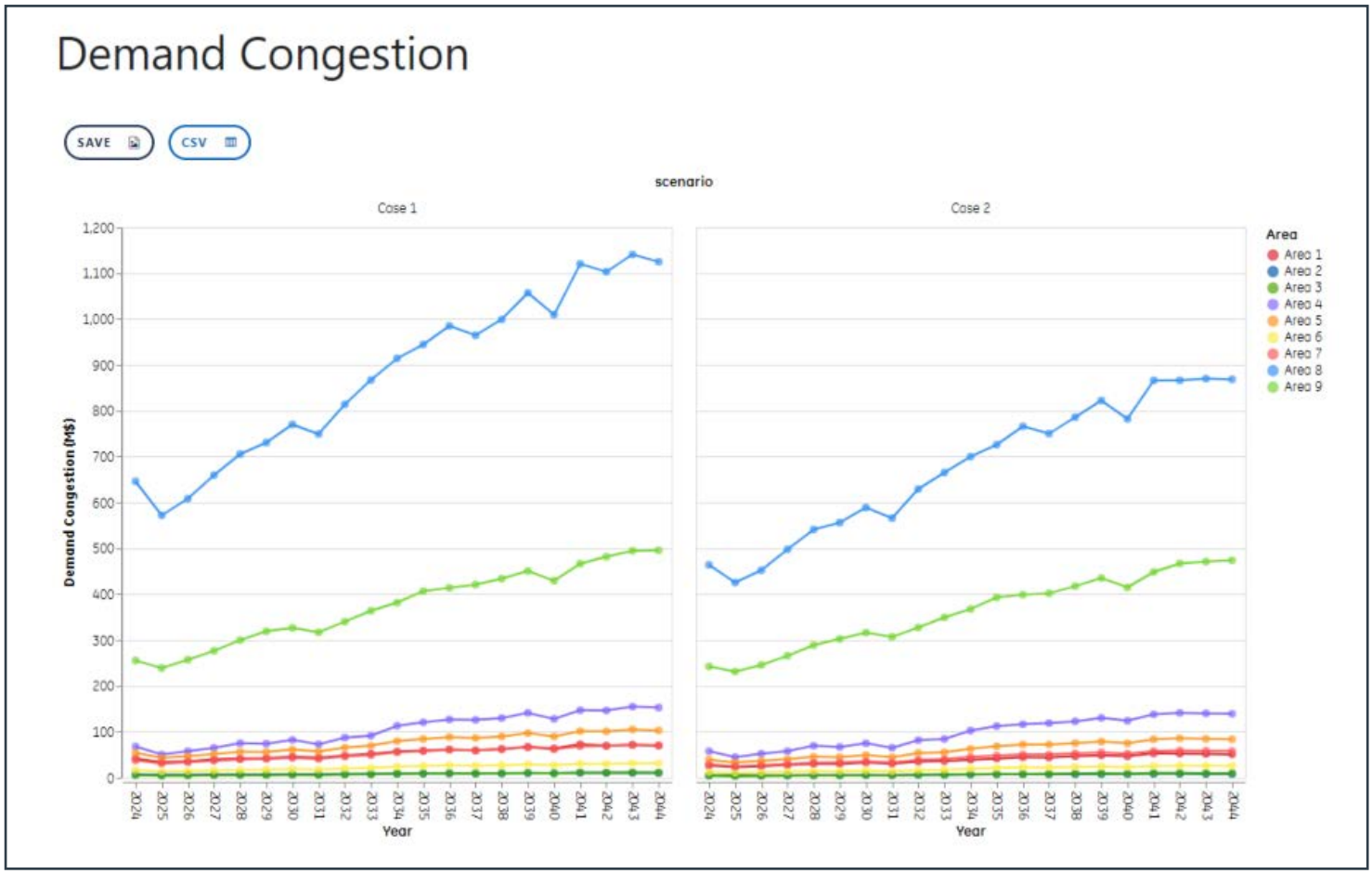
User Interface and Python Application Programming Interface

