



Aurora Overview Presentation

For APS and TEP/UNSE RPAC
Modeling Committee (RMC)

6/29/2023

Proprietary and Confidential



Agenda

- Aurora Overview
 - What is Aurora?
 - Why Choose Aurora?
 - How Aurora's Used?
 - How it works?
- Aurora Demo
- Q & A

What is Aurora?

A fundamental energy market analysis model.

Designed to forecast electric energy prices.

Also forecasts:

- Market value of generating units
- Market value of contracts and portfolios

Aurora provides information on:

- Resource value
- Portfolio value
- Net power cost
- Risk and uncertainty analysis
- Resource planning

More on Aurora



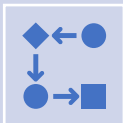
Performs an hourly or sub-hourly chronological dispatch.



The objective function is to minimize the total production cost of the system.

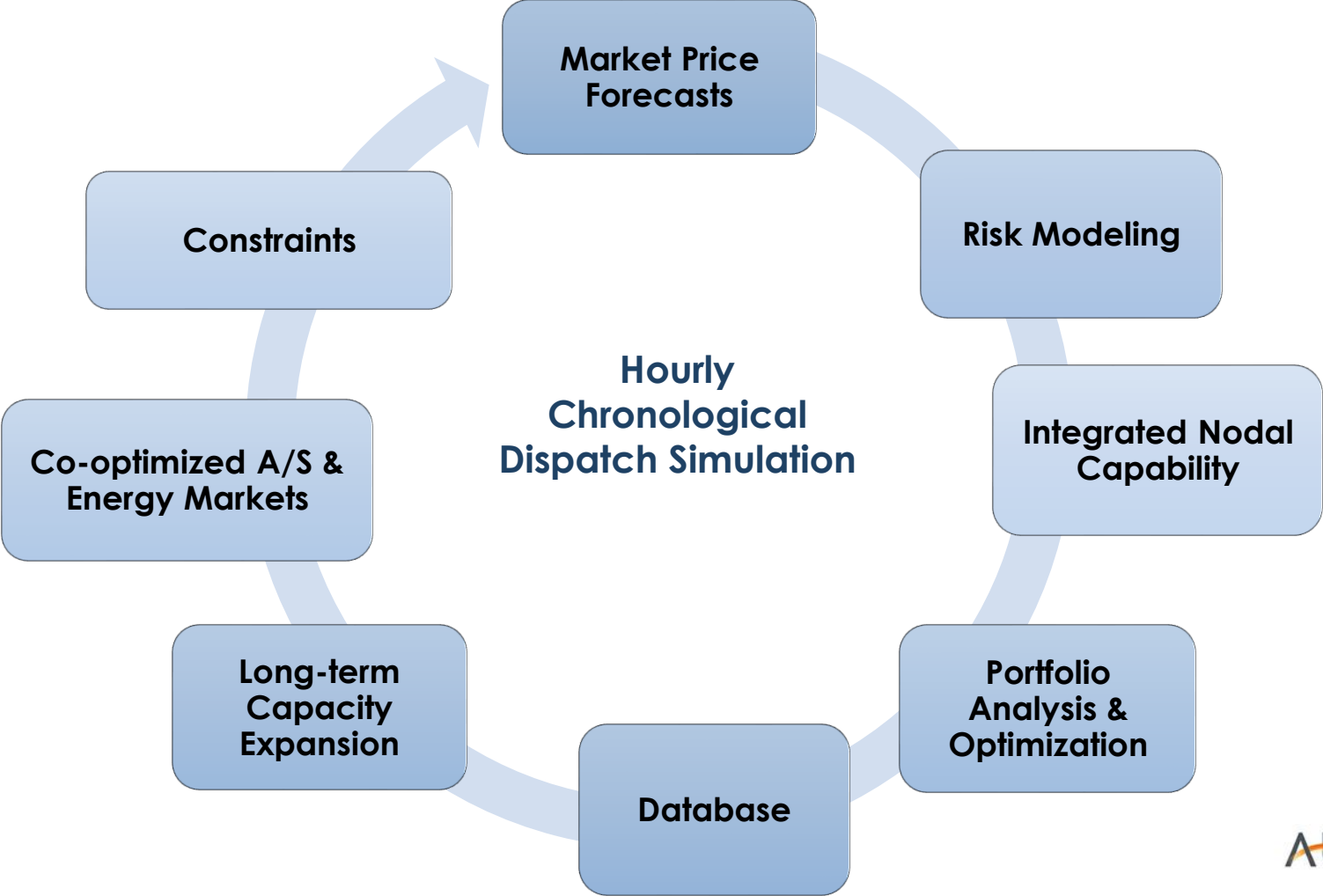


Designed with unified functionality.



