

# Smart Grid Northwest

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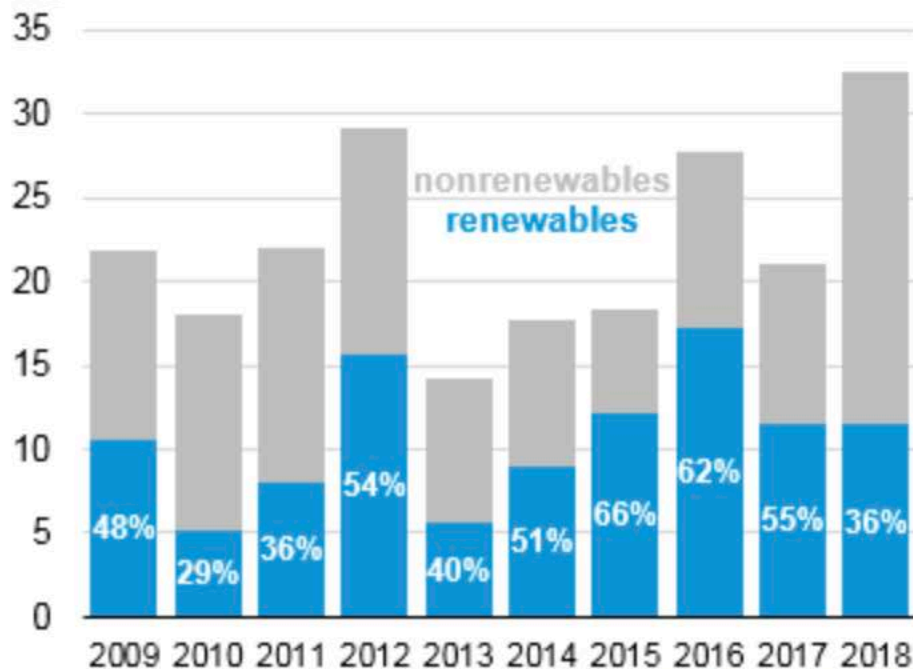


# Capacity Additions Utility Scale

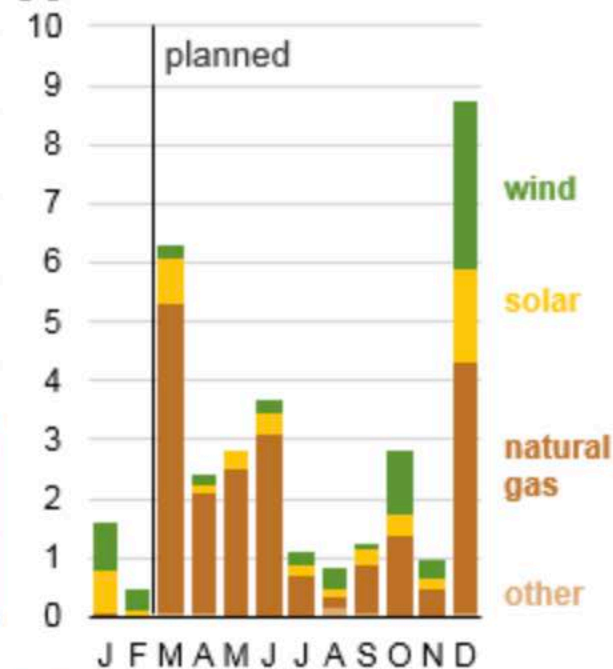
EIA 2018



### Utility-scale capacity additions, 2009-2018 gigawatts



### 2018 monthly additions gigawatts



Source: U.S. Energy Information Administration, *Preliminary Monthly Electric Generator Inventory*

# Levelized Cost of Energy (LCOE)

Lazard 2017



## Unsubsidized Levelized Cost of Energy Comparison



‡ Denotes distributed generation technology.

