



Modeling Short Term Regional U.S. Electricity Market

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Outline

- ❖ Purpose of the electricity model
- ❖ Design requirements
- ❖ Model structure
- ❖ Comparison of natural gas and coal from model results with historical data
- ❖ Challenges



Purpose of the model

Provide a link to the new integrated regional energy system in answering region specific questions:

- ❖ Summer electricity market
- ❖ Natural gas market
- ❖ Winter heating fuel market



Design Requirements

- ❖ Use all available EIA data to build a model capable of simulating dispatching decisions of fossil power plants
- ❖ Capable of tracking the effects of demand and capacity on dispatching



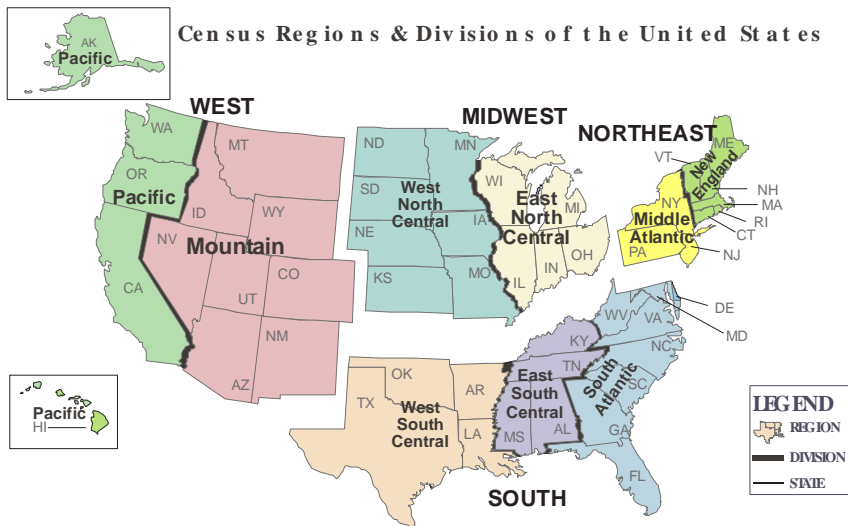
Model Structure -1of 2

- ❖ The regional electricity model has 13 regions, which are grouped into three trade zones:
 - ✓ Eastern Interconnection
 - ✓ Western Interconnection
 - ✓ Texas

- ❖ Each region has its own demand and supply representations

- ❖ A 14th region (Hawaii + Alaska) is treated separately (and simply) for completeness in deriving U.S. aggregate demand and supply

RSTEM 13 Electricity Demand and Supply Regions



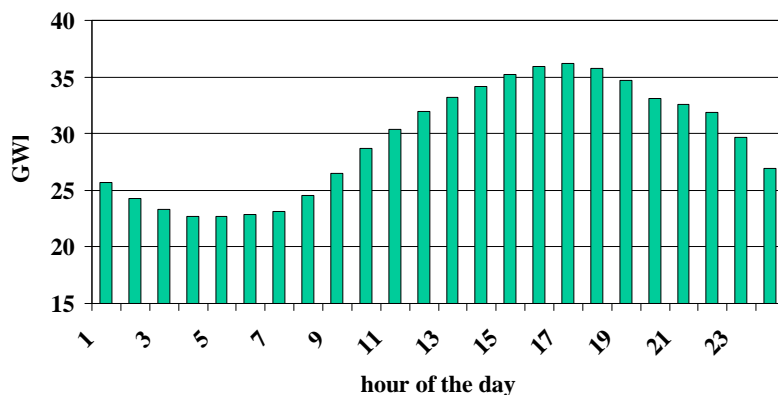


Model Structure -2 of 2

- ❖ For each region, an average daily 24-hour load curve is derived from monthly demand, historical load data and temperature.
- ❖ Supply curves are created from the EIA860 generator data file, which reports capacities and heat rates
- ❖ The model searches for a minimum-cost supply which meets hourly demand.

