EXHIBIT NO. _____ (AML-8)
DOCKET NOS. UE-200115
COLSTRIP UNIT 4 SALE
WITNESS: AMANDA MARIE LEVIN

BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, Complainant, v. PUGET SOUND ENERGY, Respondent.	DOCKET NO. UE-200115

EIGHTH EXHIBIT TO THE

PREFILED RESPONSE TESTIMONY OF

AMANDA LEVIN

ON BEHALF OF

THE NATURAL RESOURCES DEFENSE COUNCIL

October 2, 2020

INSIGHTS

Levelized Cost of Energy and Levelized Cost of Storage 2019

NOV 7 2019

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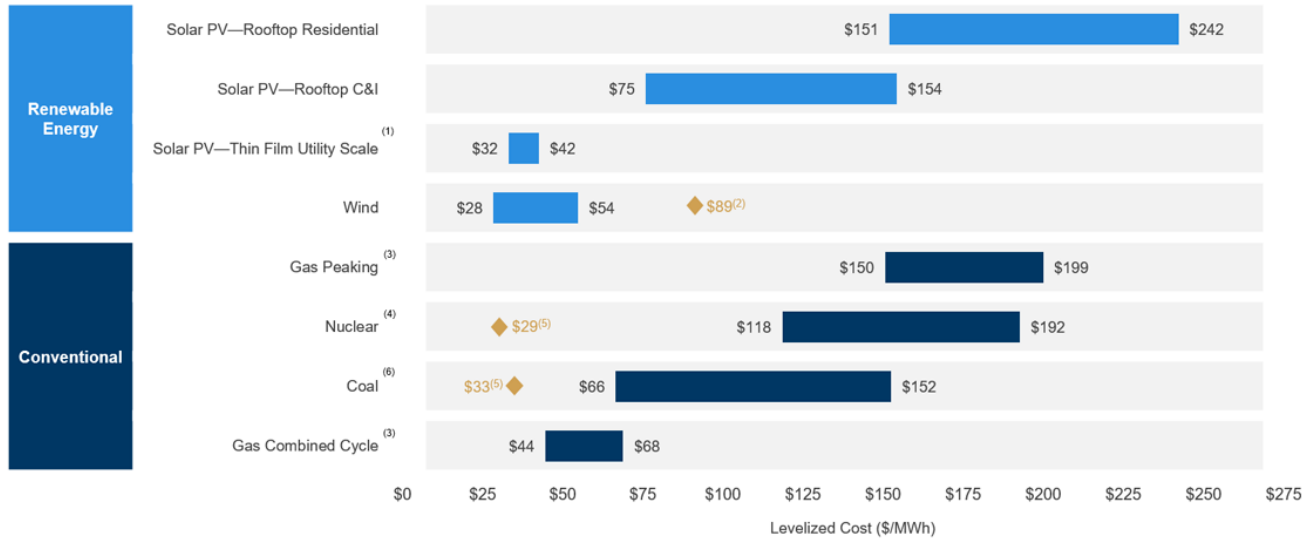
Lazard's latest annual Levelized Cost of Energy Analysis (LCOE 13.0) shows that as the cost of renewable energy continues to decline, certain technologies (e.g., onshore wind and utility-scale solar), which became cost-competitive with conventional generation several years ago on a new-build basis, continue to maintain competitiveness with the marginal cost of existing conventional generation technologies.