Developed using .NET. This offers seamless integration with MS and other products.

Unified Functionality



Why Choose Aurora?

IRP Utilities	Regulators & Planning Authorities	Traders, IPPs, Developers	Research & Consultants
			

Established in 1997

Continued development

Proven in the energy industry

Superior customer support & training

Exceptional user experience

Exceptional User Experience

Easy to use, intuitive interface

Comprehensive Help system

Powerful project management

Data Management:
Change Sets, Excel files,
etc.

Visualization tools

- Output reports for all results (easily export to Excel)
- Customize filters for any I/O

Customer Support & Training



Energy Exemplar Client Portal



Phone & email support



xPert online recorded training program



Knowledge Base Articles & Examples



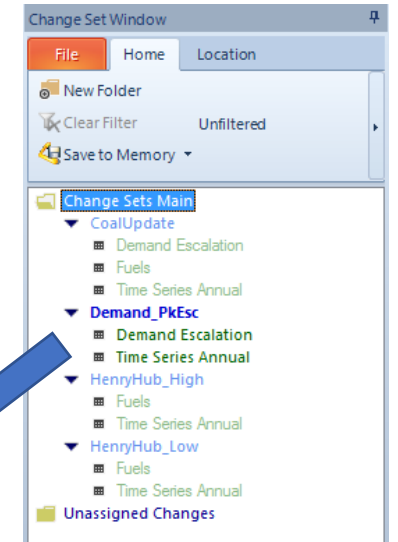
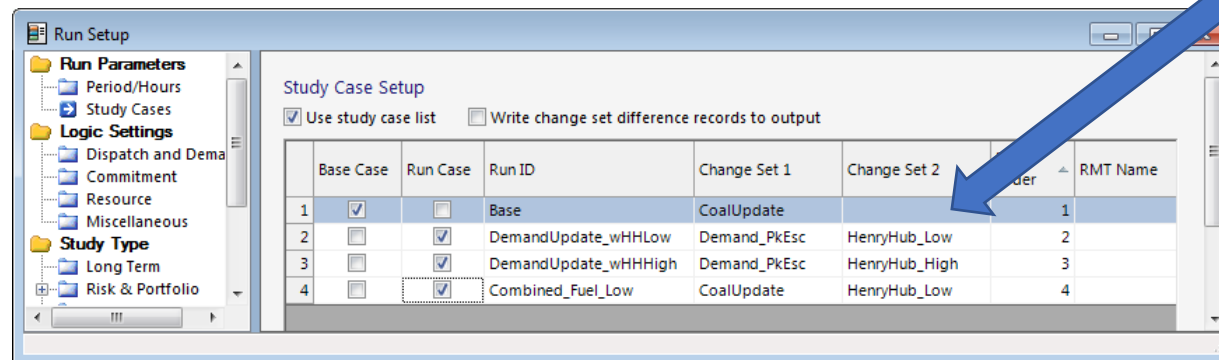
Custom online or onsite training

WORKFLOW MANAGEMENT

Data Management

SCENARIOS

- Change Sets
 - Visibly tracks changes to input database variables
 - Sophisticated application of Change Sets combines layers of changes or easily aggregates changes



Project File Management

SCENARIOS

- Parameter Sets
 - Change project settings such as sampled hours, study type, Input table selection, output database name and location, etc.

