

## Product Overview

# System Optimizer



Solution for resource planning, capacity expansion, and emissions compliance for portfolio optimization.

System Optimizer is the portfolio management solution to prepare resource plans, evaluate RFP responses, and develop strategies for current and potential Renewable Portfolio Standards and emissions regulations.

It is a valuable module for resource planners and portfolio managers because it provides the ability to assess and develop strategies to address current and evolving renewable portfolio standards and emissions regulations. The module provides optimal long-term resource plans with the potential options of resource additions, retirement, refurbishment, and changes in operations.

System Optimizer develops long-term, 20 to 30 year horizon, resource investment plans including technology type, fuel, size, location, and timing of capital projects required to meet reliability requirements. The resource alternatives that can be analyzed include demand response, energy efficiency programs, and transmission expansion in addition to new unit construction. The solution uses either Mixed Integer Programming (MIP) or Linear Programming (LP) algorithms for the optimal solution to solve for the desired time period with the existing system as well as alternatives for future expansion plans.

The primary feature of System Optimizer is its ability to analyze renewable portfolio standards and emissions regulations. Renewable portfolio standards can be modeled for the entire portfolio or for multiple jurisdictions. In addition, System Optimizer will also consider a wide range of emissions constraints for multiple emissions. Emissions constraints can be multi-layered and overlapping to simultaneously account for regulations at an individual station as well as system and multi-jurisdiction (state and federal) regulations. This allows the modeling of complex renewable and emissions regulations and provides the ability to develop strategies for current and potential regulations.

The optional hydro module is a detailed water system modeling add-on, which is required for portfolios that include large interconnected river systems. This also allows the user to consider building new conventional and pumped hydro plants as well as refurbishing them.

## Business Uses

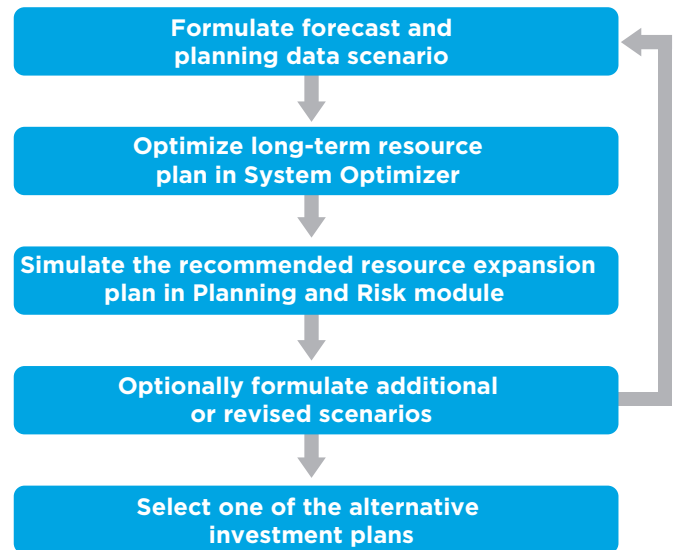
**Integrated Resource Planning:** Power supply planners deal with complexity in meeting their load and contract obligations in the future while considering technology improvements, aging assets, and self-build versus buy options. For instance, utilities create long-term plans to provide a framework for prudent future actions that are required to ensure continued, reliable, and least cost electric service to their customers. These plans must account for not only resource expansion plans, but also renewable and emissions regulations.

**Request for Proposal (RFP) Evaluations:** System Optimizer is a powerful tool for evaluating RFPs for resource acquisition. Companies that procure resources through RFPs are faced with the task of determining the best combination of resources that minimize cost and meet renewable and emissions regulations. In addition, the number of responses may be numerous making the task of identifying the best combination difficult. System Optimizer allows numerous alternatives to be included and is not limited to generic or typical resource types. Therefore, the analysis and selection process requires less time and provides accurate results. The ability to simultaneously evaluate all responses provides a robust result for third-party audits and achieving regulatory approval.

**Environmental Compliance Planning:** Use System Optimizer to include complex emissions compliance rules as well as renewable energy requirements. Using the latest technology, the model is able to determine the optimal investment plan that meets all environmental and reliability constraints. The model considers a large number of alternatives including construction, retirement, multiple retrofit options, fuel blending, efficiency programs, demand response, and emissions allowance trading.

