



## e7 Portfolio Optimization

Energy portfolio solution for unit commitment and economic dispatch optimization on a full range of complex assets and transactions

# e7 Portfolio Optimization

## Overview

ABB's e7 Portfolio Optimization optimizes a portfolio's operation by modeling detailed unit operating constraints and market conditions to provide a generation schedule for energy and ancillary services and fuel nominations; support the evaluation and pricing of potential short-term transactions; and facilitate the analysis and simulation of deterministic scenarios. It provides comprehensive modeling and excellent optimization capabilities, which enable generating companies to schedule resources, meet a wide range of operating and business constraints, minimize operating costs, and/or maximize profitability.

Portfolio Optimization globally optimizes thermal units, combined cycle units, combined heat and power stations, independent and pump storage hydro units, cascaded hydro systems, and renewables in a single solution. Portfolio Optimization also optimizes a combined portfolio of supply resources (traditional generation) and demand response/ distributed generation assets modeled as virtual power plants (VPPs). A comprehensive fuel and pipeline model is provided, including multi-fuel units and volumetric / flow limitations. The solution also includes a robust transaction model that embraces energy, reserves, emission allowances, and fuel products, and supports both purchases and sales of each. Multiple areas with transmission limitations are supported, as are system constraints.

## Portfolio Optimization

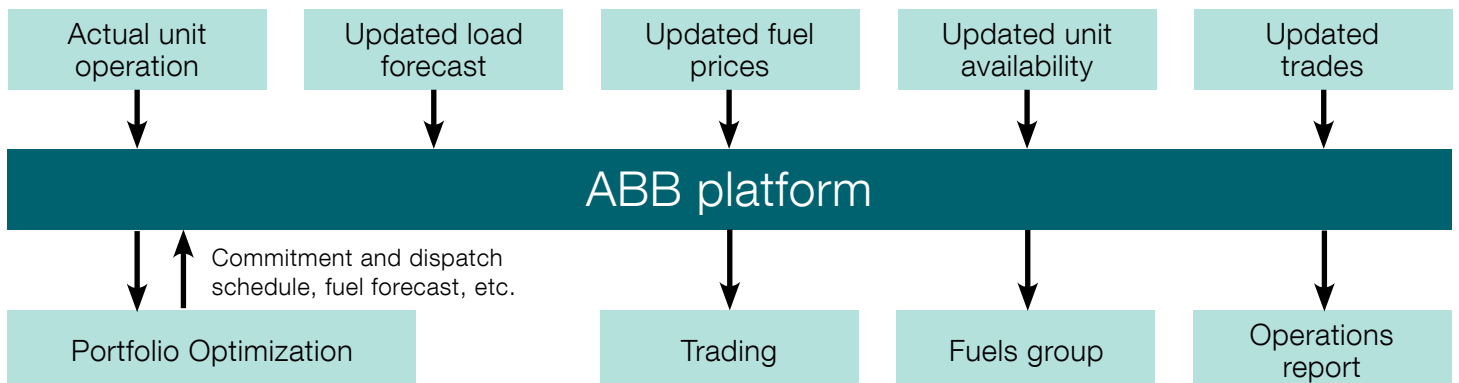
For asset owners responsible for balancing their portfolio, running load-based unit commitment/economic dispatch simulations offers a deterministic solution for running their generation assets. For asset owners that participate in a market, executing price-based optimization scenarios that output generation-in-the-money schedules provides an indication of probable market awards. Thus, it can be further used for fuel planning, plant staffing, and trading support.

The mixed-integer linear programming (MILP)-based solution provides rich modeling capabilities to truly optimize the most complex problems, eg, combined cycle gas turbines (CCGT), combined heat and power (CHP), cascading and pumped storage hydro, and the simultaneous optimization of all energy assets, reserves, and transactions. The solution architecture easily accommodates the set of ever-changing modeling requirements.

## Decision support for physical trading

Reduced costs, improved profitability and the ability to manage risk are all integral components of operations management software. Portfolio Optimization is able to price both standard and non-standard power blocks.

The solution allows traders to evaluate bidding strategies in order to maximize profit when bidding in a competitive market. When operating against a fixed position or demand, the solution will produce the operating schedule that minimizes total fuel burn and total production costs.