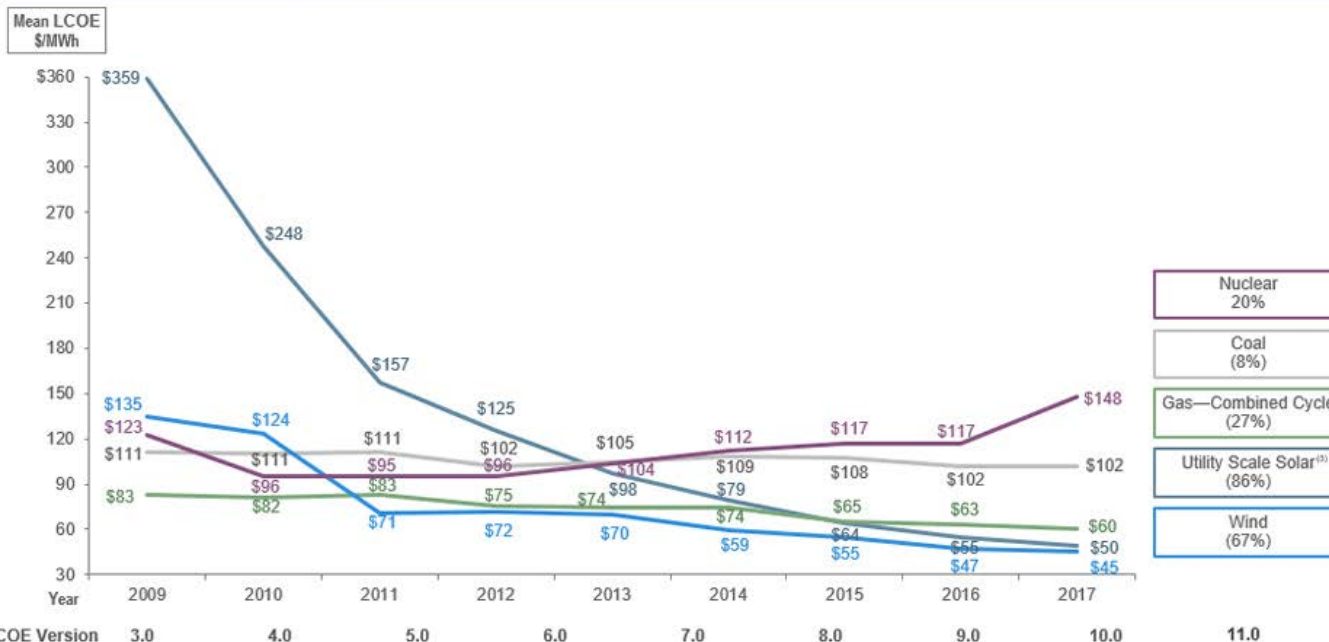
# Levelized Cost of Energy (LCOE)

Lazard 2017



## Summary Findings of Lazard's 2017 Levelized Cost of Energy Analysis<sup>(1)</sup>

### Selected Historical Mean LCOE Values<sup>(2)</sup>



Source: Lazard estimates.

Note: Reflects average of unsubsidized high and low LCOE range for given version of LCOE study.

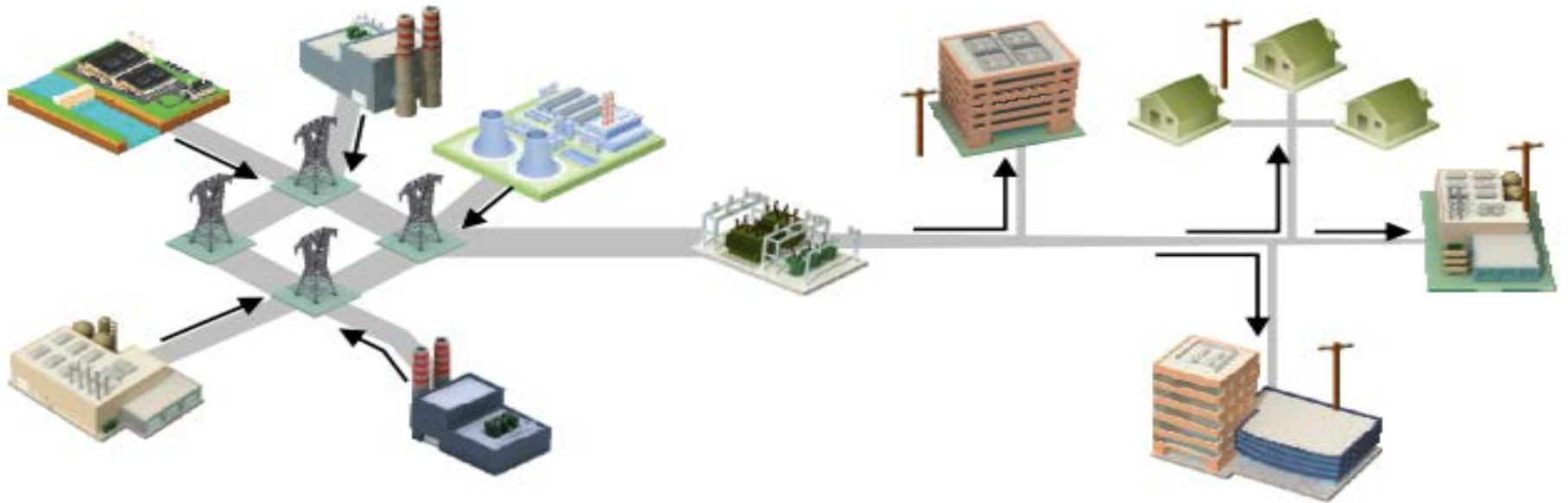
(1) Primarily relates to North American alternative energy landscape, but reflects broader/global cost declines.