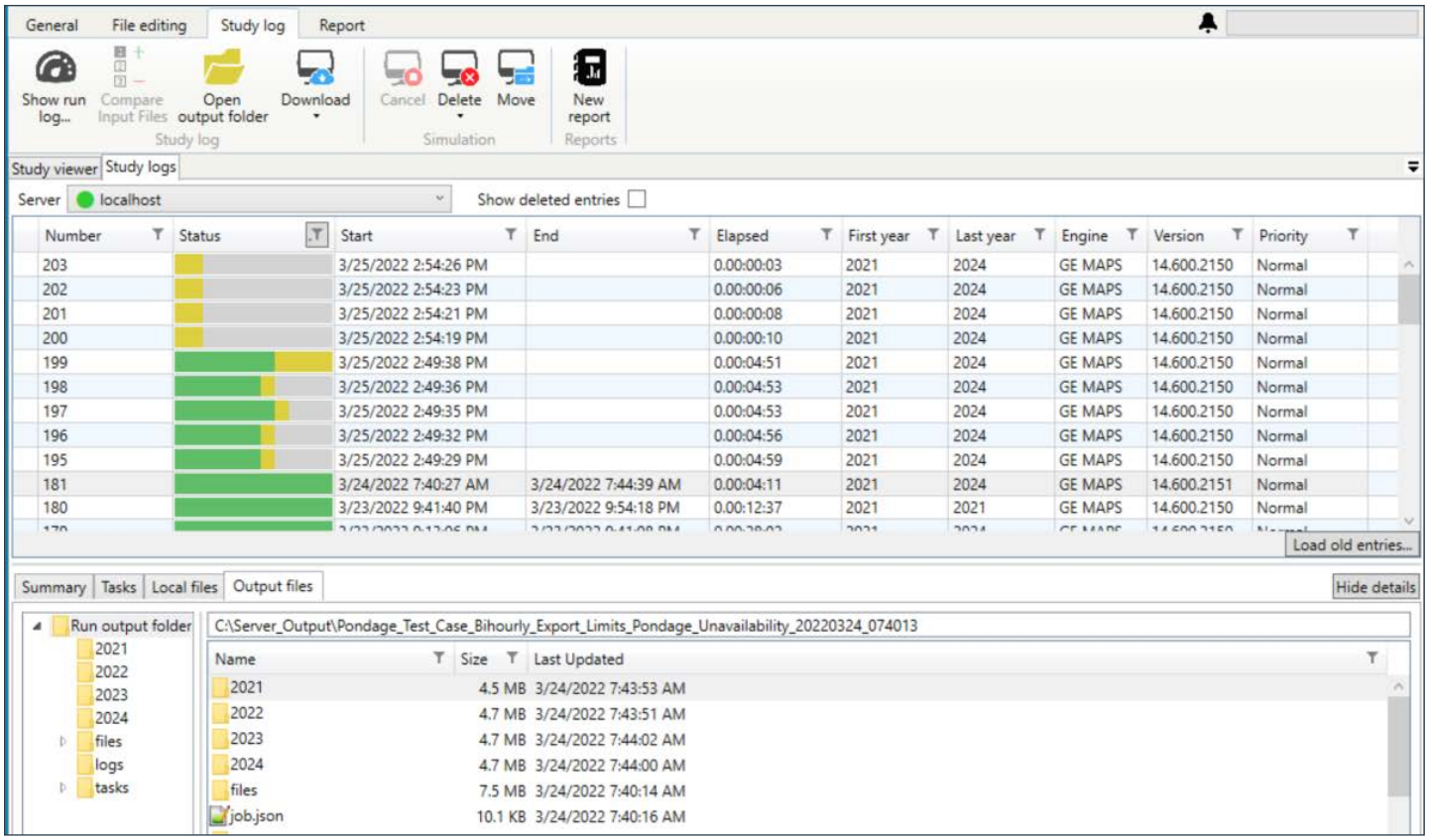
GE MAPS comes with a Graphical User Interface and Application Programming Interface (API) that greatly improve the user experience. The User Interface provides several features including:

- Easy-to-use, structured file handling for all your cases
- Special-designed text editor with documentation to make input table handling easier
- Create and save input and output tables using csv and xlsx formats
- Intuitive calculation management
- Professional-quality report creation

The API allows Python users even more power, including:

- Automated post processing calculations and report generation
- Prepare and run calculations on a local or remote computer
- Create inputs from any data source that can be handled in Python





High Performance Computing (HPC)

Large simulations can take a significant amount of time to process on standard desktop hardware. With the optional GE MAPS and MARS Client-Server Manager, GE MAPS can be run on HPC resources, so rather than running through the entire study on one machine, GE MAPS automatically splits the study up into blocks and sends each block to a separate machine/node. This allows the work to be done in parallel, greatly reducing the amount of time required for a single study. Once processed, the data is then merged, allowing the user to view the results of the study as if it had been executed on a single machine.

Experience Matters

Your business depends on accurate modeling data for accurate decision-making. GE leverages more than 80 years of experience in analyzing the power industry's economics and equipment to provide you with the tools you need to run your business successfully. Contact us at the email address below to find out more about how GE MAPS software, datasets, and other services GE provides can help optimize your business strategies.

For more information, contact:
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