

Overview Presentation: 2006 PowerWorld Client Conference

AURORA^{xmp}[®]

June 2006
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AURORA^{xmp}[®] Nothing Compares

Solid Market Fundamentals

- AURORA^{xmp} is a price forecasting and analysis software tool based on the fundamentals of the competitive electric market.
- AURORA^{xmp} applies economic principles and dispatch simulation to model the relationships of supply, transmission, and demand for electric energy to forecast market prices.

An Integrated Solution

- Detailed wholesale price forecasts (short or long-term)
- Resource/contract valuation and power costs
- Risk/Uncertainty analysis
- Automated capacity expansion/optimization

eXtensible Modeling Power

- Superior model control
- Unparalleled data management & integration with other applications
- Advanced scenario/project management
- Customizable interface

Interface to PowerWorld Simulator

- Fully Integrated with AURORA^{xmp}
- Control of PowerWorld Simulations
- Powerful Output Processing Tools

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Designed to Make Modeling Easy

- **North American Database**

- All NERC regions
- Area and Zone Demand
- Fuel Prices
- Zonal Transmission
- Resources
 - Hydro Energy
 - Renewable (Wind, Solar)
- Database and Model Updates included



- **Intuitive User Interface**
- **Flexible Area Consolidations**
- **Strong Customer Support & Training**

"The customer support from EPIS is one of the strongest aspects for us in making the decision to purchase and continue using AURORA XMP. EPIS customer support staff members are always available and so well versed in every aspect of the model. They really provide valuable insight in what to do when you are trying to get a certain result."

--Daryck Riddel, Market Analyst, TransAlta Energy Marketing

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Model Logic

- **Commitment Logic**
 - Economic Price Based Unit Commitment
 - Reliability Pool Based Unit Commitment
- **Hydro Logic**
- **Dispatch Logic**
- **Bidding Logic**
- **Emissions Logic**

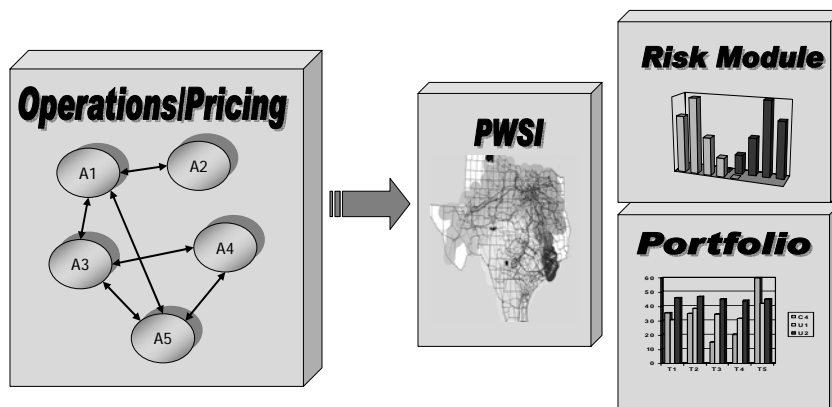
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Unrivalled Data Management

- **Generalized Time Series**
 - Hourly, Daily, Weekly, Monthly, Yearly
- **Custom Reporting**
 - Input Data, Output Data, Mid-simulation Data
- **Scenario Management**
 - Change Sets
- **Getting Data Into and Out of AURORA^{xmp}**
 - Automate Data Management
 - MS Excel and MS Access
 - Computational Data Sets (CDS)
 - VB and .Net scripts
- **Mid-Simulation Data Modifications**
 - Computational Data Sets (CDS)
 - VB and .Net scripts

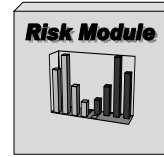
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AURORA^{xmp} Pricing Engine Provides Foundation for Superior Capabilities



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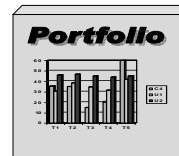
Risk/Uncertainty Analysis