Levelized Cost of Energy Comparison—Unsubsidized Analysis

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



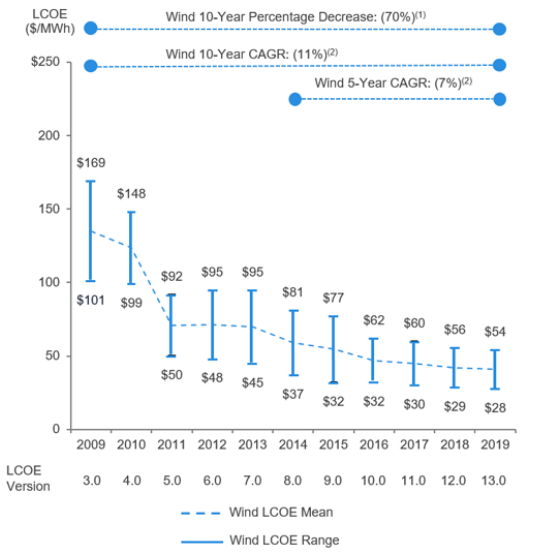
Source: *Lazard estimates.*
Note: Here and throughout this presentation, unless otherwise indicated, the analysis assumes 60% debt at 8% interest rate and 40% equity at 12% cost. Please see page titled "Levelized Cost of Energy Comparison—Sensitivity to Cost of Capital" for cost of capital sensitivities. These results are not intended to represent any particular geography. Please see page titled "Solar PV versus Gas Peaking and Wind versus CCGT—Global Markets" for regional sensitives to selected technologies.
(1) Unless otherwise indicated herein, the low end represents a single-axis tracking system and the high end represents a fixed-tilt system.
(2) Represents the estimated implied midpoint of the LCOE of offshore wind, assuming a capital cost range of approximately $2.33 – $3.53 per watt.
(3) The fuel cost assumption for Lazard's global, unsubsidized analysis for gas-fired generation resources is $3.45/MMBTU.
(4) Unless otherwise indicated, the analysis herein does not reflect decommissioning costs, ongoing maintenance-related capital expenditures or the potential economic impacts of federal loan guarantees or other subsidies.
(5) Represents the midpoint of the marginal cost of operating coal and nuclear facilities, inclusive of decommissioning costs for nuclear facilities. Analysis assumes that the salvage value for a decommissioned coal plant is equivalent to its decommissioning and site restoration costs. Inputs are derived from a benchmark of operating coal and nuclear assets across the U.S. Capacity factors, fuel and variable and fixed operating expenses are based on upper and lower quartile estimates derived from Lazard's research. Please see page titled "Levelized Cost of Energy Comparison—Renewable Energy versus Marginal Cost of Selected Existing Conventional Generation" for additional details.
(6) High end incorporates 90% carbon capture and compression. Does not include cost of transportation and storage.

Additional highlights from LCOE 13.0:

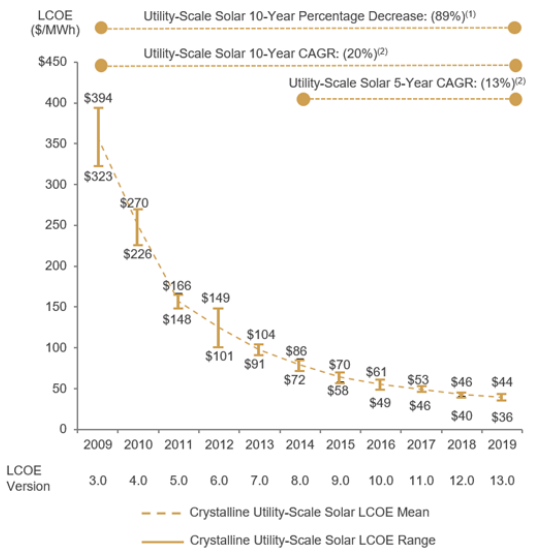
Levelized Cost of Energy Comparison—Historical Renewable Energy LCOE Declines

In light of material declines in the pricing of system components and improvements in efficiency, among other factors, wind and utility-scale solar PV have exhibited dramatic LCOE declines; however, as these industries mature, the rates of decline have diminished