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## Fuel management and pipeline modeling

Reducing fuel costs and risk through enhanced Portfolio Optimization to determine the best use of scarce fuel is a key operational requirement. Portfolio Optimization produces hourly and aggregated fuel nominations by Electric or Gas Day, which allows users to monitor gas consumption against fuel procurement. Portfolio Optimization can help you answer: Am I close to my procured amount? Can I purchase from the spot market? How will that impact profitability?

Fuel blending capabilities optimize the mix of available fuels, considering commodity cost, emission costs and limits. Modeling complex pipeline networks with multi-volumetric constraints and costs is necessary to achieve maximum profitability.

## Market bidding support

When the solution is enabled to generate offers for submission to an ISO/TSO, alternate bid strategies may be evaluated in light of potential locational marginal price (LMP) forecasts.

## Simulation scenarios

Scenario analysis allows generation companies to determine outcomes based on “what if” and provides substantial analysis and actionable information to make sound, profitable business decisions regarding their portfolio, resolving the unknowns related to generation modeling. Portfolio Optimization offers an easy-to-use interface to analyze and compare sensitivity studies.

## Post analysis for improved operations

The ability to import and simulate, using actual data, and compare this data with forecasted scenarios enables feedback into the operational processes to improve efficiency.

# e7 Platform | Data Management System

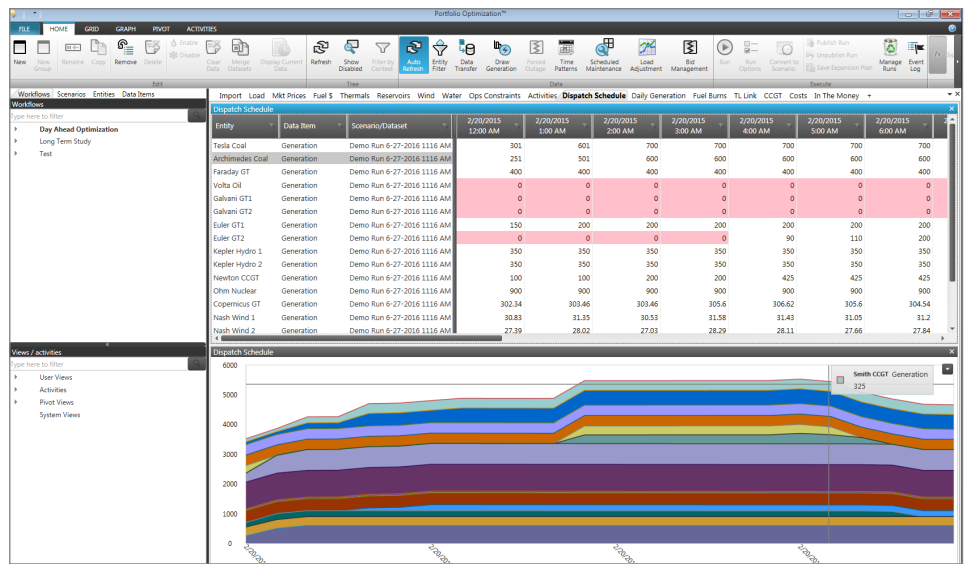
## e7 platform

Portfolio Optimization is built upon our latest technology platform, e7, which has been completely refreshed to address the changing needs of the modern customer. It utilizes a common interface that is shared by ABB's other market and portfolio solutions allowing a consistent look and feel across many products (Capacity Expansion, PROMOD and SENDOUT). New workflow management features, configurable reporting and an in-application formula tool

provide users the flexibility to mold the application to their specific needs. Easy-to-configure activities can be automated, resulting in a seamless integration with upstream and downstream systems. All of these features have been developed to optimize the user experience, regardless of whether they are modeling a small portfolio deployed on a single machine or modeling multiple markets in the cloud on thousands of nodes.

