THE ART OF THE POSSIBLE: IRP

CONSIDERING STATE-WIDE AND REGIONAL PERSPECTIVES IN INTEGRATED RESOURCE PLANNING

Horizons Energy

Indiana Contemporary Issues Conference

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IRP'S HAVE BECOME MORE COMPLEX

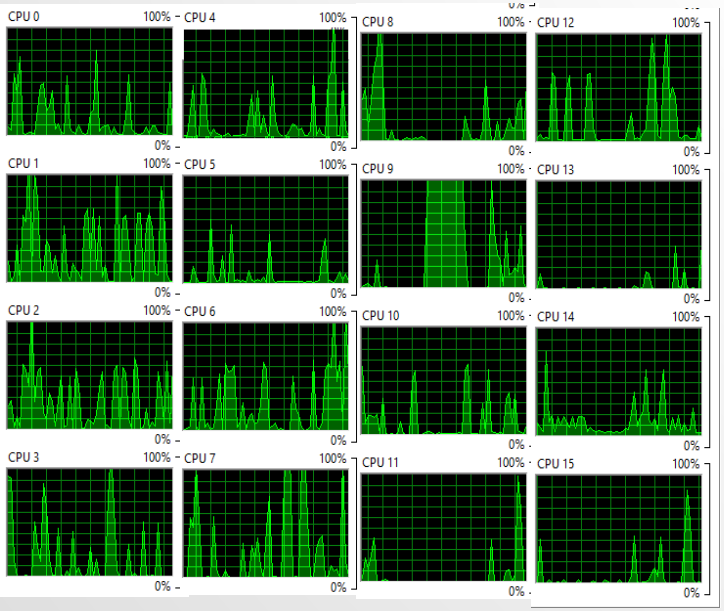
- Modeling:
  - Integration of alternative resources
  - Strategic retirements/repower
  - Greater emphasis on intermittent resources
- Process: role of stakeholder

IRP (MODELING) IS THE "ART OF THE POSSIBLE"

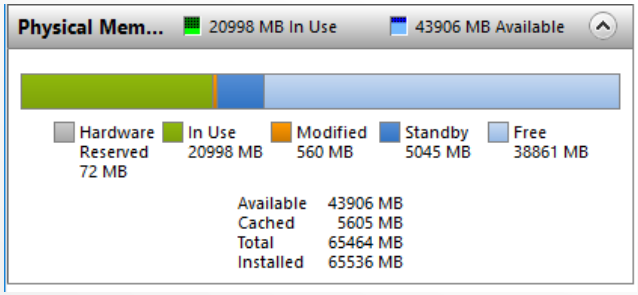
- The size and scope of the tools have finite limits: memory and run-time
- The art
  - Incorporate the relevant aspects of the analysis
  - Have sufficient simulation detail to capture costs/benefits of decisions
  - Design a solid framework for studying future decisions and uncertainties
- Knowing:
  - What is contributing to time/size of the problem
  - What level of detail is required to perform the study
- Killers are number of constraints:
  - time intervals (years, hours/year),
  - number of resources
  - number of integer variables (unit commitment, ramp and build/retire)
  - heavily constrained system

POWER MODELS, MACHINES, METHODS HAVE EVOLVED

- Big memory, 64 bit processors, parallel processing
- Tools: MIP/LP, third party solvers
- One tool/one database/many applications



