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## Sector Coupling in Practice: An Energy Hub Approach for Power and Industry

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### Abstract

Achieving carbon neutrality will require energy systems that are not only cleaner, but more integrated. The deployment of hydrogen and other low carbon technologies depends on the development of supply chains, robust fuel markets, and significant expansion of enabling infrastructure—challenges that no single sector can address alone. Sector coupling—the intentional coordination of the electric, industrial, transportation, and fuels sectors—provides a powerful framework to guide and accelerate this transition. By aligning demand across sectors, coupling energy and infrastructure investments, and collectively scaling deployment, sector coupling can improve asset utilization, reduce risk, and accelerate technology development. A coordinated approach also supports alignment across regulatory, policy, and community domains, helping stakeholders work toward a common vision for system evolution. In doing so, sector coupling provides a practical framework for enhancing the viability and timeliness of decarbonization investments while strengthening system flexibility, resilience, and long-term value.

This session draws on work by EPRI, an independent and objective nonprofit organization, that performs collaborative research and demonstration projects with more than 400 energy companies in more than 40 countries in support of a reliable, affordable, and resilient energy future. EPRI's sector coupling research examines how emerging technologies—such as hydrogen, synthetic fuels, electrification, carbon capture, and localized heat and power generation – can be used to expand energy optionality, drive alignment between sectors, and enable informed decision making through the creation of shared regional vision and planning efforts.

The presentation will provide an overview of a recent collaboration between EPRI and an Asian utility to explore the creation of an Energy Hub aimed at reducing the carbon intensity of electricity and industrial products across a three-county region. Central to this effort is a detailed electric system economic model that solves for the least cost portfolio of capacity (including new investments, retrofits, and retirements) and dispatch needed to meet demand within both the Energy Hub and the broader power system under a Net Zero policy scenario. The energy system model is informed by a technology and cost capability assessment of potential to retrofit natural gas fired combined cycle with hydrogen compared to carbon capture. Decarbonization pathways for industry within the Energy Hub were also assessed, including electrification, carbon capture, hydrogen, and alternative fuels and processes. Together, these results demonstrate how sector coupled planning can illuminate trade-offs, investment timelines, and infrastructure needs while maintaining reliability and supporting progress toward Net Zero goals.