

California 2030 Low Carbon Grid Study

Information Sheet

Overview

The California 2030 Low Carbon Grid Study (LCGS) explores how the electric sector can cost-effectively support deep reductions in greenhouse gas (GHG) emissions. According to Phase I modeling results, the California grid can reduce emissions by more than 50% below 2012 levels by the year 2030 with minimal rate impact, minimal curtailment to renewables, and without compromising reliability. These findings are significant because they illustrate an affordable, reliable, and practical trajectory toward meeting California's ambitious 2050 GHG emissions goals.

Participants

The National Renewable Energy Laboratory (NREL) is conducting the modeling work, and Phase II will incorporate analysis from General Electric Consulting and JBS Energy Inc., as well as input from an independent Technical Review Committee. A Steering Committee of nearly thirty companies, trade associations, and foundations is funding the study.

Characteristics

The LCGS is unique in its focus on emissions reduction, and in its use of a diverse set of resources and portfolio-balancing measures aimed at achieving a cost-sensitive, low-carbon grid without major disruption to transmission flows or trading patterns. The final report will remain neutral on specific policy recommendations, as the LCGS is primarily a technical informational tool, broadly applicable to a variety of energy policy and planning decisions.

Study Components

Phase I models two low-carbon portfolios that were developed to meet the anticipated need for GHG reductions in 2030. These scenarios were developed based on data, load forecasts, and other assumptions from the California Public Utilities Commission (CPUC), the California Air Resources Board (CARB), and the California Energy Commission (CEC), and they incorporate a wide range of renewable generation and energy efficiency, as well as the flexibility provided by strategic use of natural gas, energy storage, responsive demand, and the regional diversity available from resources across the Western Electric Coordinating Council (WECC). Although this study is not designed to produce an optimized portfolio, Phase I presents two credible example cases in which the grid can effectively integrate the resources needed for deep GHG reductions in 2030, without compromising system reliability and with comparatively minimal rate-impacts, ultimately setting California on a clear path toward its 2050 GHG goals.

Phase II will involve an independent rate-impact analysis and further PLEXOS scenarios and sensitivities, to identify additional ways of reducing costs and increasing efficiencies. The final report will be a robust, technical perspective on the feasibility of a near-term low-carbon grid, and will be relevant to many critical energy issues now facing California and the interconnected western region.

Principles and Outputs

- I. Key Assumptions:
 - Technologically and geographically diverse clean energy resources and energy storage
 - Increased flexibility and strategic use of gas-fired generation in California
 - Coordination with WECC balancing authorities and Energy Imbalance Market(s)
 - Use of energy efficiency, price-responsive demand, and dispatchable load
- II. Study Outputs:
 - GHG reduction costs expressed as \$/MMT of CO₂ reduced
 - Rate impacts in 2030 compared to a Baseline case without low-carbon additions (expressed as \$/MWh and percentage change in system revenue requirements)

Phase I: Released August 2014

- I. Methodology:
 - Determined GHG reductions needed by 2030 in order to be on a trajectory for 2050 targets, based on load forecasts, data, and assumptions from CPUC, CARB, CEC, and WECC.
 - Identified the net short of zero-carbon energy needed to achieve 2030 GHG reductions.
 - Developed two low-carbon portfolios to respectively meet and exceed the net short.
 - PLEXOS production cost modeling of low-carbon portfolios, with one comparison case:
 - Target Case:
Achieves 58% emissions reduction below 2012 levels; 177 TWh zero-carbon energy
 - Accelerated Case:
Achieves 72% emissions reduction below 2012 levels; 205 TWh zero-carbon energy
 - Baseline Case (maintaining 33% RPS compliance):
Achieves 18% emissions reduction below 2012; 110 TWh zero-carbon energy
 - Analysis of the capital expenditures and rate impact associated with the Target Case, as compared to the Baseline Case.
- II. Results:
 - The model shows that GHG emissions from California's grid can be reduced by at least 50% below 2012 levels by the year 2030.
 - Portfolios modeled show no unserved load or dramatic changes in transmission flows or trading patterns.
 - Results show minimal curtailment of renewable energy.
 - Production cost savings from reduction in fossil fuel purchases balance the cost of the investment in a low-carbon portfolio, resulting in minimal rate impacts.

Phase II: Expected January 2015

- I. NREL will build off of Phase I results, running sensitivities and scenarios to identify additional ways of reducing costs and increasing efficiency for achieving deep carbon reduction, with support and review from an independent Technical Review Committee.
- II. JBS Energy, Inc. will perform an independent capital cost and rate impact analysis.
- III. A final report will be released in January 2015.