Example of 16 Core 64 GB Machine: Permits Evaluation of Larger Problems



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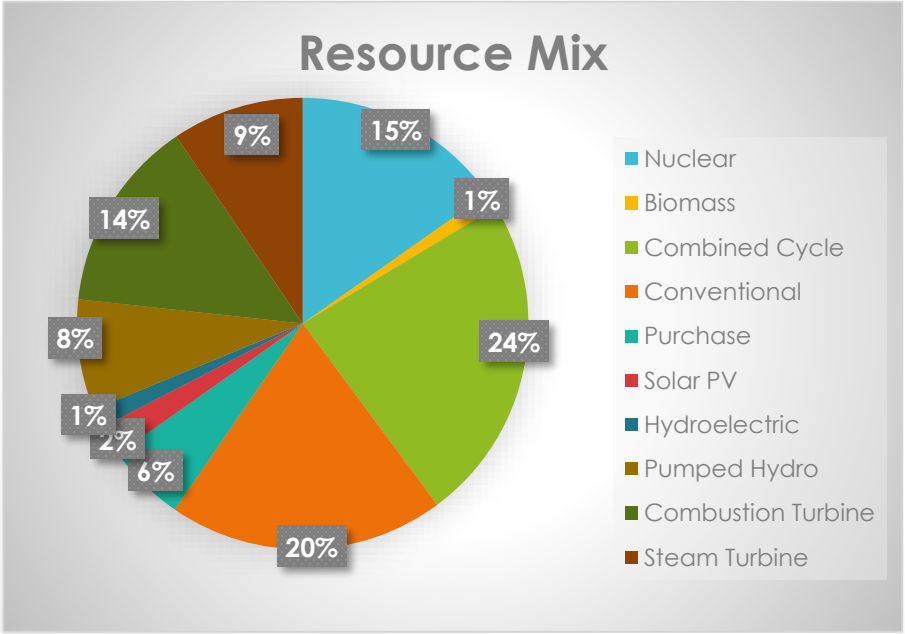
TESTING THE ART OF THE POSSIBLE

- State-wide resource plan?
- Database
  - 18 k MW peak demand
  - 22 k MW (86 commitment and dispatchable resources)
  - 11 expansion technologies
  - 8 retirement options
- Example capability:
  - 20 years
  - Typical week per month
  - Integer optimize resource expansion
  - Full commitment and dispatch
  - Co-optimization
    - Energy
    - Ancillary Services
    - Capacity Expansion
    - Strategic Retirement