California Actual System Load

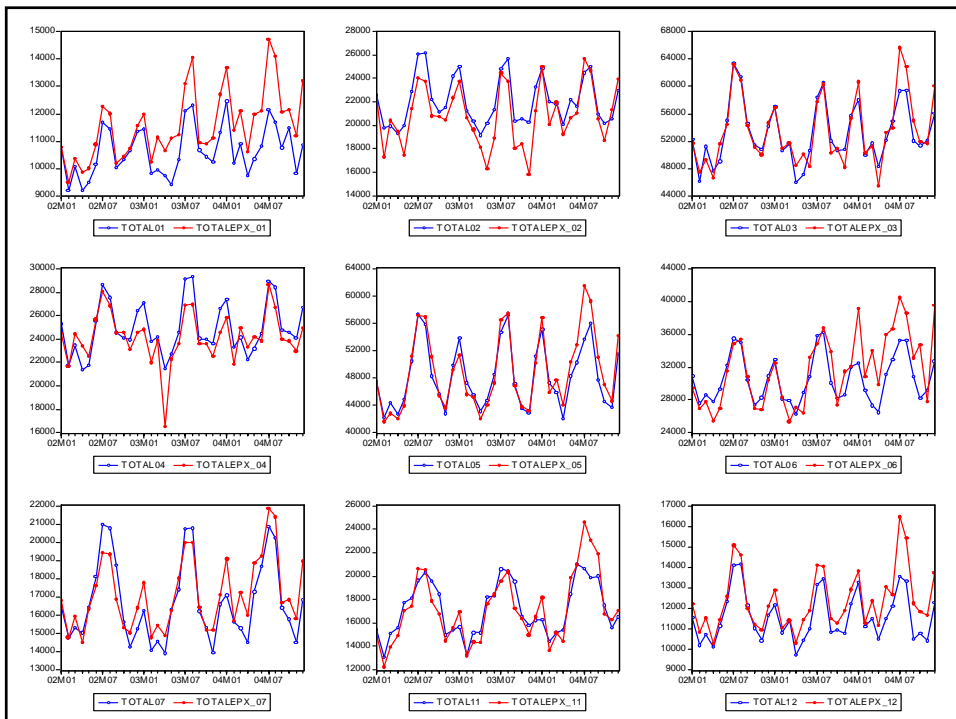
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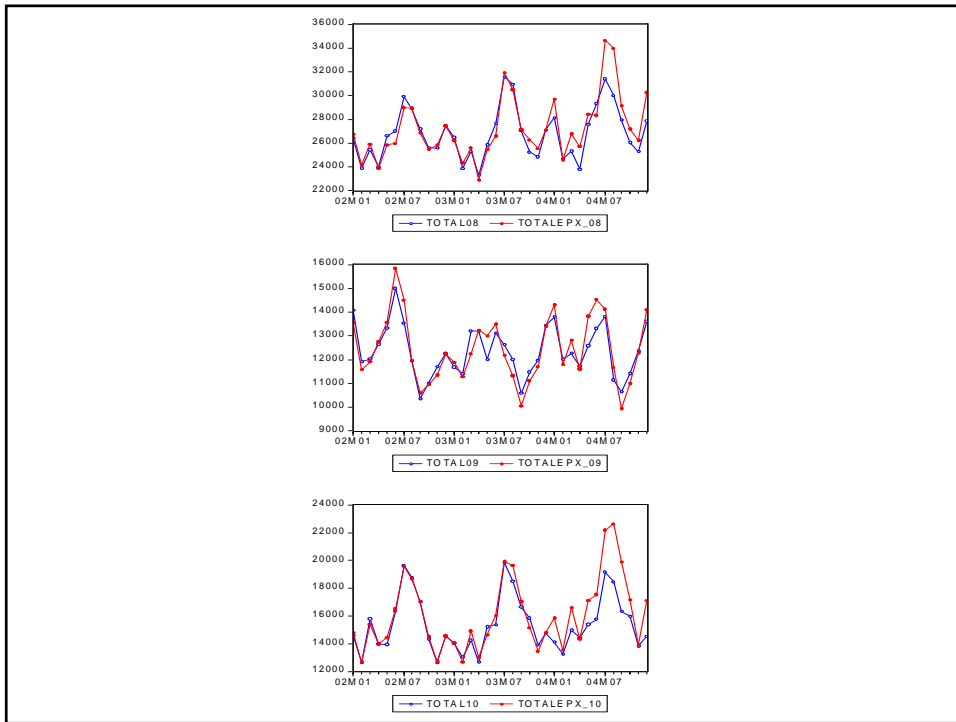




Preliminary Simulation Results

- ❖ Regional total generation
- ❖ Comparison of coal and natural gas in Eastern and Western Trading Block
- ❖ Comparison of regional power generation from coal and natural gas.

