The Utility Fuel Economics – National Power Model Forecasting System

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Outline

- How Our Models Work
- Factors Affecting Electric Plant Dispatch
- Factors Affecting New Plant Construction
- Modeling as a Business
Figure I-1

Hill and Associates, Inc.
Electric Generation, Coal and Emissions Forecasting System

National Power Model™
- Dispatch Economics
- 90+ Control Areas
- Seasonal/TOD Prices, Flow & Gen.

Demand Model
GDP
Weather
Electric Intensity

Regional Emission Limits
- SO2, CO2, NOx

Transmission
- Bi-Directional Simultaneous Flows
- Seasonal Limits
- Time-of-Day Rates

Utility Fuel Economics Model
- Fuel Switching
- Clean-up Equip Choices
- Allowance Trading

Coal Supply Curves
- Cash Cost by Mine
- All Regions
- By Coal Type

Generation Database (all units)
Seasonal Dispatch Costs, Emission Rates
Generation Cost Supply Models
- New Build
- Gas & Oil Forecast

Coal Plant Costs & Emissions Forecast
Coal Plant Energy Demand

Plant/Area by TOD
- Generation
- Power Flows
- Marginal Prices
- Emissions

Generation Database (coal units)

Strategies for
- SO2
- NOx
- Particulates

Demand
- Industrial
- Commercial
- Residential

International Coal Trade Model
Coal Marginal Cost Models

Generation Compliance Models

I-2
Factors Affecting Dispatch

- Pure Economics
- Nuclear/Hydro Availability
- Severity of NOx & SO2 Restrictions
- Transmission Bottlenecks
Dispatch Costs - Gas and Coal Units

![Graph showing dispatch costs for gas and coal units. The y-axis represents the cost per MW-Hr, ranging from $0 to $100, and the x-axis represents TW Hrs Available Capacity, ranging from 0 to 3000. The graph shows two lines: one for coal and one for gas. The coal line is shown as a red line with diamonds, while the gas line is shown as a green line with squares. The cost per MW-Hr increases significantly as TW Hrs Available Capacity increases.]
Nuclear/Hydro Availability

• In the Next 15 Years, Many Nuclear Plants Either Retire or Re-license
  – Through 2010, we have 5,617 MW retiring
  – In 2011-2015, we have an additional 18,318 MW retiring

• Hydro plants are under attack
  – Licenses are typically 30-40 years
  – In 2005-2007, over 11,000 MW renewal
Hydropower Re-Licensing

Capacity (MW) At Risk

- 1999: 223
- 2000: 350
- 2001: 2,068
- 2002: 228
- 2003: 1,378
- 2004: 951
- 2005: 4,141
- 2006: 2,427
- 2007: 4,620
- 2008: 1,263
- 2009: 755
- 2010: 408
U.S. + Canada Elec. Fuel Shares (With Diff. Environmental Rules)
Projected Tonnage Increases at Coal-Fired Power Plants 2000 - 2005

Increase in Ktons Per Year
- Less Than 0
- 0 - 199
- 200-1000
- 1000-3000
Factors Affecting New Utility Plant Construction

- Pure Economics
  - Natural Gas vs Pulverized Coal Plant
  - Natural Gas vs Gasified Coal Plant

- Politics
  - Bias
  - Uncertainty
New Coal Units Lose to Gas at Low Gas Prices, But Win Easily at Today’s Market Levels
“... As we all know, we have to stop using coal to generate electricity.”

- EPA official, at a recent conference in Washington, D.C.
Market Power Issues --The “What If” Capability--

- Environmental Rules Change
- Reluctance to Invest in Cleanup Capital
- Some Unexpected Nuclear Plants Don’t Re-license

- An Individual Utility (or two) Withhold Some of their Power
- A Coal Supplier (or two) Withhold Tonnage
- A Railroad (or two) Lower/Raise Prices
Modeling as a Business

• Defining Your Product
  – Are you providing a tool, “canned” analysis, custom analysis, forecasts (pt. vs range), multi-client studies

• Communicating Your Results
  – Getting it onto the client’s level
  – Explaining variance from the “real-world” (What’s important; Perception; Usefulness)