What’s this about?

- We describe the growth of Variably Energy Resources (VER) in the Western Interconnect.

- More emissions are mitigated with the use of VERs but the cost of achieving those reductions is significantly higher than using gas.
WECC* Balancing Authorities

* (Western Electricity Coordinating Council or WECC)

WECC Generation By Region

Evolution of VERs

- 90% of the growth in low-carbon capacity is from VERs (mostly wind) but hydro remains dominant.

Evolution of Transmission

Source: NERC ES&D Database 2013 and NERC LTRA 2011
Note: Prior to 2008, lines below 200kV were not accounted for.
Historic and Forecast Capacity Factors


Note: San Onofre Nuclear station taken offline in January 2012

From the data

• New capacity coming from gas and renewables

• Gas balances variability from renewables

• Transmission growth has been flat

• Low (under-utilized) capacity factor for gas suggests gas solves balancing role vs. transmission
Estimating the impact of VERs

- Use WEEC’s forecast for 2020 demand

- Incremental demand in 2020 (115 TWh) is met by three hypothetical scenarios: COAL; GAS; REN and use EIA levelized costs.

- Costs and emission reductions for GAS and REN are compared to the base case COAL
Estimated emissions

![Graph showing estimated emissions over time]

Costs

<table>
<thead>
<tr>
<th>Total Cost by Scenario using EIA Levelized Costs ($B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020 COAL</td>
</tr>
<tr>
<td>2020 GAS</td>
</tr>
<tr>
<td>2020 REN</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Emission reduction (MT)</th>
<th>Cost $/tCO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020 GAS</td>
<td>42</td>
<td>7.5</td>
</tr>
<tr>
<td>2020 REN</td>
<td>102</td>
<td>64 - 96</td>
</tr>
</tbody>
</table>
Conclusion: Low carbon generation in the Western Interconnect – slow and steady.


Conclusion

• The Western Interconnect may have 50% low-carbon generation by 2020, up from 44% almost two decades earlier – slow & steady.

• More emissions are mitigated with the use of VERs but the cost of achieving those reductions is significantly higher than using gas.
The 2060 Project:
Energy Pathways for BC and Canada
http://www.iesvic.uvic.ca