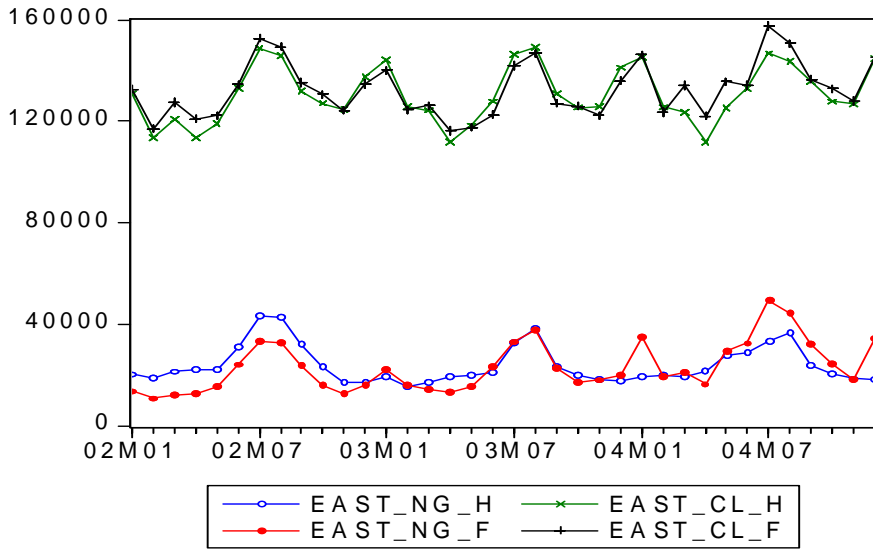




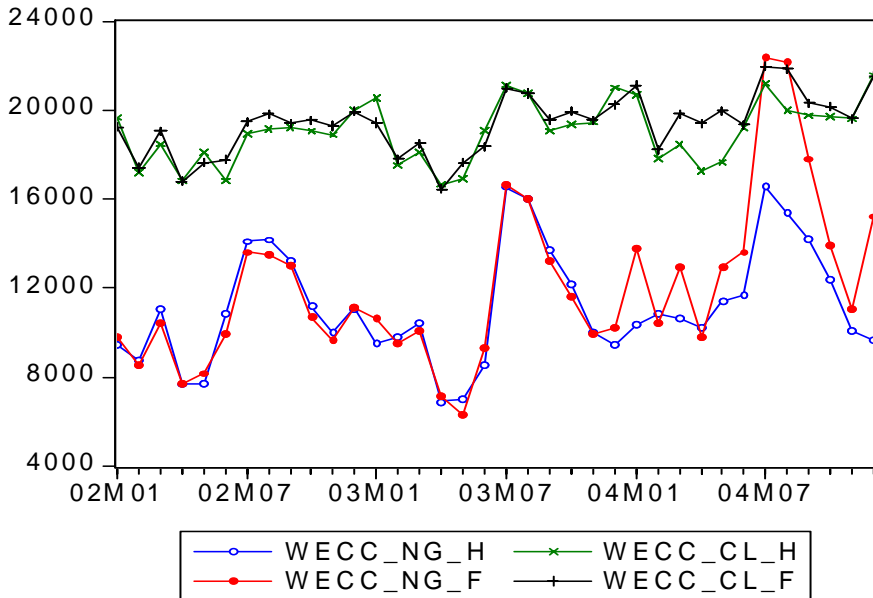
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Comparison of Eastern Interconnection