- **Integrated risk simulation on a defined set of variables**
 - Uses core pricing engine, not a post processor
 - Monte Carlo or Latin Hypercube sampling of price drivers
 - Demand, fuel prices, resource outage, transmission, & hydro generation.
 - Built in sampling distributions.
 - Flexible time period definition for stochastic variables.
 - Correlated variable specification (positive or negative)
- **Full output reported for each risk iteration**

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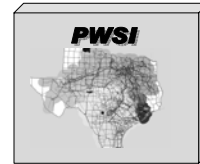
Portfolio Analysis



- **Valuations**
 - Portfolios
 - Resources
- **Portfolio Resources, Contracts & Loads**
 - Detailed power production costs (net of market purchases and sales)
 - Numerous contract-types supported
- **Scenario Analysis**
- **Easily combined with risk analysis**

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PowerWorld Simulator Interface (PWSI)



- **Fully Integrated with AURORA^{xmp}**
- **Control of PowerWorld Simulations**
- **Powerful Output Processing Tools**
 - Output from PowerWorld
 - Compare Output from AURORA^{xmp} and PowerWorld Simulator.

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Transmission Planning/Expansion Hurdles

- **Increasing pressure by PUC's/RTO's etc. to identify system economic benefits for transmission projects**
 - Transmission models provide a static “snapshot” of the system under study
 - Reliability based (traditional) transmission analyses identify system “weak spots” utilizing cases that assume a fixed load and generation pattern
 - Additional scenarios possible, but must be individually modeled and assigned an appropriate “weight”
 - Difficult to accurately estimate annual benefits from either a single case or a small set of cases
- **LMP, FTR values**
 - Generation and load profiles significantly impact LMP, FTR values
 - Again, an estimate of the likelihood of the patterns in the modeled case(s) must be developed

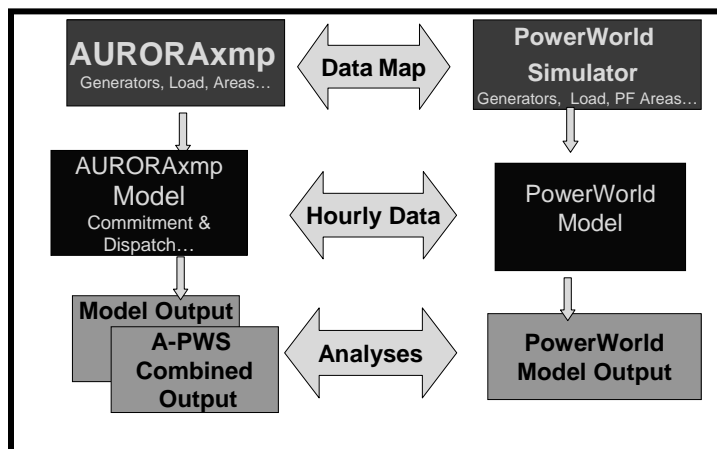
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PWSI Benefits

- By utilizing the strengths of AURORA^{xmp} and PowerWorld Simulator these hurdles can be overcome.
 - AURORA^{xmp} provides a consistent chronological analysis.
 - User controls granularity of OPF/SCOPF solution
 - User defined hours to 8760 hours per year
 - Aurora updates key parameters on an hourly basis
 - Loads
 - Generation costs
 - Generator availability
 - PowerWorld Simulator provides state of the art transmission analysis
 - The resultant system economic impacts/FTR values derived from the appropriate use of each provides a consistent analysis based on diverse system conditions

