Overview

• Recent electricity generation trends in the West
• Planned coal unit retirements
• Future resources additions from utility IRPs
• Modeling scenarios of future generation
• Electricity sector CO2 emissions trends and forecasts
• Western states CO2 emissions by sector
Electricity Generation Trends on the 11-State Western Grid

• No increase in total generation since 2008
  • Generation from natural gas and hydro flat (on average)
  • Coal down 27%

The decline in coal and nuclear generation in the West since 2008 has been offset by growth in renewables
2005-2016 Net Generation – Western US
(EIA – 000 MWHRs)

- natural gas
- hydro
2005-2016 Net Generation – Western US
(EIA – 000 MWHRs)

- **coal**
- **renewable**
Planned Retirements of Western Coal Units

Half of the existing coal capacity in the West is scheduled to retire in the next 10 years

• Units remaining after these planned retirements are already quite old
  • If these remaining units retire at age 50 (or 20 years after recent pollution control investments), then:

  Up to 90% of the existing coal units in the West may retire in the next 20 years
Western Coal Unit Retirements by State and Retirement Year

Remaining coal units

Assumed retirement at 50 years or +20 years from installation of SCRs

Installed Capacity in MW


Remaining  Age  AZ  CO  MT  Navajo  NM  NV  OR  UT  WA  WY
### Summary of New Resources from Western IRPs

(Does not include CA)

#### 2017-2030

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<thead>
<tr>
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<th>Capacity Added (MW)</th>
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#### 2017 to 2022

- **Wind**
- **Solar**
- **NGCC**
- **Combustion Turbines**
- **Storage**
Cumulative Capacity Additions, 2017-2030
Source: Western Utility IRPs (not including CA)
Summary of New Resources from Western IRPs (not incl. CA)
Southwest Comparison - 2017-2022

- **Capacity Added (MW)**

- **Wind**
  - All utilities: 3000 MW
  - Southwest (AZ, NM, NV): 100 MW

- **Solar**
  - All utilities: 500 MW
  - Southwest (AZ, NM, NV): 50 MW

- **NGCC**
  - All utilities: 2500 MW
  - Southwest (AZ, NM, NV): 1500 MW

- **Combustion Turbines**
  - All utilities: 1500 MW
  - Southwest (AZ, NM, NV): 500 MW

- **Storage**
  - All utilities: 0 MW
  - Southwest (AZ, NM, NV): 0 MW
Load Growth Forecasts are Reported Differently Across Utilities

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<tr>
<th>Utility</th>
<th>Average, Pre-DSM (%)</th>
<th>Average, Post-DSM (%)</th>
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Most common forms of reporting.
Western states utility-scale generation by fuel, 2015-2030
TWh, % of total

EXPENSIVE GAS AND RENEWABLES

- 3% Other non-fossil
- 7% Solar
- 22% Wind
- 5% Nuclear
- 26% Hydro
- 33% Other Fossil
- 17% Natural Gas

CHEAP GAS AND RENEWABLES

- 3% Other non-fossil
- 7% Solar
- 23% Wind
- 5% Nuclear
- 26% Hydro
- 22% Other Fossil
- 13% Coal
- 20% Natural Gas

Source: Rhodium Group analysis. Note: "Other Fossil" includes petroleum and non-classified fuels. "Other non-fossil" includes geothermal, municipal solid waste and biomass. Distributed generation is not included in these data.
2016 EIA Net Generation vs. WECC 2026 Common Case v2.0 (11 Western States Only)
CO2 Emissions Trends on the 11-State Western Grid

- CO2 emissions from the electricity sector in the West decreased by 20% from 2008 to 2016
  - Planned coal unit retirements will lead to significant additional reductions in the coming years
  - Western state policies and planned utility investments in renewables will reinforce the trend to lower emissions

As a region, the West will exceed the emission reduction targets in the Clean Power Plan
Western Electricity Sector CO2 Emissions
EPA CAMD (short tons)

[Chart showing Western Electricity Sector CO2 Emissions from 2005 to 2030, with two lines: CO2 (short tons) and CPP Regional Cap.]

- Actual Emissions 2005-2016
- 2016 emission minus planned retirements 2017-2030
- CPP aggregate Western cap 2022-2030
Western states electric power CO\(_2\) emissions, 2005-2030

Million metric tons

Source: EIA, Rhodium Group analysis.

Expensive gas and renewables: 37% reduction from 2005

Cheap gas and renewables: 47% reduction from 2005
2015 CO2 by Sector - 11 Western States
(EIA - million metric tons)

*Elec. Adjusted to 2016
Achieving Further CO2 Reductions Across the West

Transportation sector emissions in the West are 1.6X higher than the electricity sector

• We need more clean, affordable electricity to electrify transportation and other end uses
  • Tremendous potential to increase renewable generation across the Western grid

How will Western states work together toward this goal?
Recent Reports

- So. Cal. Edison - The Clean Power and Electrification Pathway

- RMI - From Gas to Grid

- CA ISO – Electricity 2030