



Demand Response + Ancillary Service

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- Ancillary Services are services that support the transmission of energy from generation resources to loads while maintaining **reliable operation** of the California ISO Controlled Grid in accordance with WECC standards and Good Utility Practice
- In California, CAISO sets the day to day, hour by hour requirements for how many MWs of Ancillary Services are needed
- There are four types of Ancillary Services
 - Regulation Reserves Up
 - Regulation Reserves Down
 - Spinning Reserves
 - Non-Spinning Reserves
- 100% of Ancillary Services must be procured in the Day Ahead market
 - Any additional procurement happens in Real Time (75 minutes before the hour)
- Currently in California, Demand Response may only provide Non-Spinning Reserves, due to WECC restrictions

- PG&E is a leader in the space testing DR as an Ancillary Service
 - 2009 -> Launched several DR pilots that demonstrated Ancillary Service
 - Participating Load Pilot (PLP):
 - Large Commercial and Industrial customers providing CAISO with Non-Spinning Reserve
 - First ever demonstration that used OpenADR (v1.0) to communicate between CAISO and participating customers
 - SmartAC Pilot:
 - Deployed 1600 residential customers to simulate Spinning/Non-Spinning Reserve
 - 2011 -> Launched pilot studying how DR can assist with Renewables Integration
 - Intermittent Renewable Management Pilot (IRM):
 - Leveraged PLP infrastructure to demonstrate DR customers providing regulation up/down (sub-4 second instructions)
 - Tested load reduction (Reg. Up) and load consumption (Reg. Down)

- Existing WECC rules disallows the use of DR to provide most Ancillary Services (except Non-Spinning)
- Cost to enable customers to provide Ancillary Services
 - Existing CAISO telemetry requirements are rigorous – cost of equipment is cost-prohibitive
 - Robust automated Energy Management Systems are needed
 - Cost of participating in the CAISO market
- Ability to forecast the load reduction in a more granular view
- Customer education



Ancillary Service definitions:

- Regulation Reserves (Up/Down): Reserved capacity provided by generating resources that are running and synchronized with the CAISO controlled grid, so that the operating levels can be increased (incremented) or decreased (decremented) instantly through Automatic Generation Control (AGC) to allow continuous balance between generating resources and demand. The CAISO operates two distinct capacity markets for this service, upward and downward Regulation Reserve.

- Spinning Reserves: Reserved capacity provided by generating resources that are running (i.e., “spinning”) with additional capacity that is capable of ramping over a specified range within 10 minutes and running for at least two hours. The CAISO needs Spinning Reserve to maintain system frequency stability during emergency operating conditions and unanticipated variations in load.

- Non-Spinning Reserves: Generally, reserved capacity provided by generating resources that are available but not running. These generating resources must be capable of being synchronized to the grid and ramping to a specified level within 10 minutes, and then be able to run for at least two hours. Curtailable demand can also supply Non-Spinning Reserve provided that it is telemetered and capable of receiving dispatch instructions and performing accordingly within 10 minutes. The CAISO needs Non-Spinning Reserve to maintain system frequency stability during emergency conditions.