Unsubsidized Wind LCOE



Unsubsidized Solar PV LCOE

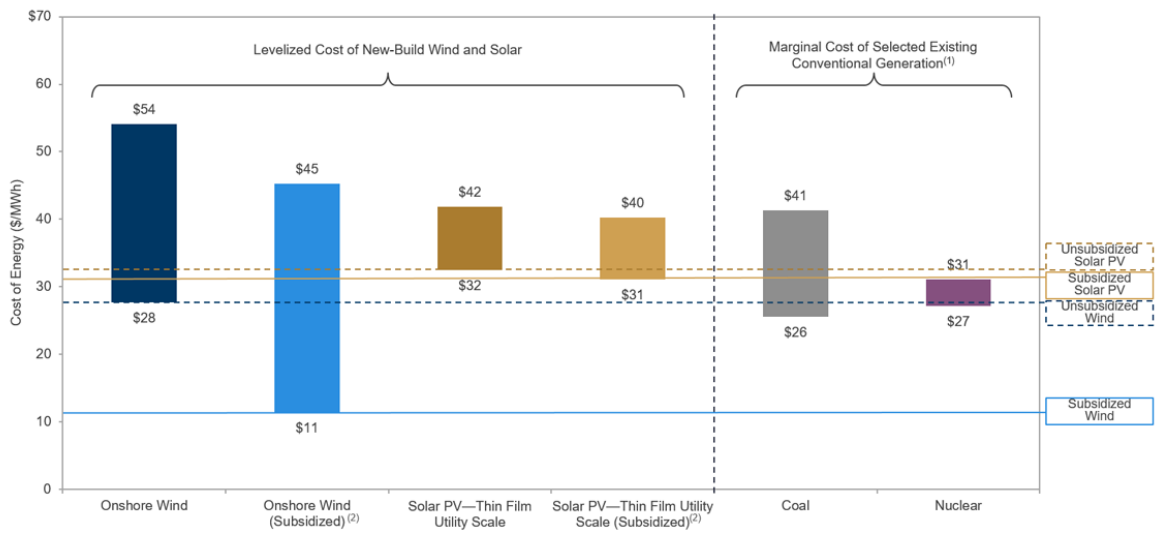


Source: *Lazard estimates.*
(1) Represents the average percentage decrease of the high end and low end of the LCOE range.
(2) Represents the average compounded annual rate of decline of the high end and low end of the LCOE range.

While the reductions in costs continue, their rate of decline has slowed, especially for onshore wind. Costs for utility-scale solar have been falling more rapidly (about 13 percent per year) compared to onshore wind (about 7 percent per year) over the past five years.

Levelized Cost of Energy Comparison—Renewable Energy versus Marginal Cost of Selected Existing Conventional Generation

Certain renewable energy generation technologies are approaching an LCOE that is competitive with the marginal cost of existing conventional generation