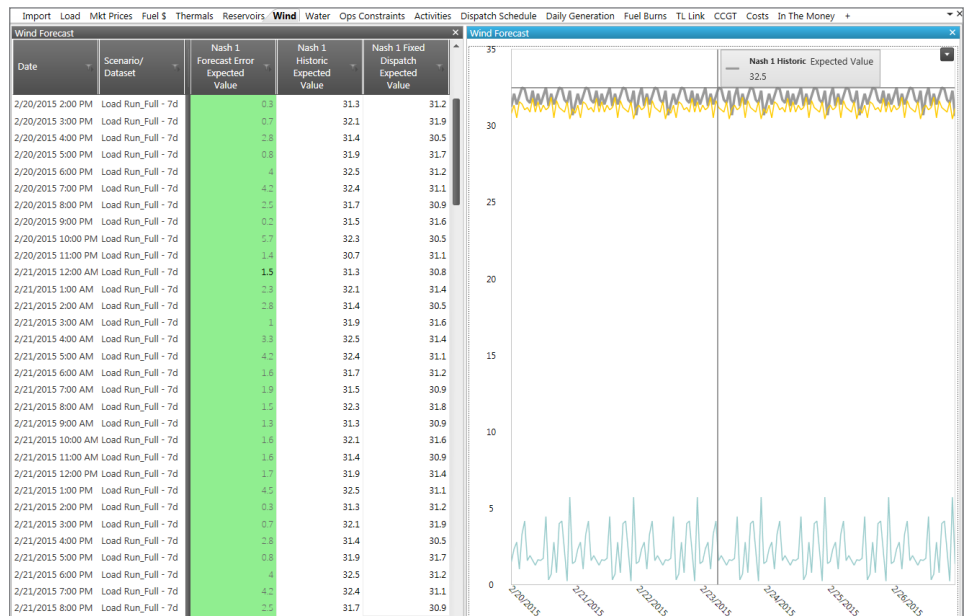
## Workflows

A workflow is a collection of user-defined views including data entry views, activities, pivot tables, and output reports. These views are easily defined, customized and ordered creating a consistent and repeatable user experience that reduces time spent searching for data and allows for a greater focus on modeling.



## Data views

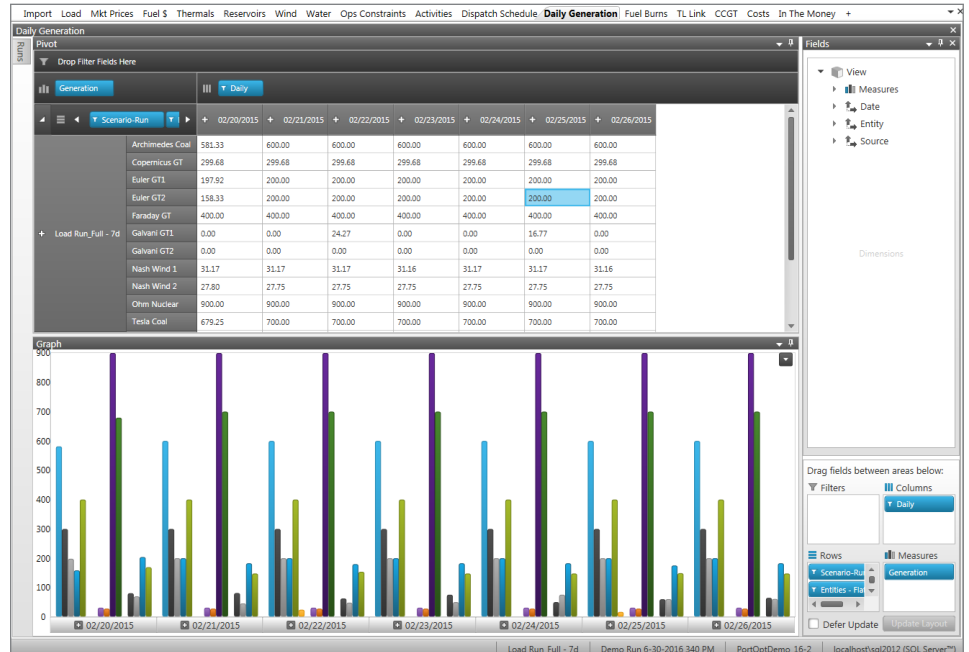
Data views are configured by the user and can include both input and output data items. Input values can be displayed in unique datasets or as the fully resolved data exactly as it is sent to the engine. Views allow full data entry and editing as well as simple graphing and reporting. Creating a new view is as easy as selecting a scenario, entity(s), and data item(s).



## Pivot views

In-application reusable pivot tables allow for complex reporting and aggregation, with the ability to look at a single scenario or compare multiple runs. Configuration of a pivot table is consistent with any user-defined view and can be included in a workflow as described above.