Active Study Type

Standard Zonal

Long Term Capacity Expansion

Portfolio Optimization

Maintenance

Nodal

[Customize Study Options](#)

Study Period

Daily Mode

Standard Dates

Start Date: January 2024

End Date: December 2024

Dispatch

Hours: Every Hour

Days: Every Day

Weeks: Every Week

Available Parameter Sets

Name
Typical Week Sampling

Parameters in this set:

Category	Parameter	New Value	Original Value
ProjectSetup	DispatchHours	EveryHour	EveryHour
ProjectSetup	DispatchDays	EveryDay	EveryDay
ProjectSetup	DispatchWeeks	SecondWeek	EveryWeek

Workflow Efficiency

POWERFUL PROJECT MANAGEMENT

- Study Cases
 - Change Sets
 - Parameter Sets
- Easy to share with team members

The screenshot displays the Aurora software interface for configuring study cases. It is divided into several sections:

- Active Study Type:** Includes radio buttons for Standard Zonal (selected), Long Term Capacity Expansion, Portfolio Optimization, Maintenance, and Nodal. A 'Customize Study Options' button is located below.
- Study Period:** Features a 'Daily Mode' checkbox, a 'Standard Dates' dropdown, and date pickers for Start Date (January 2024) and End Date (December 2024). It also includes 'Dispatch' settings for Hours (Every Hour), Days (Every Day), and Weeks (Every Week), a 'Pause at the First' date (01/01/2018), and a 'Sub-Hourly Settings' section with a 'Use Sub-Hourly Dispatch' checkbox.
- Study Cases:** Contains radio buttons for 'Run Using Active Edits' and 'Run Using Study Case List' (selected). Below is a list of 'Available Study Cases' with checkboxes: Base Case All Hours, Typical Week Sampling, High NG Fuel Scenario (highlighted), and Low NG Fuel Scenario. An 'Advanced Editor' button is to the right.
- Selected Case Details:** Includes input fields for Run ID (High NG Fuel Scenario), RMT Name, and Parameter Set (Typical Week Sampling). Below this is a 'Selected Change Sets' section with a list containing 'High NG Price Scenario' and buttons for 'Select Change Sets' and 'Select Partial Change Set'.
- Bottom Section:** Contains 'New Case' and 'Delete Case' buttons, and a checkbox for 'Write Change Set Difference Records To Output'.

How is Aurora used?

Generation Planning/ Budgeting

- Integrated resource planning
- Budget projections
- Detailed generator analysis
- Assess RPS and environmental policies

Trading Support

- Short term analysis (often nodal)
- FTR analysis
- Highly automated (e.g. data feeds)

Transmission Planning

- Frequency and value of constraints
- Production cost impacts
- Infrastructure studies

Market Assessment/Strategy

- Zonal & Nodal price forecasting (hourly &/or sub-hourly)
- Scenario based and probabilistic
- Risk & Portfolio analysis
- Market design and policy analysis (CPP)

Aurora Market Fundamentals & Modeling Methodology

Market Fundamentals



Supply - Generation

Demand

Transmission

Fuel Price

Constraints

Operating Reserves

Supply - Generation



Baseload Resources (Nuclear, Must Run)



Commitment Resources (Coal, Gas)



Renewable Resources (Wind, Solar, Geothermal)



Hydro (Run-of-River, Reservoirs)



Energy Storage (Batteries, Pumped Storage)



Conservation & Load Control

Commitment Optimization

Mixed-Integer programming (MIP)

Commitment Units: Minimum up-times, Minimum down-times, Minimum capacity, Start costs

Look Ahead: Looks over current day plus user-specified additional forecast days to determine unit commitment & dispatch.

Seeks to minimize total production cost across the system.

Constraints



Fuel



Energy



Renewable Portfolio Standards (RPS)