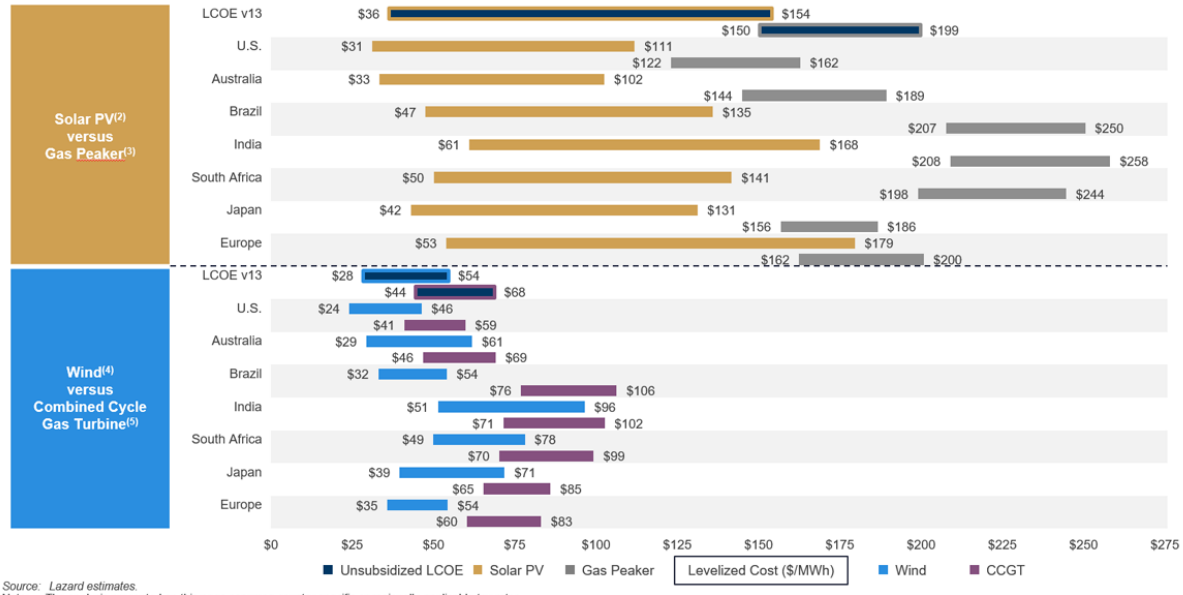


Source: *Lazard estimates.*
Note: Unless otherwise noted, the assumptions used in this sensitivity correspond to those used in the global, unsubsidized analysis as presented on the page titled "Levelized Cost of Energy Comparison—Unsubsidized Analysis".
(1) Represents the marginal cost of operating coal and nuclear facilities, inclusive of decommissioning costs for nuclear facilities. Analysis assumes that the salvage value for a decommissioned coal plant is equivalent to its decommissioning and site restoration costs. Inputs are derived from a benchmark of operating coal and nuclear assets across the U.S. Capacity factors, fuel and variable and fixed operating expenses are based on upper and lower quartile estimates derived from Lazard's research.
(2) The subsidized analysis includes sensitivities related to the TCJA and U.S. federal tax subsidies. Please see page titled "Levelized Cost of Energy Comparison—Sensitivity to U.S. Federal Tax Subsidies" for additional details.

When US government subsidies are included, the cost of building new onshore wind and utility-scale solar (with values averaging $28/MWh and $36/MWh, respectively) is competitive with the marginal cost of coal and nuclear generation (with values averaging $34/MWh and $29/MWh, respectively).

Solar PV versus Gas Peaking and Wind versus CCGT—Global Markets(1)

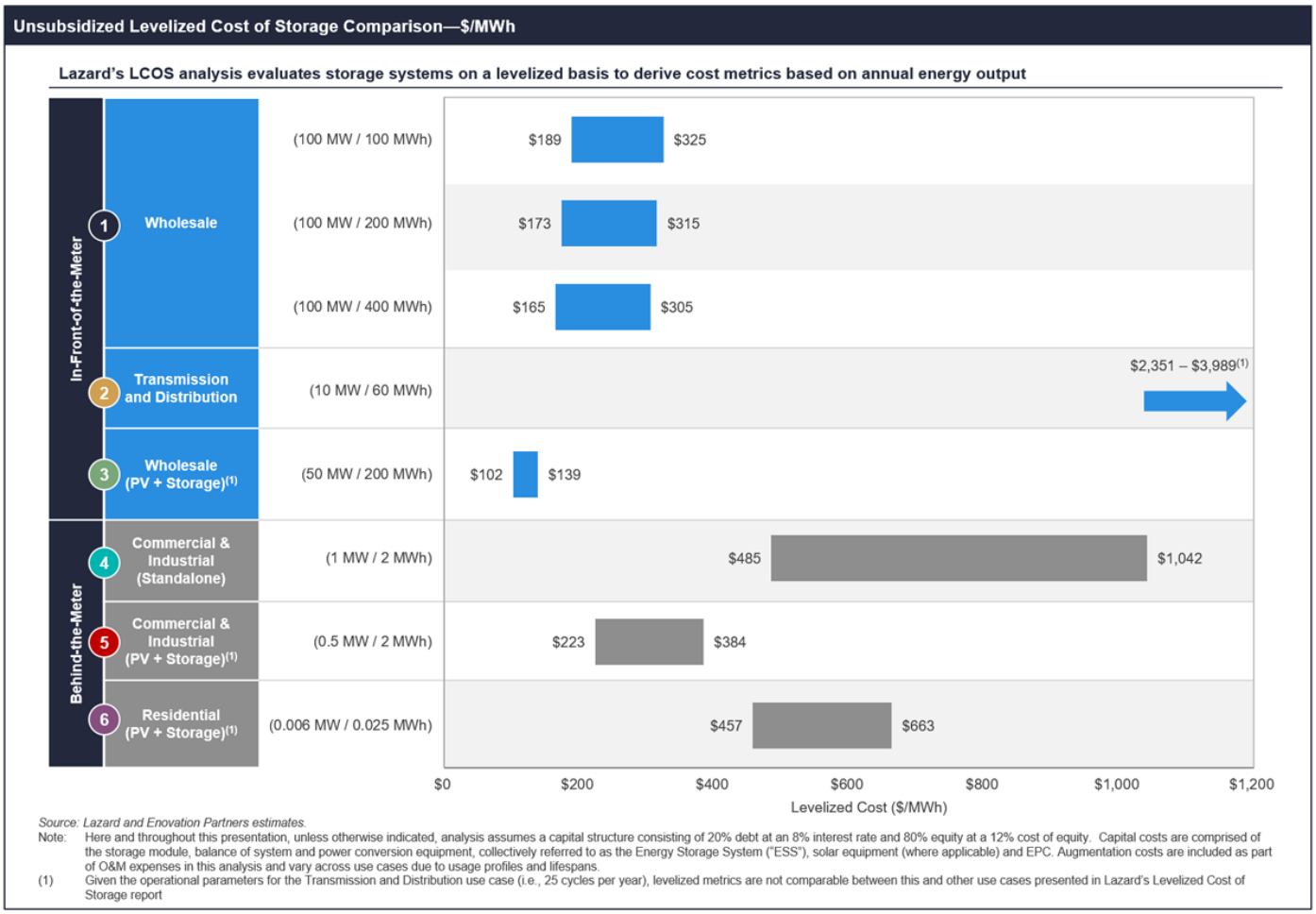
Solar PV and wind have become increasingly competitive with conventional technologies with similar generation profiles; without storage, however, these resources lack the dispatch characteristics, and associated benefits, of such conventional technologies



