



DOE - GO COMPETITION CHALLENGE – RTO/ISO OUTREACH

SPP COMPUTATIONAL CHALLENGES

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*Helping our members work together to keep
the lights on... today and in the future.*



SouthwestPowerPool



SPPorg



southwest-power-pool

PAST & PRESENT

INTERESTING SPP FACTS

- ~1000 Resources
- ~30 GW Wind Resource Capacity
- 21.13 GW Wind Peak
- 87.5% Renewable Penetration Record (Renewables/Load)
- 51 GW Peak Load
- Network model includes all of the Western Interconnect and a large portion of the Eastern Interconnect
- MIP Gap is 0.1% (0.001)

OPTIMIZATION MODEL SIZE (AS OF 5/2020)

- **RTBM**
 - ~10,000 variables, 5,000 constraints, & 25,000 non-zeros
 - Most study time is in doing the network calculations and reading in all the input data. The actual solution time is pretty small 0.05 seconds
- **DAMKT**
 - ~900,000 variables, 850,000 constraints, & 7,000,000 non-zeros
 - Solve times vary a lot more w/ DAMKT depending on many factors. A lot of single solves (does not include mitigation solves) occur under 10 minutes, but we've had MIPs take much longer (Ex: 35 minutes), but these are rare

HISTORICAL HURDLES

- Huge Amounts of Similar Offers can lead to some degeneracy
 - Wind was ~31% of energy produced in 2020 (lots of similarity)
 - Currently one of the biggest challenges in DAMKT
- Splitting Regulation into Regulation Up & Down
- Inline Mitigation & other Resolves/Call-backs
- Extremely Complex/Detailed Ramp Rate Constraints
- Reduction in time allowed for running/posting DAMKT
 - To align better with gas markets
- Multi-Configuration Resources (MCR)

IMPROVEMENTS

- **Technology-Related**
 - CPLEX & AIMMS updates (Ex: parallel file reading)
 - AIMMS code improvements (like C# + ReSharper)
 - CPLEX Settings
 - New Hardware
- **Formulation/Data/Process-Related**
 - Re-run sensitivity calculations only when topology changes
 - Widening MIP AbsGapTolerance based on Time
 - Fixed 2nd Day model methodology

FUTURE

POTENTIAL FUTURE HURDLES

- Massive influx of additional resources (Wind, DR, Solar, Storage)
 - More decision variables and potential for similar offers
- MCR being expanded for other uses (Ex: coal mills/pulverizers)
- Additional Products
 - Flexibility, Frequency Response, potentially Voltage, BlackStart, & Inertia
 - Many forward looking products and interacting constraints
- Fast-start pricing (dispatch and pricing solve)
 - Does not decrease solver performance, but burdens hardware, storage, and users

POTENTIAL FUTURE HURDLES (CONTINUED)

- RTO West (Co-optimization across interconnects)
 - Possible single SCUC for East & West (model would get considerably larger)
- Possible use of Stochastic Optimization?
- Potential reduction in DAMKT time to run/post (again)
- Multi-Day Forecast (MDFC) & eventually Multi-Day Market
 - Very large SCUC case