Renewables Grid Initiative

# Energy Region in Transition – California

**RES in CA:**

California has established an ambitious array of renewable energy objectives, the most recent calling for 50% renewable energy by 2030. The State is ahead of schedule in meeting its targets; in 2014, ~25% of electricity came from RES and in late 2015, the operating capacity of RES was 21,700 MW (solar PV 8,700 MW; wind 6,000 MW; geothermal 2,700MW)[1]. In some intervals, as much as 50% of California's energy needs are being met by renewables. As part of Governor Brown's 2011 Clean Energy Plan, the sunshine state has met its goal of adding 8,000 MW of large-scale renewable generation and as of 2015, reached 60% of its goal to add 12,000 MW of renewable distributed generation (both by 2020). It is notable that rooftop solar and large hydroelectric resources do not count against the state renewable energy goals.

**CAISO:**

The California Independent System Operator is one of seven regional transmission operators in the U.S., managing 26,000 miles of high voltage lines and overseeing the dispatch of thousands of energy resources. The organization is critical to the power supply for 30 million people. As an ISO, they do not maintain or own the transmission system, as seen in Europe, but they operate it. They are responsible for:

Open access to the transmission system: CAISO provides market participants open and non-discriminatory access to the grid. Participants include utilities, generating companies, transmission owners, energy-trading companies and Scheduling Coordinators (SCs).

Maintaining balance: CAISO is the largest balancing authority (BA) in the west, managing electricity flow for most of California and a part of western Nevada. Unlike in Europe where over-generated power can be sent to a neighbouring country, CAISO has to either trade the energy with parties outside the California border, or contain the power inside their transmission control area. To help share the power, in 2014, the CAISO launched an Energy Imbalance Market (EIM) where imbalance is resolved through an automated 5-minute dispatch service.

The wholesale electricity market: As a not-for-profit public benefit cooperation, CAISO runs a wholesale electric market by providing a platform where generated power can be traded. It is the only BA in the west with a multiparty centralised wholesale market, whereas other BAs engage in bilateral contracts. Market products and services include: day-ahead and real-time markets, ancillary services, congestion revenue rights (CRRs) and convergence bidding. ~ $8 billion is run through CAISO every year.

[1] http://www.energy.ca.gov/renewables/tracking_progress/documents/renewable.pdf

**Challenges:**

To increase RES penetration on the grid, a flexible natural gas fleet is necessary to help with periodic oversupply and ramping situations. For that gas fleet, generic capacity is no longer of prime value. Instead, the CAISO needs units that can start, stop and ramp quickly, to support the variability and intermittency of renewables. The more flexible the grid, the more RES can be integrated into the system. Ramping flexibility is important to react quickly to changing needs in electricity demand throughout the day with the evening producing the most significant ramp (when solar declines and demand increases). Here, thermal resources are necessary to meet these ramps. CA sometimes manages ramps of 10,000 MW over 3 hours (these are growing to as much as 15,000 MW in a few years). Thirdly, over-supply needs to be mitigated. Because the US is not as regionally integrated as Europe, CAISO is unable to send over-generated power to surrounding states, unless it is being traded. By integrating California with its regional neighbors, it is expected that regional integration would reduce carbon emissions by over 2.5 millions tons per year. The regional integration would also save $1.5 billion for California consumers.

**What Europe teaches California:**

To cope with the challenges of RES integration, regional cooperation is key, as it provides security of supply, increases flexibility and decreases capital requirements. In the California context, this would give access to highly flexible thermal production in case ramping is needed and also provide a home for the over-supply of renewables. The constraints in the western U.S. to regionalise are largely political, and reflect states' willingness to relinquish a certain level of control of their grid assets.

**What California teaches Europe:**

Under the EIM initiative, CAISO optimizes the grid every 5 minutes using the ISO's real-time market. The rest of the West does so every hour. This movement of generation from RES and the distribution and transmission systems lowers costs and makes better use of installed energy assets.

**More Information:**

To learn more about what is being done in California, take a look at the presentation, "Energiewende made in the USA – What can we learn from California?" by David Olsen, member of the Board of Governors of the CAISO and former president of the grid planning initiative RETI

**Website:**

For more information on CAISO, visit their official website
This overview and FAQs provided by CAISO will provide more insight into the Energy Imbalance Market

**Contact:**

Theresa Schneider, theresa@renewables-grid.eu
Krausenstraße 8, 10117 Berlin