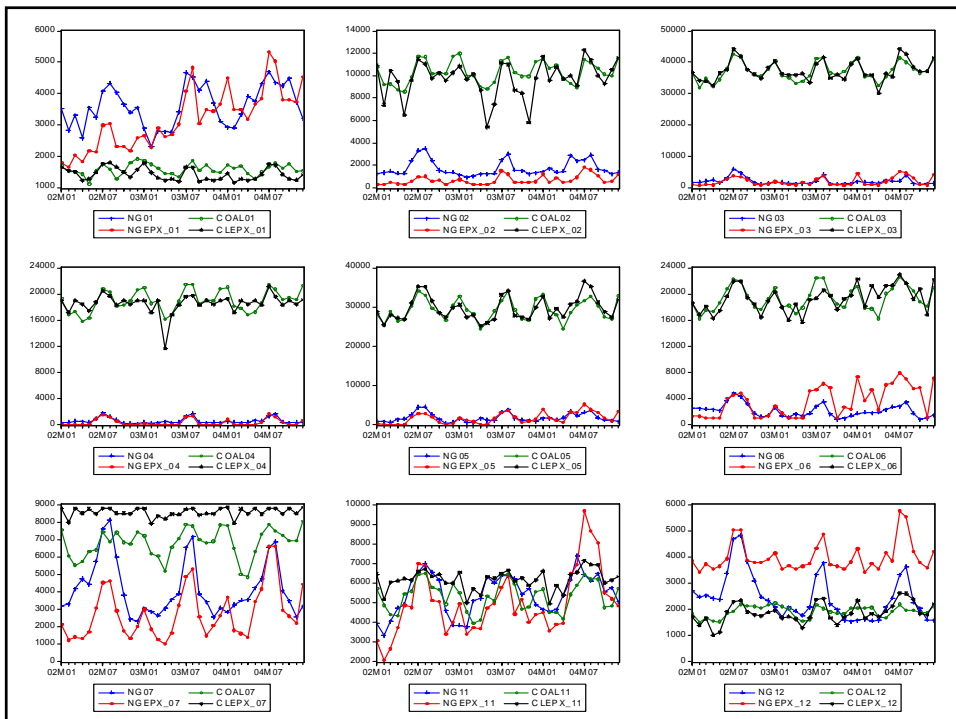
Comparison of Western Interconnection

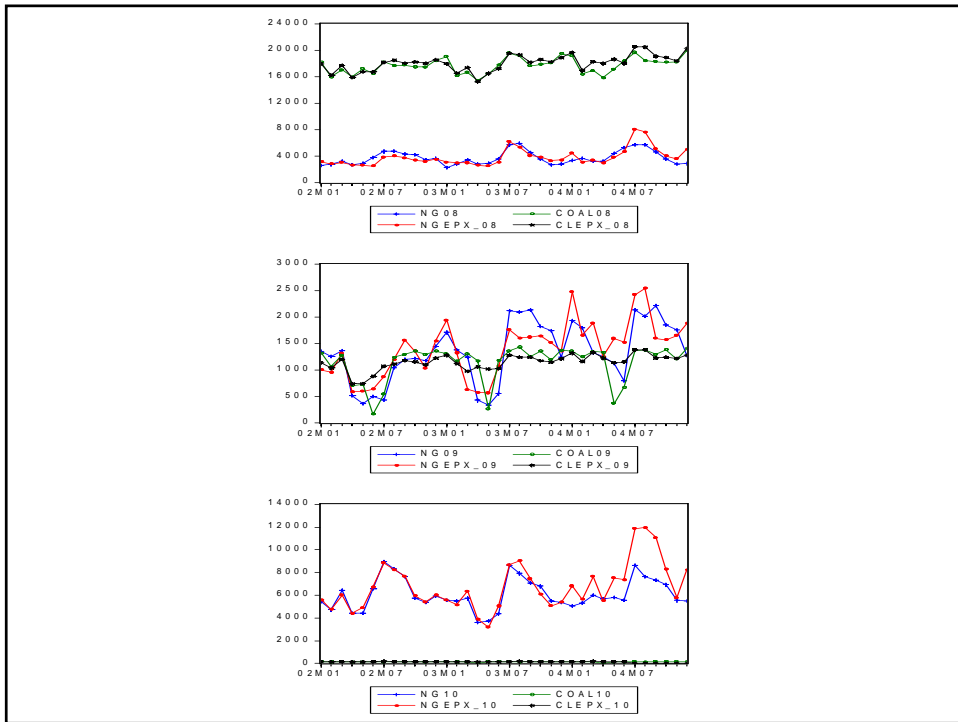




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Challenges

- ❖ Capture inter-regional power flow
- ❖ Analyze transmission constraints on flow pattern
- ❖ Assess power reliability