June 2021 Newsletter and Research Highlights

The ESCA group recently sent out the second installment of its 2021 newsletter. Download the PDF version of the June 2021 newsletter. If you would like to sign up for the ESCA public mailing list, please email eea@epri.com.

Article – Impacts of Carbon Dioxide Removal Technologies on Deep Decarbonization

Carbon dioxide removal technologies, such as bioenergy with carbon capture and direct air capture, are valuable for stringent climate targets. Previous work has examined implications of carbon removal, primarily bioenergy-based technologies using integrated assessment models, but not investigated the effects of a portfolio of removal options on power systems in detail. Here, we explore impacts of carbon removal technologies on electric sector investments, costs, and emissions using a detailed capacity planning and dispatch model with hourly resolution.

We show that adding carbon removal to a mix of low-carbon generation technologies lowers the costs of deep decarbonization. Changes to system costs and investments from including carbon removal are larger as policy ambition increases, reducing the dependence on technologies like advanced nuclear and long-duration storage. Bioenergy with carbon capture is selected for net-zero electric sector emissions targets, but direct air capture deployment increases as biomass supply costs rise.

Read the full article in Nature Communications or check out our two-pager summary. For more information, please contact John Bistline (jbistline@epri.com).

Tech Update – Temperature impacts on electricity demand: US-REGEN load projections for climate resilience

This research advances EPRI modeling capabilities and methods for estimating the potential impact of changes in air temperature on energy demand for space conditioning in the United States. Specifically, we demonstrate a structural approach within EPRI's US-REGEN end-use demand module, which projects hourly energy demand from the bottom-up for several key end-use sectors.

This bottom-up approach complements the existing climate impacts literature, as many studies have relied on empirical models that estimate the statistical relationship between weather and electricity use. Our results from a structural basis offer a point of comparison to previous estimates. Furthermore, this project helps to produce temperature-adjusted load projections that can be utilized by the broader community of energy-economy models to better assess the electric system's vulnerability to and plan for different climate conditions. Ultimately, we will use the US-REGEN capacity expansion and dispatch model to assess these demand-side impacts on the electricity system, including generation and capacity decisions, supply cost, and emissions over time. Integrating climate warming into the US-REGEN end-use model can be applied in future studies to inform system planners and other stakeholders about electric power systems that are resilient to a range of possible climate, policy, and technology futures.

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