(2) Reflects total decrease in mean LCOE since the later of Lazard's LCOE—Version 3.0 or the first year Lazard has tracked the relevant technology.

(3) Reflects mean of fixed-tilt (high end) and single-axis tracking (low end) crystalline PV installations.

# Old/Current Grid

One Way Flow, Central Generation



# New/Modernized Grid

Two Way Flow, Central & Distribution Generation, Increased Monitoring and Controls



# Key Reasons for a Smart Grid



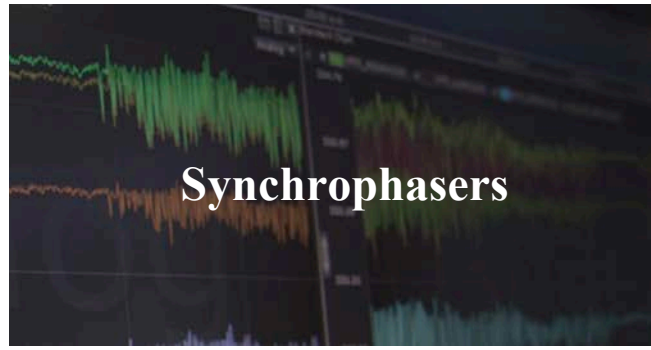
- Outdated infrastructure (delayed investments)
- Manage total energy costs (especially peak)
- System flexibility (integrate distributed resources, storage)
- Better system resiliency, control and uptime
- Higher asset utilization
- Consumer choice and education
- GHG reduction and carbon management



# Smart Grid Happening Now



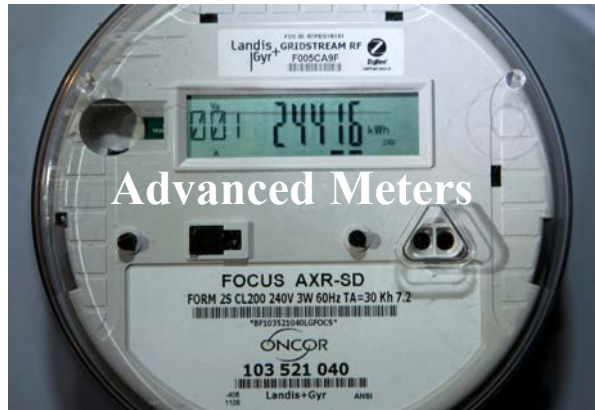
**Better Forecasting**



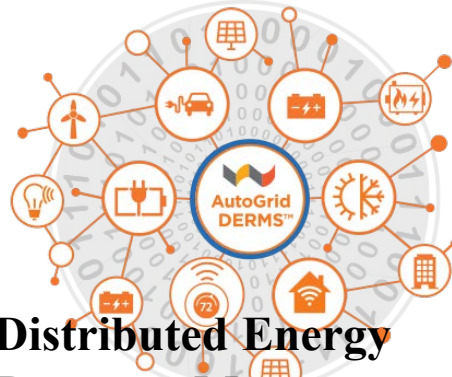
**Synchronphasers**



**Distribution Automation**



**Advanced Meters**



**Distributed Energy Resource Management System**



**Controllable Thermostats**



# Thank you.

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