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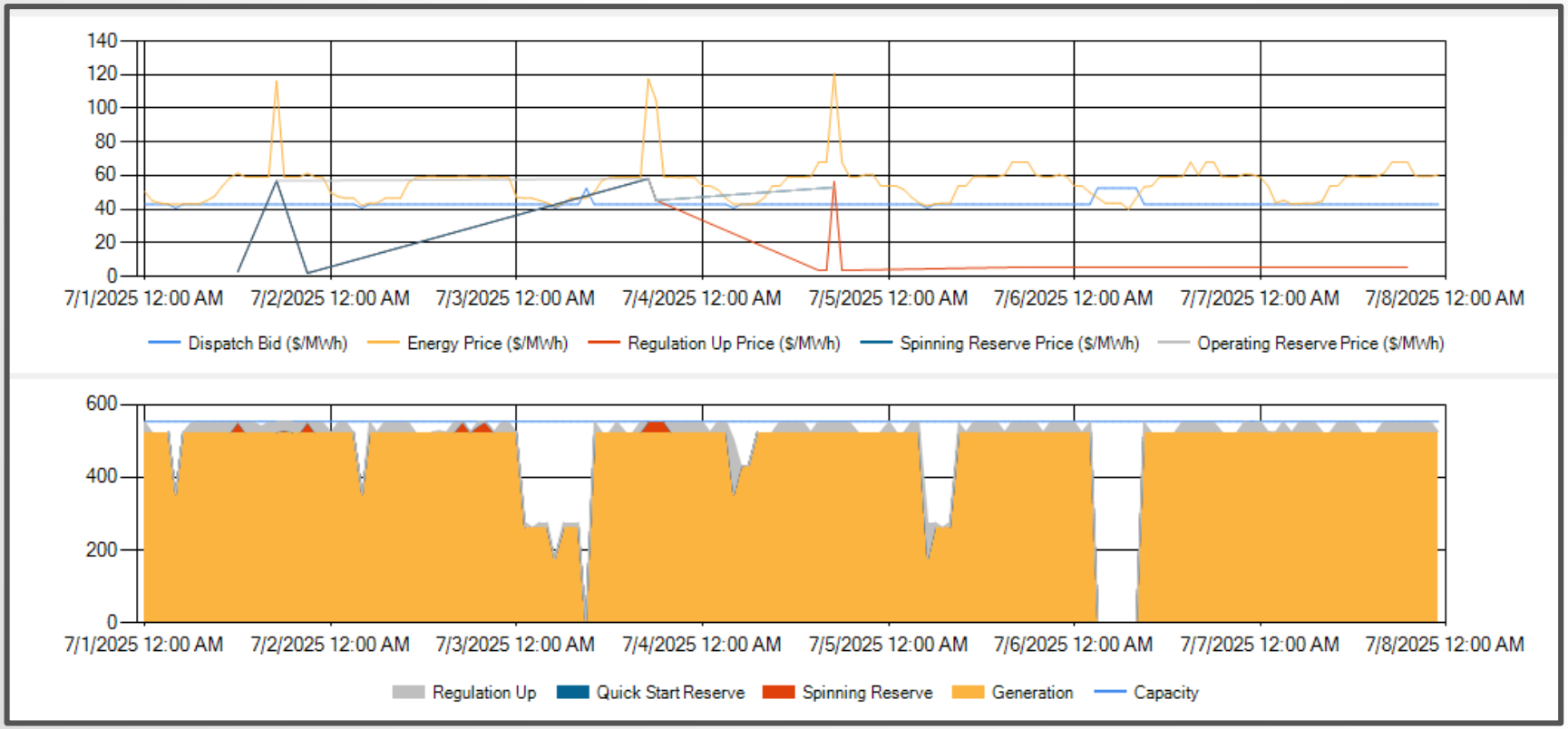
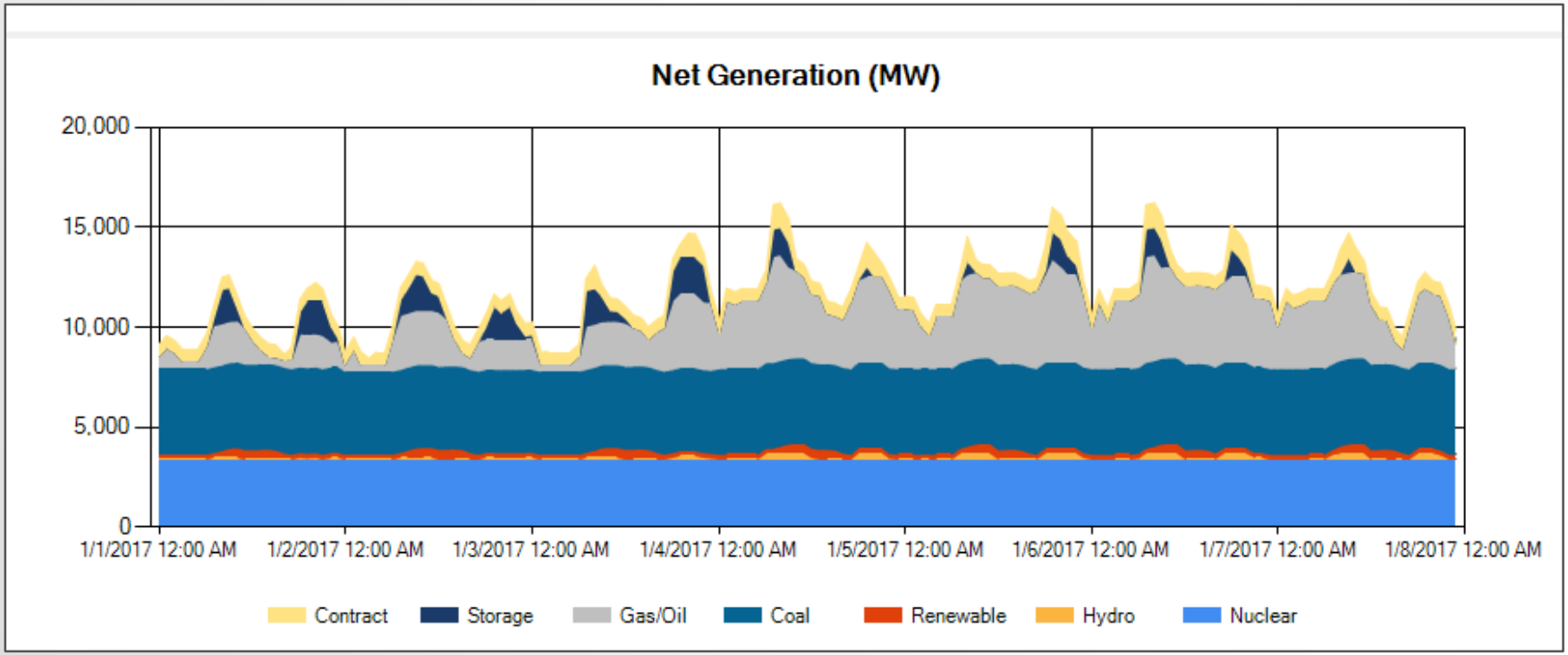
RESULTS