Source: *Lazard estimates.*
Note: The analysis presented on this page assumes country-specific or regionally-applicable tax rates.
(1) Equity IRRs are assumed to be 10.0% – 12.0% for Australia, 15.0% for Brazil and South Africa, 13.0% – 15.0% for India, 8.0% – 10.0% for Japan, 7.5% – 12.0% for Europe and 7.5% – 9.0% for the U.S. Cost of debt is assumed to be 5.0% – 5.5% for Australia, 10.0% – 12.0% for Brazil, 12.0% – 13.0% for India, 3.0% for Japan, 4.5% – 5.5% for Europe, 12.0% for South Africa and 4.0% – 4.5% for the U.S.
(2) Low end assumes crystalline utility-scale solar with a single-axis tracker. High end assumes rooftop C&I solar. Solar projects assume illustrative capacity factors of 21% – 28% for the U.S., 26% – 30% for Australia, 26% – 28% for Brazil, 22% – 23% for India, 27% – 29% for South Africa, 16% – 18% for Japan and 13% – 16% for Europe.
(3) Assumes natural gas prices of $3.45 for the U.S., $4.00 for Australia, $8.00 for Brazil, $7.00 for India, South Africa and Japan and $6.00 for Europe (all in U.S.$ per MMBtu). Assumes a capacity factor of 10% for all geographies.
(4) Wind projects assume illustrative capacity factors of 38% – 55% for the U.S., 29% – 46% for Australia, 45% – 55% for Brazil, 25% – 35% for India, 31% – 36% for South Africa, 22% – 30% for Japan and 33% – 38% for Europe.
(5) Assumes natural gas prices of $3.45 for the U.S., $4.00 for Australia, $8.00 for Brazil, $7.00 for India, South Africa and Japan and $6.00 for Europe (all in U.S.$ per MMBtu). Assumes capacity factors of 55% – 70% on the high and low ends, respectively, for all geographies.

Regional differences in resource availability and fuel costs can drive meaningful variance in the LCOE of certain technologies, although some of this variance can be mitigated by adjustments to a project's capital structure, reflecting the availability, and cost, of debt and equity.

Lazard's latest annual Levelized Cost of Storage Analysis (LCOS 5.0) shows that storage costs, particularly for lithium-ion technology, have continued to decline faster than for alternate storage technologies.



Source: Lazard and Enovation Partners estimates.

Note: Here and throughout this presentation, unless otherwise indicated, analysis assumes a capital structure consisting of 20% debt at an 8% interest rate and 80% equity at a 12% cost of equity. Capital costs are comprised of the storage module, balance of system and power conversion equipment, collectively referred to as the Energy Storage System ("ESS"), solar equipment (where applicable) and EPC. Augmentation costs are included as part of O&M expenses in this analysis and vary across use cases due to usage profiles and lifespans.

(1) Given the operational parameters for the Transmission and Distribution use case (i.e., 25 cycles per year), levelized metrics are not comparable between this and other use cases presented in Lazard's Levelized Cost of Storage report

Additional highlights from LCOS 5.0:

Lithium-ion, particularly for shorter duration applications, remains the least expensive of energy storage technologies analyzed and continues to decrease in cost, thanks to improving efficiencies and a maturing supply chain.

Solar PV + storage systems are economically attractive for short-duration wholesale and commercial use cases, though they remain challenged for residential and longer-duration wholesale use cases.