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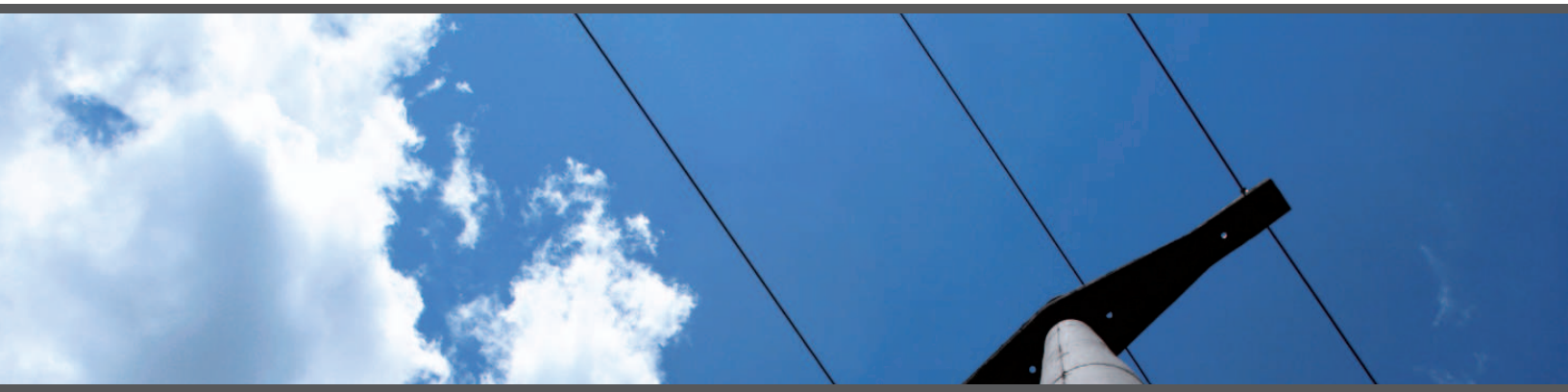
Product Overview

Market Analytics Functional Overview
Zonal Analytis Module



The Ventyx solution for regional price formation.

General Functionality

- Ability to produce electric market price forecasts for both single and multi-area systems for one week up to forty years
- Accommodates traditional (cost-based) analyses or market (bid-based) analyses using single- or multi-part bidding processes
- Market simulations may be: every hour of the year, in two or four-hour time steps, a chronological typical week, sample week per month execution or user-defined seasonal periods
- Uses the PROSYM chronological production costing simulation algorithm taking into consideration the costs (or bids) of all generation units, unit performance characteristics and chronological constraints, as well as relevant zonal transmission and system constraints to commit, dispatch, and simulate the actual functioning of the system or market
- User selection of objective functions (minimize system cost, maximize consumer and producer surplus in a bid-based market)
- Ability to forecast up to five Ancillary Service prices using a fundamental approach that simultaneously clears the energy and ancillary services market
- Ability to develop multiple bidding strategies for assessment of competitive markets
- Ability to produce either expected value or distribution of prices using the distribution functions of selected variables
- Transmission Areas are the fundamental building blocks of the regional simulation for unit commitment and dispatch decisions, and the loads are defined by the Power Customer. The Power Customers are combined to form the Transmission Area Load. The resulting prices are developed for the transmission areas in the zonal analysis.
- Power Customers and Transmission Areas along with physical locations within
- a run topology for producing price forecasts are included in the database to accurately model and reflect boundary conditions for path definitions and area interchanges.
- Ability to model detailed CC and CHP plants with heat area topology

Generation Assets

- Commitment and dispatch simulation of generation assets and dispatchable power purchase contracts
- Models supply of electric energy and five ancillary service capacity products
- Comprehensive coverage of thermal, hydro and renewable asset types including pumped storage, run-of-river pumped storage, combined heat and power, and Wind Power
- Over 50 potential asset characteristics, including startup costs, minimum up and down times, ramp rates, minimum and maximum generation capacities
- Ancillary service capabilities
- Fuel modeling to represent limited fuels, fuel sequencing, fuel blending, fuel contracts, and fuel spot markets
- Deterministic and probabilistic maintenance outage methods
- Supports full and partial forced outage modeling with choice of Monte Carlo method using a variety of outage distributions representing both frequency and duration of outages
- Enhanced intermittent renewable energy modeling