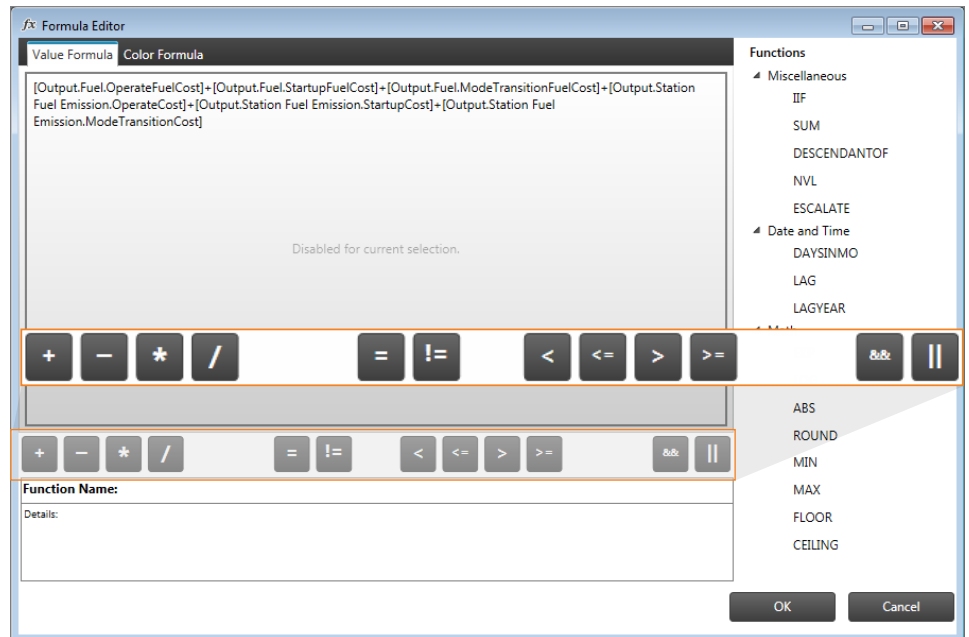
Pivot views facilitate graphing for quick and easy visualization of results to better understand the information within the raw data.



## Formulas

Formula Editor functionality allows for basic adjustments of data such as patterns, escalations, or reusable indexes to more complex calculations including conditionals and topology aggregations. Included in the formula capabilities are:

- Basic math functions (+, -, \*, /)
- Complex math functions (abs, sum, exp, log, round, min, max, floor, ceiling)
- Built-in functions (iif, decendantof, nvl, lag, lagyear, daysinmo)
- Inputs can derive their value from a combination of indexes, patterns or functions
- Custom outputs can be calculated based on inputs, outputs, indexes and functions
- Output cells can be shaded different colors based on conditional statements



## Security

With disparate groups using the software, there is a need for different groups to have permissions to different areas and data within the software. With the security capabilities groups of users can be limited to only editing and viewing

data in specified datasets and views within the software. This allows the same software to be deployed to numerous groups pointing to the same database and prevents groups of users from viewing and editing data they should not be permitted.

Type	Read	Write	Delete	Create
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
View	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
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## Automation and activities

An activity is a user-defined in-application set of steps built as part of a workflow. Automation of activities gives users a simple way to define a set of tasks (activities) to execute automatically. These steps include items such as:

Once configured, automation can significantly reduce repeatable steps, reduce data input errors, and ultimately reduce the time to obtain valid results.

- Executing a scenario
- Importing data
- Publishing a run to an output API
- Adding or removing datasets from a scenario
- Executing custom T-SQL for easy integration

Priority	Task Type	Task Name	Scenario
1	Data Transfer	Market Price Import	
2	Data Transfer	Fuel Prices Import	
3	Execute Scenario		Load Run_Full - 1d
4	Publish Run		Load Run_Full - 1d
5	View Export	Dispatch Schedule	Load Run_Full - 1d
6	Add Dataset	Load Increase 10%	Load Run_Full - 1d
7	Execute Scenario		Load Run_Full - 1d
8	Publish Run		Load Run_Full - 1d
9	View Export	Dispatch Schedule	Load Run_Full - 1d

# About us

## **ABB's Enterprise Software product group**

We provide industry-leading software and deep domain expertise to help the world's most asset-intensive industries such as mining, energy, and utilities solve their biggest challenges, from plant level, to regional network scale, to global fleet-wide operations.

Our enterprise software portfolio offers an unparalleled range of solutions for asset performance management, operations and workforce management, network control, and energy portfolio management to help customers reach new levels of efficiency, reliability, safety and sustainability. We are constantly researching and incorporating the latest technology innovations in areas such as mobility, analytics and cloud computing.

We offer unmatched capabilities to integrate information technologies (IT) and operational technologies (OT) to provide complete solutions to our customers' business problems.

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