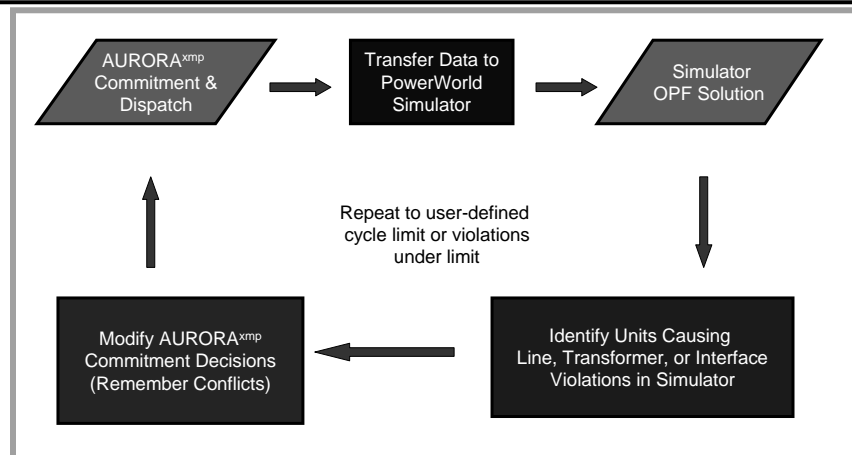
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AURORA^{xmp}-PowerWorld Simulator Interface Modeling Controls



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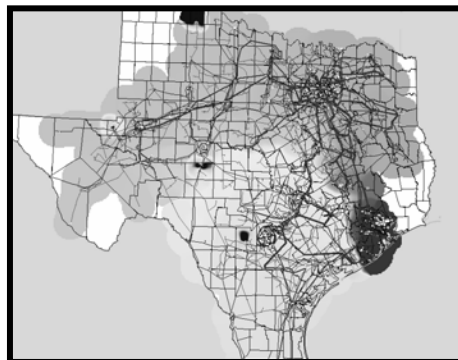
AURORA^{xmp}- PowerWorld Feedback



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AURORA^{xmp} - PowerWorld Results

- **Full PowerWorld Capabilities for Nodal and Power Flow Analysis**
 - Analysis, Graphics, Reports...



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Getting Data Into and Out of AURORA^{xmp}

- **AURORA's input database delivered in XML and MS Access**
 - User may import tables from MS Excel or MS Access.
- **AURORA's output database can be:**
 - XML
 - Zipped XML
 - SQL Server
 - MS Access
 - mySQL

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Results - Focused Output

Detail by Zones and Hubs

- Reported for all and/or user specified time periods

Resource Operation

- Detailed resource information
- Resource Value
 - Both existing and new projects

Resource Stacks

- Zone
- Area

Portfolio and Power Costs

- Net costs and energy
- Contracts
- Resources

Fuel

- Usage
- Price

Transmission

- Use/Congestion

	Hourly	Daily	Monthly	Annual	Study Summary
Fuel	Yes	Yes	Yes	Yes	Yes
Fuel x Zone	Yes	Yes	Yes	Yes	Yes
Hub	Yes	Yes	Yes	Yes	Yes
Link (Transmission)	Yes	Yes	Yes	Yes	Yes
New Resource	Yes	Yes	Yes	Yes	Yes
Pool	Yes	Yes	Yes	Yes	Yes
Portfolio	Yes	Yes	Yes	Yes	Yes
Resource	Yes	Yes	Yes	Yes	Yes
Resource Emissions	Yes	Yes	Yes	Yes	Yes
Resource Group Emissions	Yes	Yes	Yes	Yes	Yes
Resource Stack	Yes	Yes	Yes	Yes	Yes
Zone Emissions	Yes	Yes	Yes	Yes	Yes
Zone Prices	Yes	Yes	Yes	Yes	Yes
Risk	Yes	Yes	Yes	Yes	Yes

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Proven

- AES
- American Electric Power (AEP)
- American National Power (ANP)
- Arclight Capital
- ATCO Power Canada Limited
- Avista
- Bonneville Power Administration (BPA)
- Bruce Power (Ontario)
- Cambridge Energy Research Associates (CERA)
- CLECO
- Coral Energy
- EPCOR
- FPL Energy
- Hydro Quebec Distribution
- Northpoint Energy (SaskPower)
- Northwest Power & Conservation Council
- Pace Global Energy Services
- Portland General (PGE)
- Platt's Research and Consulting
- PPL Corporation
- PPM Energy Marketing
- Puget Sound Energy (PSE)
- TECO Energy
- Tenaska
- TransAlta Energy Marketing
- TransCanada
- WA Util. & Trade Commission (WUTC)
- Wood Mackenzie
- Xcel Energy

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