



CAISO 33% Integration Study

Udi Helman
Principal Economist

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Objective is to provide operational and economic information to guide policy decisions & utility procurement

First Phase - comparative integration requirements for four CPUC developed renewable portfolios:

- What is added system variability that must be managed through characteristics such as: regulation, load following?
- What conventional resources must be added to integrate renewables and still meet the planning reserve margin, and serve load?
- What are the relative GHG emission levels/natural gas usage?
- What are the differences in production costs?
- Is there lost renewable energy due to Overgeneration?



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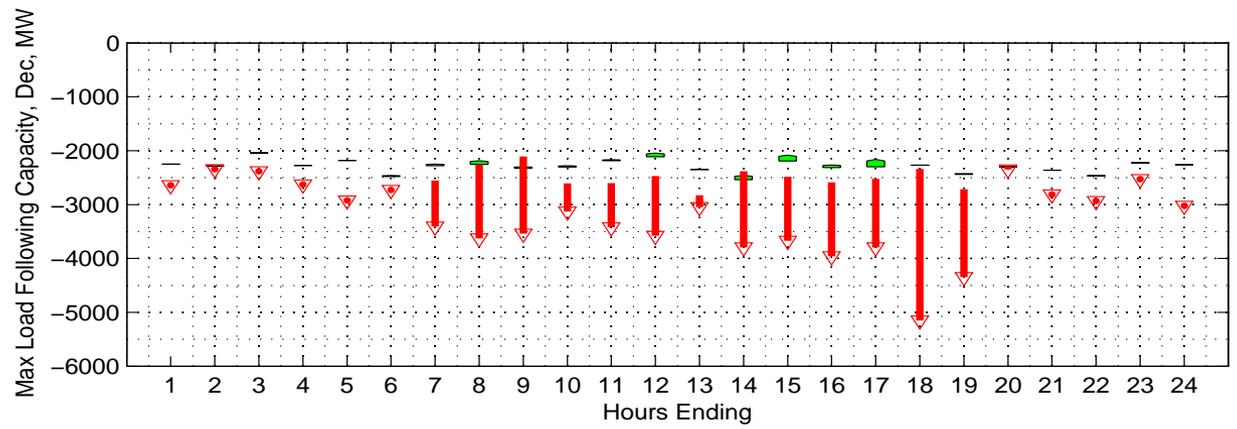
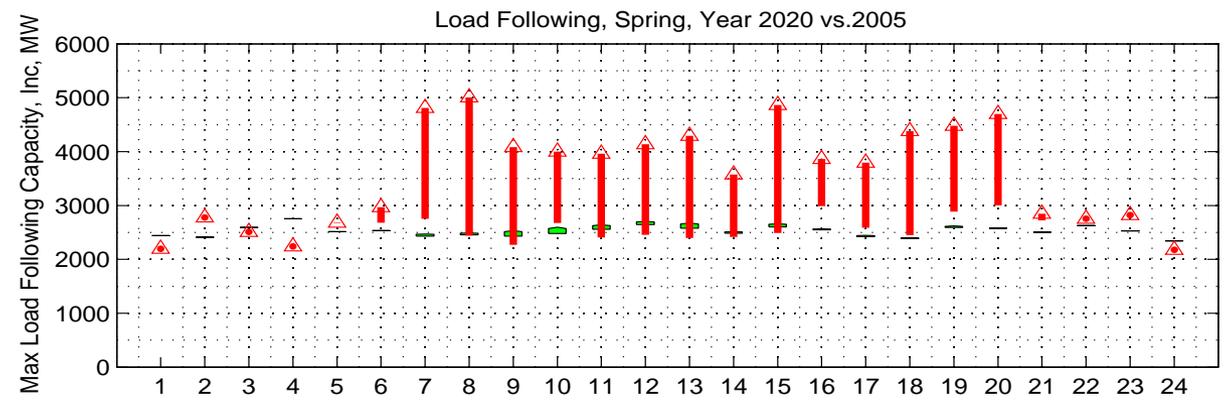
Second Phase – quantify benefits of alternative solutions to integrate renewable portfolios:

- Conventional resource alternatives
 - Demand response
 - Solar defocusing
 - Feathering wind resources
 - Storage

Example of changes in five minute economic dispatch/load following capacity for 33% reference case [results are preliminary and not to be relied upon]

Maximum upward increase from 2500 MW to 5100 MW in HE 8.

Maximum downward decrease from 2100 MW to 5200 MW in HE 18.





Study is being conducted through a collaborative public process

Core Study Team – responsible for doing the work

- ISO – study design, assumptions and outputs
- CPUC – study design, assumptions and outputs
- SCE – primary modeling responsibility
- Nexant – project management and resource profiling

Working Group – represents a cross-section of industry and provides input on methodology, assumptions and outputs through weekly calls

- CEC
- PG&E
- WPTF
- TURN
- Large Scale Solar Association
- CalWEA

Other Public forums – ISO will hold at least two “stakeholder” meetings to discuss preliminary and final results