The module allows specification of emissions regulations through the choice of four types of emissions allowance rules:

1. Cap
2. Cap and Trade
3. Rate
4. Price



These emissions allowances can be modeled with and without banking of the emissions.

Organizations that require development of integrated resource plans can use System Optimizer in conjunction with Planning and Risk as depicted in the following workflow diagram. The EnerPride system provides single data entry for System Optimizer and Planning and Risk and allows resource plans to be saved and used in Planning and Risk to provide full hourly chronological simulations to provide operation level detail.

## System Optimizer - Hydro

System Optimizer Hydro includes the additional capability to do long-term resource investment plans including type, size, location, and timing of conventional and pumped hydro projects within interconnected river systems over a long planning horizon. The hydro module is primarily useful for portfolios containing hydro stations that span river systems and include water storage facilities with limits and other constraints affecting hydro operations.

The hydro functionality allows the user to model large hydro systems as shown in the following figure. Typically, these hydro systems contain water storage reservoirs capable of multiple year or seasonal water storage and where the dispatch of the hydro facility is coordinated with other non-hydro resources

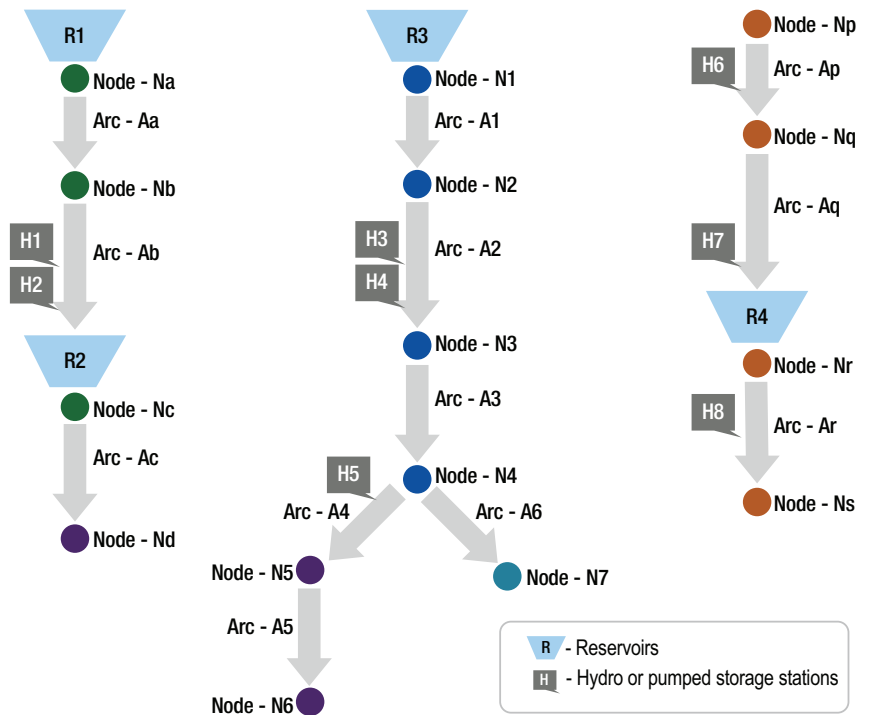
**Different types of entities represent these hydro systems:**

- Hydro Stations
- Pumped Storage Stations
- Hydro Nodes; (Reservoirs, Junctions joining two or more streams), and Ground where water leaves the systems
- Hydro Arcs; the links between the nodes where the stations are connected
- Hydro Basins; to group the river systems for collection for optimization

**System Optimizer – Hydro features include:**

- Hydro Arc provides the linkage of the hydro topology between nodes and models water flow constraints
- Hydro Arc can have one or multiple hydro units associated with different production functions, as well as cascaded
- Ability to represent multiple hydro basins. Hydro Basin can be assigned to each hydro node for selection to simulate or for report grouping
- Monthly water continuity constraint can be applied to each node in the water basin
- The monthly energy results for the hydro unit can be optimized considering the reservoir water conditions (storage) and water topology

Model of a detailed river system topology that has large storages with energy limits that span multiple years and are interconnected in the river system with multiple hydro stations with flow and other constraints.





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