

ENERGY MARKETS & POLICY

Developing Demand Response Hourly Profiles in the 2034 ADS

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DSM Inputs to Western Regional Planning

- Berkeley Lab has worked with WECC staff and its subcommittees over the past 13 years to develop DSM-related assumptions and modeling inputs for WECC's regional transmission planning studies
- Two types of demand response (DR) modeling assumptions required for each study case:
 - **DR resource quantities**: How much DR is available to be dispatched in any given hour for each load zone?
 - DR dispatch mechanics: When is the DR dispatched and how does it affect hourly loads and peak demand?
- DR resource quantities are based on non-firm load forecasts reported by balancing authorities to WECC



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DR modeling approach is intended to realistically model DR resources within the constraints of WECC's production cost modeling

- DR programs are dispatched for reliability and economic purposes
- Dispatch is limited by tariff provisions specifying maximum number of events per month or year, and multi-hour event periods
- Berkeley Lab worked with WECC staff in 2012 to test different endogenous representations/proxies, including: high-cost CT, iterative LMP-based approach, peak shave hydro resource, and dispatchable transactions
- WECC staff chose to use exogenous dispatch methodology to develop fixed DR hourly shapes
- Methodology and assumptions have remained consistent throughout all studies to allow for comparisons across study years



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DR Dispatch Tool methodology

Inputs

- Hourly Load
- Hourly LMPs
- Maximum Available Monthly DR
- Program constraints

Resource Availability

 Calculate "hourly shaping factors" to scale maximum available DR to hourly load

Simulated Dispatch

- Identify top-LMP hours to act as dispatch trigger
- Dispatch DR over top-LMP hours, subject to program constraints

Output

 8760 loadmodifying profile of DR used in production cost model as static profile



Three key data inputs

- DR resource capacities are based on non-firm load forecasts reported by balancing authorities to WECC
 - Four categories of non-firm load (i.e., DR program types): Interruptible, Direct Load Control, Pricing, and Load as a Capacity Resource
- 2. 2034 hourly loads
- 3. 2034 hourly prices (LMPs) without DR (weighted by load and net behind-the-meter generation)



DR program dispatch constraints

DR Program Type	Expected Dispatch Hours per Year (Hours)	Number of Events (#)	Duration of Events (Hours)
Interruptible	10	5	2
Direct Load Control	40	10	4
Pricing	50	10	5
Load as a Capacity Resource	60	10	6

Assumptions are consistent with the assumptions made in the WECC 2024, 2026, 2028, 2032, and 2034 (20-year) Common Case / ADS studies



Hourly shaping factor to account for diurnal patterns

The hourly shaping factor represent the hourly load divided by the maximum annual peak, so that only one hour of the year has 100% DR resource availability







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DR is dispatched over expected contiguous hour periods subject to program-specific constraints



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Output are hourly shapes for each WECC load zone



Results shown only for load zones with DR capacity in 2034 ADS and are provisional





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