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# LAZARD C+-

### LEVELIZED COST OF ENERGY+

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# Lazard's Levelized Cost of Energy Analysis—Version 17.0



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# Levelized Cost of Energy Comparison—Version 17.0

Selected renewable energy generation technologies remain cost-competitive with conventional generation technologies under certain circumstances



Source: Lazard and Roland Berger estimates and publicly available information.

- Note: Here and throughout this analysis, unless otherwise indicated, the analysis assumes 60% debt at an 8% interest rate and 40% equity at a 12% cost. See page titled "Levelized Cost of Energy Comparison—Sensitivity to Cost of Capital" for cost of capital sensitivities.
- (1) Given the limited public and/or observable data available for new-build geothermal, coal and nuclear projects the LCOE presented herein reflects Lazard's LCOE v14.0 results adjusted for inflation and, for nuclear, are based on thenestimated costs of the Vogtle Plant. Coal LCOE does not include cost of transportation and storage.
- (2) The fuel cost assumptions for Lazard's LCOE analysis of gas-fired generation, coal-fired generation and nuclear generation resources are \$3.45/MMBTU, \$1.47/MMBTU and \$0.85/MMBTU respectively, for year-over-year comparison purposes. See page titled "Levelized Cost of Energy Comparison—Sensitivity to Fuel Prices" for fuel price sensitivities.
- (3) Reflects the average of the high and low LCOE marginal cost of operating fully depreciated gas peaking, gas combined cycle, coal and nuclear facilities, inclusive of decommissioning costs for nuclear facilities. Analysis assumes that the salvage value for a decommissioned gas or coal asset is equivalent to its decommissioning and site restoration costs. Inputs are derived from a benchmark of operating gas, coal and nuclear assets across the U.S. Capacity factors, fuel, variable and fixed operating expenses are based on upper- and lower-quartile estimates derived from Lazard's research. See page titled "Levelized Cost of Energy Comparison—New Build Renewable Energy vs. Marginal Cost of Existing Conventional details.
- (4) Represents the illustrative midpoint LCOE for Vogtle nuclear plant units 3 and 4 based on publicly available estimates. Total operating capacity of ~2.2 GW, total capital cost of ~\$31.5 billion, capacity factor of ~97%, operating life of 60 80 years and other operating parameters estimated by Lazard's LCOE v14.0 results adjusted for inflation. See Appendix for more details.
- (5) Reflects the LCOE of the observed high case gas combined cycle inputs using a 20% blend of green hydrogen by volume (i.e., hydrogen produced from an electrolyzer powered by a mix of wind and solar generation and stored in a nearby salt cavern). No plant modifications are assumed beyond a 2% increase to the plant's heat rate. The corresponding fuel cost is \$6.66/MMBTU, assuming ~\$5.25/kg for green hydrogen (unsubsidized PEM). See LCOH—Version 4.0 for additional information.

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# Levelized Cost of Energy Comparison—Sensitivity to U.S. Federal Tax Subsidies<sup>(1)</sup>

The Investment Tax Credit ("ITC"), Production Tax Credit ("PTC") and Energy Community adder, among other provisions in the IRA, are important components of the LCOE for renewable energy technologies



■LCOE Subsidized (incl. Energy Community)<sup>(3)</sup> ■Subsidized (excl. Energy Community)

Source: Lazard and Roland Berger estimates and publicly available information.

Note: Unless otherwise indicated, this analysis does not include other state or federal subsidies (e.g., domestic content adder, etc.). The IRA is comprehensive legislation that is still being implemented and remains subject to interpretation—important elements of the IRA are not included in our analysis and could impact outcomes.

- (1) This sensitivity analysis assumes that projects qualify for the full ITC/PTC, have a capital structure that includes sponsor equity, debt and tax equity and assumes the equity owner has taxable income to monetize a portion of the tax credits.
- (2) Results at this level are driven by Lazard's approach to calculating the LCOE and selected inputs (see Appendix A for further details). Lazard's LCOE analysis assumes, for year-over-year reference purposes, 60% debt at an 8% interest rate and 40% equity at a 12% cost (together implying an after-tax IRR/WACC of 7.7%). Implied IRRs at this level for Wind—Onshore (PTC) is 13% (i.e., the value of the PTC and Energy Community adder result in an implied IRR greater than the assumed 12%).
- (3) This sensitivity analysis assumes that projects qualify for the full ITC/PTC and also includes an Energy Community adder of 10% for ITC projects and \$3/MWh for PTC projects.

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# Levelized Cost of Energy Comparison—Sensitivity to Fuel Prices

Variations in fuel prices can materially affect the LCOE of conventional generation technologies, but direct comparisons to "competing" renewable energy generation technologies must take into account issues such as dispatch characteristics (e.g., baseload and/or dispatchable intermediate capacity vs. peaking or intermittent technologies)



Source: Lazard and Roland Berger estimates and publicly available information.

Unless otherwise noted, the assumptions used in this sensitivity correspond to those used in the LCOE analysis as presented on the page titled "Levelized Cost of Energy Comparison-Version 17.0". Note:

Assumes a fuel cost range for gas-fired generation resources of \$2.59/MMBTU - \$4.31/MMBTU (representing a sensitivity range of ± 25% of the \$3.45/MMBTU used in the LCOE). (1)

(2) (3) Assumes a fuel cost range for nuclear generation resources of \$0.64/MMBTU - \$1.06/MMBTU (representing a sensitivity range of ± 25% of the \$0.85/MMBTU used in the LCOE).

Assumes a fuel cost range for coal-fired generation resources of \$1.10/MMBTU - \$1.84/MMBTU (representing a sensitivity range of ± 25% of the \$1.47/MMBTU used in the LCOE)

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