Emissions



Capacity



Transmission Links

Operating/Ancillary Reserves



Co-optimized energy and ancillary reserve requirements



Spin, Non-Spin, Regulation (up & down) reserves



Reserves based on generation



Reserves based on demand



Reserves based on fixed MW values

Commitment & Dispatch Decisions



All system characteristics present in optimization in full detail

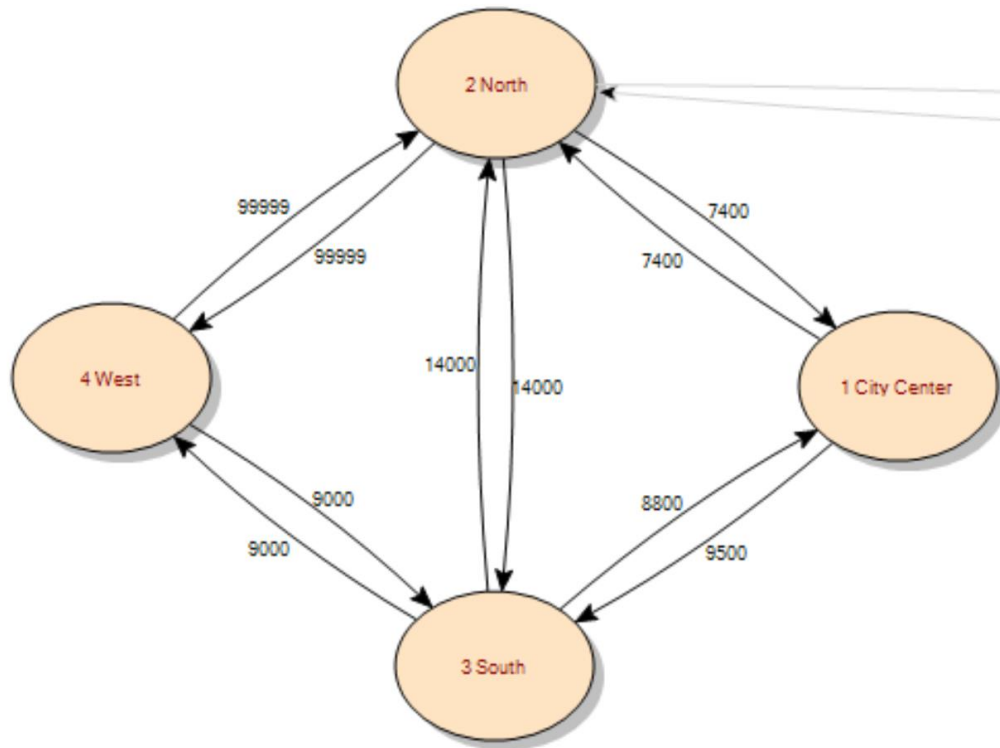
All resource data
Constraints
Zone demand
Zone link limits, multi-link limits
Wheeling, Losses
Operating / Ancillary requirements



Dispatch/commitment essentially solved simultaneously

Commitment decisions have full view of dispatch

Modeling Methodology



Solves the whole system dispatch simultaneously.

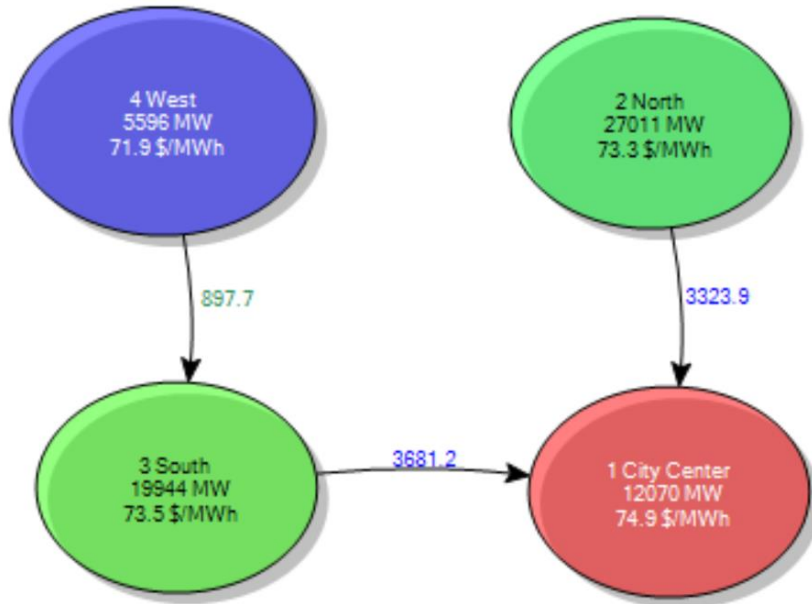
Dispatches hourly (with sampling capabilities, where appropriate).

Determines the market-clearing prices from resource marginal dispatch cost.

Values all the resources in the system.

Provides price and value forecasts for each time period being studied.

Zone Price Forecast



Marginal Resource

Fuel, Variable O&M, Emissions

Demand

Transmission

Wheeling

Aurora Demo

Thank You.