- Over 14 million constraints
- 16 hours to solve
- A higher level of operation detail
- Co-optimized energy, A/S, capacity

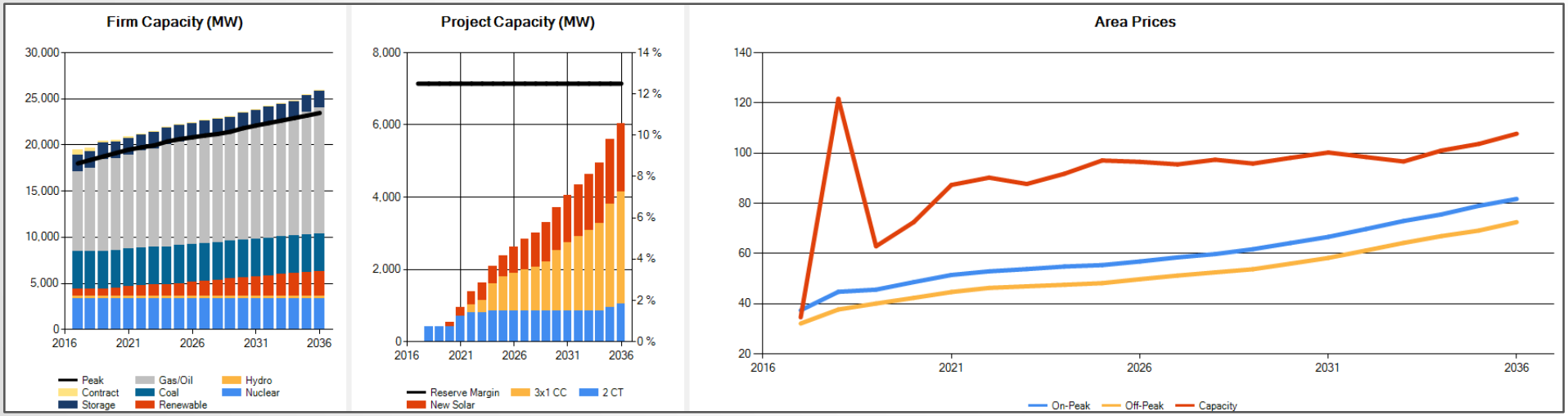
HOURLY RESOLUTION: DISPATCH TO ENERGY AND A/S



CHRONOLOGICAL UNIT COMMITMENT



RESOURCE EXPANSION/RETIREMENT



RECOMMENDATIONS

- DSM Integration:
  - "Supply-curves" for DSM
  - Linear constraint
- Chronological constraints
- LMP differentials from zonal price

REGIONAL PERSPECTIVE

- Reliability – congestion (stability, transferability)
- Economics – resource mix to minimize total system cost
- Resource adequacy – LOLE, LOLP

STATE PERSPECTIVE

- Policy Issues:
  - Fuel,
  - Emissions,
  - Technology Mix,
  - Economy
- Economic opportunities?
- Consistency of assumptions
- Example Issues:
  - Intermittent resources
  - Regulation services

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