Retail Customer Load and Tariffs

- Assign customer types to specific load shapes or forecasts
- Flexible assignment of one or multiple customer segments to one or multiple transmission areas
- Support for a chronological hourly load shapes library
- Three-part tariff representation (monthly fixed charge, monthly demand charge, and seasonal by TOU energy charges) by customer segment
- Fixed or indexed energy tariff rates
- Ability to utilize externally created load forecasts or internally forecast hourly loads from base year load shape and annual (or monthly) peak and average growth rates
- Full stochastic modeling of customer segment loads or load index values
- Load growth algorithms embedded for load forecasting out of historic load shapes
- Load forecasts may be obtained from the Load Forecasting module

Interface and Data Management

- Built on a common EnerPrise interface used by other Ventyx simulation applications
- Easy integration with other EnerPrise modules, including Planning and Risk, Generation Management, Load Forecasting, and Market Data Warehouse
- Flexible and robust application login and database security
- Supports multiple users interacting with the database simultaneously in a workgroup environment
- Data audit reporting with query capability
- Windows “style” interface with menu tree navigation with well-structured menus and variable groupings
- Workflow menu creation capability allows users to add frequently used menu items to multiple workflows
- Easily create base case, scenario and sensitivities from base case
- Consistent data management interface used for entering and editing input data for all entity types
- Maintains complete history of changes with full “roll back” features
- Virtually all PROSYM variables and all data types managed with the graphical user interface
- Copy any entity for easy creation of similar entities
- User-defined filtering capability for all entity types
- User-defined views and filtering for display of summary data across multiple entities
- Advanced mass edit capability with flexible filtering, and in-place grid editing
- Flexible input data reporting in grid format with scenario stacking capability
- Standard and user defined time pattern editor for defining time of use (TOU) periods
- Time series index drivers can be applied to price and volume variables
- Import data via predefined XML routines allows automated updates from Ventyx and third party systems

Case Management

Case management capability is provided to allow for accurate tracking of inputs and configuration options for the model runs. It includes the following:

- Ability to create/save/modify/execute a 'Study definition'
- Allows users to perform sensitivity analysis on a given case study
- Ability to manage multiple runs of the model (or multiple case-studies)
- Multi-run capability allows user to submit a series of runs to execute
- Logical tree structure/organization of multiple runs
- Track progress/status of a run
- Start/monitor/continue run sequence from any workstation
- Allows the user to query the output databases for user defined reports - more details in the following section of "Data Analysis Tools and Output Reporting"
- Facilitate input/output comparisons among scenarios
- Ability to automatically split a long run either by time (multi-years) or by iterations
- Execution possible in quad core machines in addition to the dual core machines

Data Analysis Tools and Output Reporting

Load/Resource reports by four user-selected report levels in tabular or graphical format, with data exportable to Excel format. The report levels are:

- By Region – Generates loads and resource summary reports on the entire region
- By Control Area – Generates loads and resource summary for selected Control Areas
- By Transmission Area – Generates loads and resource summary for selected Transmission Areas
- By Utility – Generates the loads and resource summary for individual Utilities

User-defined supply curves for identified transmission areas, with data exportable to Excel format:

- For a selected Transmission Area, year, month, day, and hour, the incremental cost curve of all the thermal stations within that Transmission Area is calculated
- The variable O&M Cost, fuel cost and emission cost (optional) is included in the cost curve
- User flexibility to select a single Transmission Area for multiple years or a set of Transmission Areas for one year
- Generates reports and graphs summarizing critical fundamental demand and supply data
- Output detail controlled from simulation settings to facilitate effective system use
- Output database can be queried using Study Viewer to create one-off views, standard views and export files for deterministic and iteration level data.
- Flexible output reporting in grid format with Data Explorer and enhanced visualization tool
- Choice of iteration level hourly results aggregation for storage by daily or monthly time periods
- Export via XML to third Party systems or ODBC complaint systems
- Ability to produce pivot table reports to analyze price forecasts and other user specified output variables

