Low Carbon Grid Study

NWEC Clean & Affordable Energy Conference

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Low Carbon Grid Study

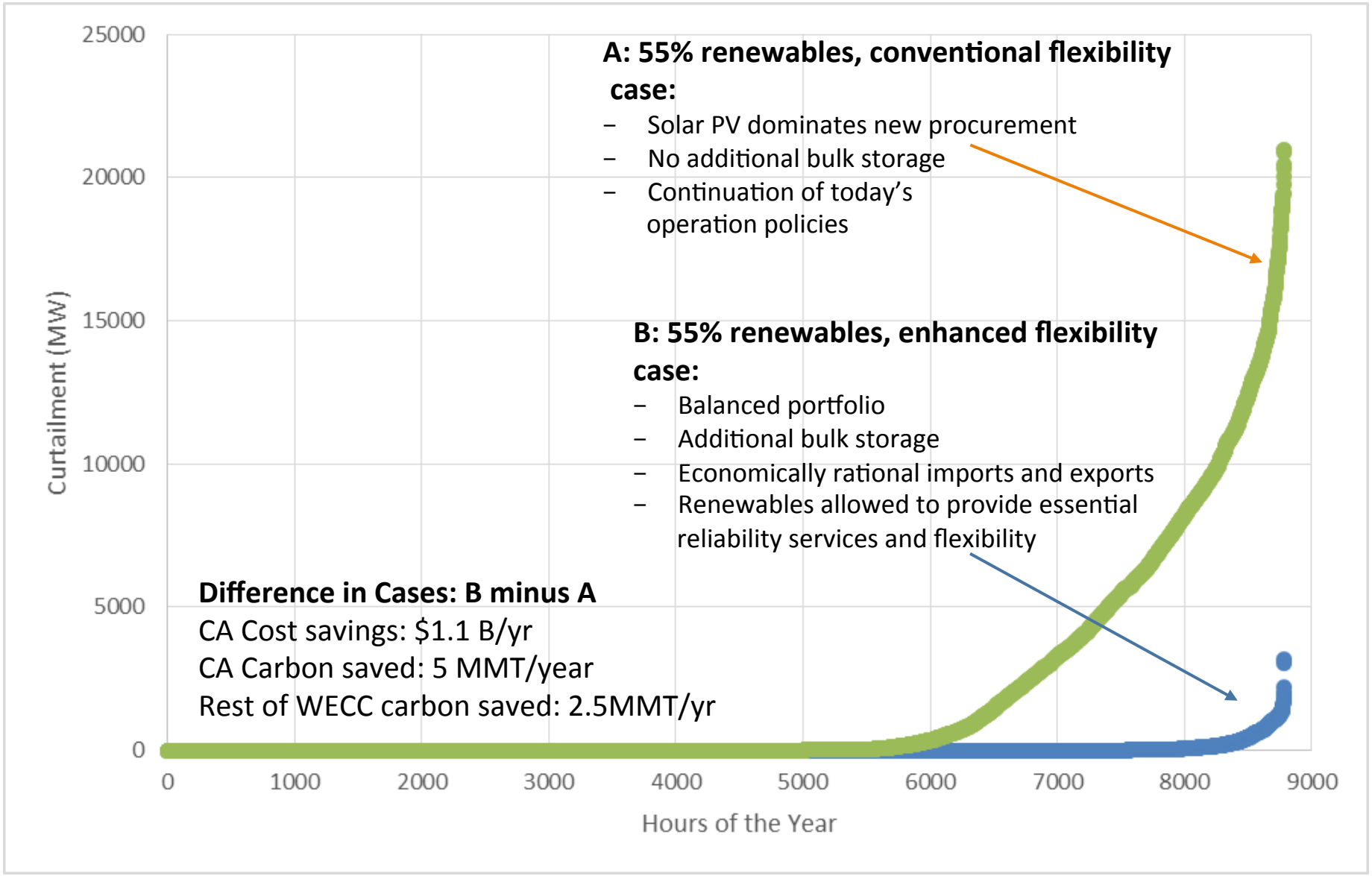
The Low Carbon Grid Study was a two year modeling exercise funded and sponsored by thirty-seven companies, trade associations, foundations and government agencies. The objective was to explore the limits of current technology to achieve deep reductions in carbon emissions from the California electric grid within the context of the interconnected eleven Western States in the 2030 timeframe, and to focus on both near term actions to ensure success, and setting the stage for achieving the long term policy objective of 80% reduction in carbon emission economy wide by 2050.

The modeling was conducted by the National Renewable Energy Laboratory, JBS Energy, the Energy Efficiency Industries Council, and General Electric Consulting. The Project was managed by a Steering Committee of the sponsors and an independent Technical Review Committee composed of Western utilities, CA State energy agencies, and consumer representatives.

