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Inputs & Assumptions for IEPR Electricity System Modeling

California Energy Commission

Richard Jensen

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Supply Analysis Branch, Energy Assessments Division
California Energy Commission

Topics for Discussion

- PLEXOS Model and Model Settings
- Data Inputs & Sources
- Modeling Assumptions

PLEXOS Model & CEC IEPR Database

- By Energy Exemplar
  - Production Cost Model
  - Least Cost Dispatch Optimization
  - Licensed by many CA / Western Interconnect Regulatory Agencies and Utilities
  - CEC IEPR database
    - Public data, available to all, must license PLEXOS to use / read

IEPR Database & Results - Uses and Users

Uses

- Greenhouse gas emissions in electricity sector
- Modeling natural gas demand for electricity generation – CA Gas Report
- Wholesale electricity prices for rate forecasting
- Time Dependent Valuation – Efficiency Division

Users

- Academic Institutions & Students
- CA Electric & Gas Utilities
- Consulting firms

PLEXOS Model Settings

- Regional (Zonal) aggregation of Loads & Resources
- IEPR studies are “deterministic”
- Every hour of forecast “horizon” simulated
- One day “look-ahead” for better results
- “Linear” modeling approach for significant time savings

Input Data & Sources

- State and Federal-level data sources
  - California
    - CEC (demand forecast, NG prices)
    - QFER (historical gen data, MW, new adds)
    - CPUC Preferred System Plan (RE additions)
  - Western Interconnect data from WECC & EIA
    - Plant characteristics
    - Demand forecast (outside CA)
    - Policy information (state RPS, clean energy)

WECC
Electric Reliability and Security for the West

Input Data & Sources (cont.)

- Utility Integrated Resource Plans (IRPs)
  - Loads, resources, “preferred plans”, compliance methods
  - Not uniform in any way between states
  - Lengthy, very detailed, many throughout western states

Modeling Input Examples – Physical System

- Plant Characteristics (CEC, EIA)
  - Capacity, efficiency, planned retirements, monthly hydro gen
- Demand profiles
  - Hourly load profiles at utility / BAA level (CEC, EIA, WECC Anchor Data Set (ADS))
  - Load Modifiers (AAEE, BTMPV)
- Modeling System Constraints
  - Minimum generation, import / export limits (MW)

Modeling Input Examples – Economic Variables & Sources

- Fuel Prices
  - Natural gas (CEC), coal and uranium (EIA)
- Wheeling rates for imports / exports (ADS, consultant reports)
  - No costs for internal CA flows, no CO2 calc for exports
- Variable operation & maintenance costs - ADS
- CO2 prices (CA and AB)
- Start costs for thermal plants - ADS
- Moody's Deflator for inflation adjustment

Modeling Assumptions

- Resource additions – “generic” (unnamed, yet to be built) to meet RPS
  - Locations, resource types, capacity
- Hydroelectric generation
  - Plant monthly average for past 15-years
- Policy driven assumptions
  - Renewable portfolio standard, clean energy mandates are met

Modeling Assumptions (cont.) – CA RPS / Battery Adds.

Year	Solar	Battery	Wind	Offshore Wind	Geothermal	OOS Wind
2023	3,410	3,025	1,377	0	89	0
2024	5,610	8,598	1,707	0	89	0
2026	10,010	10,103	3,198	120	159	0
2030	14,996	11,181	3,198	195	1,135	1,500
2032	18,160	12,357	3,198	1,708	1,135	1,500
2035	25,660	16,434	3,198	1,708	1,135	1,500

Modeling Assumptions (cont.)

- Planned retirements, additions, fuel-switching for out of state plants based on available information

- Once through cooling units
  - Natural gas units essentially retired
  - Diablo Canyon retiring in 2024 and 2025 – subject to extension
- Transmission expansion in western interconnect
  - Follow ADS lead

Questions and Comments

Thank you!

For follow-up questions:

Richard Jensen

Richard.Jensen@Energy.ca.gov