Regional Market Data (via Optionally Priced Simulation Ready Databases)

- Ventyx provides accurate and current databases for North America, Europe, Asia and Australia in the Market Analytics format to ease the "time-to-production" of client studies.
- Each regional dataset stores supply and demand data required to simulate a given region or marketplace. Ventyx's Integrated Data Product department manages this source data and processes them into simulation ready data. Ventyx Advisors further enhances the database by building out the economic capacity additions (retirements) for up to 20 years. The database is used to produce credible industry standard 20-year market price forecast.
- These databases contain generator, fuel, load and transmission data required to generate a detailed, chronological, market energy price forecast.

Specifically, the regional database(s) include the following information:

- **Thermal Generation Data** - Generator unit level information such as heat rate curves, capacity, fuel usage, owner, location, minimum loads, ramp rates, flue gas emissions, variable and fixed operating cost
- **Transmission Data** - Transmission information for all major interconnection within the energy market such as line ratings, line losses, wheeling rates
- **Transactions Data** - Bilateral agreements are stored along with point to point, or network provided, transmission information
- **Hydro Data** – Reservoir size, run-of-river minimums, storage limits
- **Pumped Storage Data** – Hydro data plus pumping characteristics
- **Fuels Data** – Fuel prices by fuel, or fuel indices, transportation charges, burn constraints, pipeline limits, and fuel switching parameters. Fuel price forecast was developed through fundamental analysis iteratively considering the demand for power production developed using fundamental fuel analysis tools for 20 years
- **Demand Data** – Hourly loads and monthly or annual peak and energy forecasts, also up to 20- 25 years
- **Maintenance Data** – Scheduled and/ or distributed maintenance for stations, maintenance areas for regional evaluation
- **Emission Price Data** – Emission price forecast is also developed by fundamental analysis by the advisors

Stochastic Modeling

- Ability to generate a distribution on market energy prices as opposed to just a single deterministic price point
- Index drivers (stochastic or deterministic) may be mapped to loads, fuel prices, emission costs, hydro energy availability, generation station maximum and minimum capacity, and transmission link capacity
- General time-series index creation capability, with choice of deterministic (non-random) or stochastic (with random component) indexes
- Choice of Normal, lognormal, and Markov regime-switching distributions for stochastic driver entities
- Support of user-defined distributions by importing externally generated random draws
- User may create hourly or non-hourly derived indexes as a function of primary (stochastic or deterministic) indexes and/or other derived indexes with an Index Equation Builder
- Distinct volatility rates by TOU period may be modeled
- Stochastic modeling of correlated entities via short-run and long-run random shocks and mean-reversion
- Choice of daily, weekly, or monthly random draws (with hourly scaling for electricity prices and loads)
- Short-run stochastic parameters may be statistically estimated with the integrated tool
- Automatically estimate volatility and correlation parameters by season for one or more time-series of daily, weekly, or monthly historical data
- Allows user to select from 1 to 12 calendar seasons for estimating season-specific parameters
- Allows for growth rate control term when estimating parameters for loads
- All models include parameter estimates for rates of mean reversion, volatility, and correlation
- Allows user to save parameter estimates to a specified scenario
- Ability for user to break the stochastic process from the power system simulation process, and view the generated draws (index values by iteration) through the ‘index analysis’ reporting capability

Remote Execution via Process Server Component (OPTIONAL)

- Process server capability allows a study's run to be split by run period or Monte Carlo iterations across several "process servers" to speed time to completion
- Results from all process servers collected into a single study
- Frees workstation for other uses during remote execution on process servers
- Run monitoring can occur from any workstation

API's and Data Interfaces

- XML file data integration capability for transforming external inputs into EnerPrise database

Integrating with System Optimizer

- Provide interface to integrate the optimized expansion plan from System Optimizer for regional analysis with emission compliance
- Transfers, Expansion Plan, optimal fuel mixes, emission prices by plant and publishes as a scenario which can be used in subsequent Market Analytics runs and is editable by the user

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