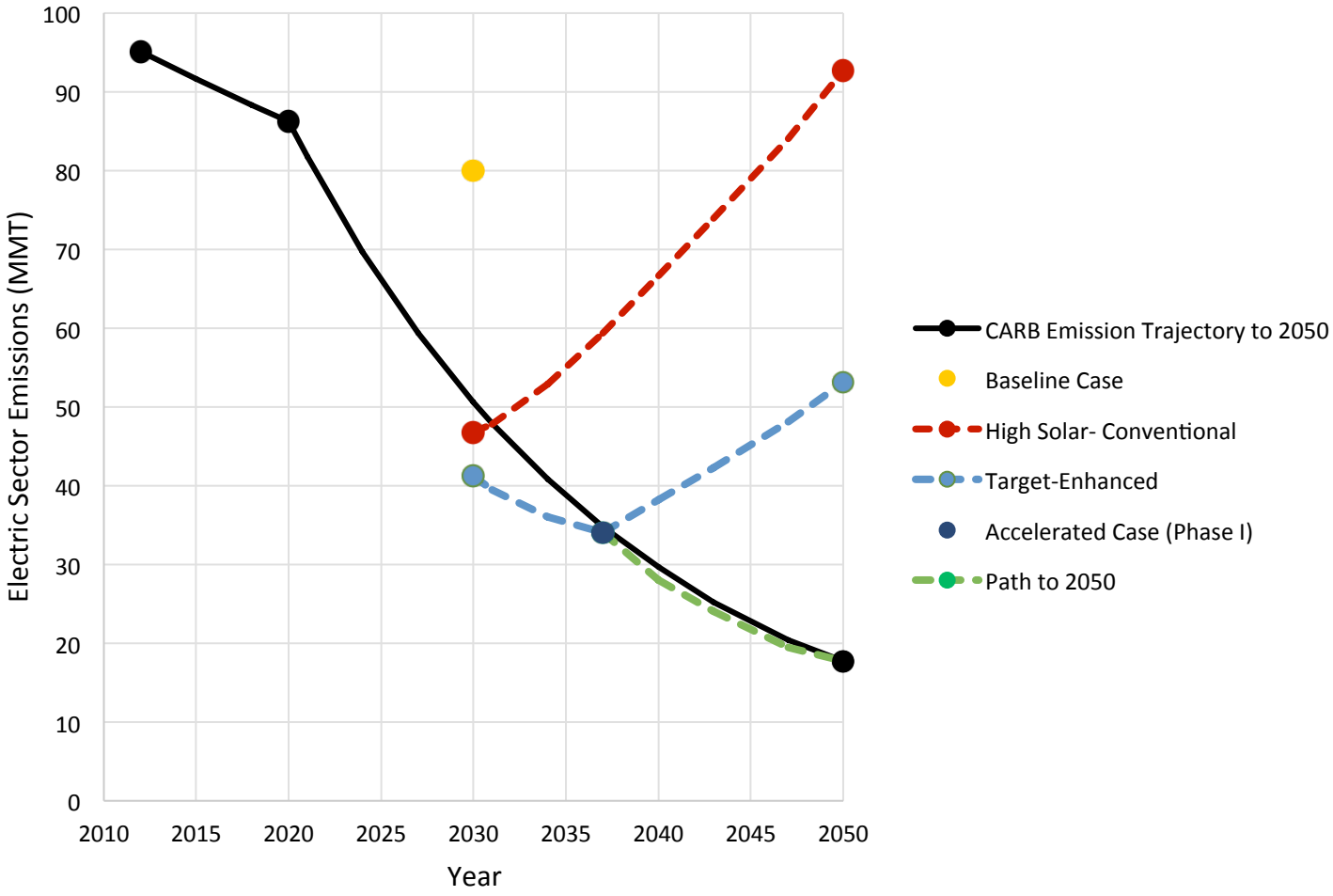
Sidebar studies were conducted on the value of baseload geothermal and regional wind from Wyoming and New Mexico in a technical and geographically diverse balanced renewable investment portfolio, the impact of closure of the Diablo Canyon Nuclear Power Plant, and high level transmission needs throughout the West to support the generation investment.

All data and analysis used and modeling results are non-proprietary and open architecture. Results and workpapers are posted at www.lowcarbongrid 2030.org.

Low Carbon Grid Study
Curtailment of Renewable Energy



Towards 2050:
CA Carbon Emission Trajectories



Low Carbon Grid Study
Cost of Carbon

- Achieving a 50% reduction in CA electric sector carbon emissions using today's technology at today's costs requires a ~$55B infrastructure investment that breaks even vs. $5/mcf natural gas. Extension of Federal renewable tax credits or achievement of "planned" renewable cost reductions lowers the breakeven point to ~$3.25/ mcf natural gas (roughly today's price).
- Cost of carbon reduced is roughly $30/MT.

Low Carbon Grid Study
Principal Takeaways

- Acquiring all cost effective energy efficiency and demand response at today's technology and today's costs is an important element for early success and essential in the long run.
- A technical and geographically diverse mix of new renewables (~40% utility scale solar, ~40% wind, ~10% distributed behind the meter solar, ~10% geothermal/biomass) is critical for cost effectiveness. LCOE is not the correct procurement metric.
- Significant investment in new storage is important for reliability and cost effectiveness but does not change the optimum generation mix to a large degree.
- New "flexible" gas to "back-up" intermittent renewables is NOT necessary. However, the existing gas fleet must be capable of quick, reliable starts for meeting multi-hour load ramps and contingency reserves.
- "Regionalization"(a West-wide RTO) is not essential but is helpful for long term success. However, robust economic trade between Balancing Authorities through institutions like a real time Energy Imbalance Market are almost essential for reliability and cost effectiveness.
- Required transmission investments are modest and consist mainly of filling the current gap between southern Idaho and central Nevada to create a strong parallel path to the N/S costal backbone plus "gen ties" to collect and distribute WY and NM wind to ID, AZ, and CO.