Northwest **Power** and **Conservation** Council

November 6, 2018

MEMORANDUM

TO: **Council Members**

FROM: **Gillian Charles, John Ollis, Mike Starrett**

SUBJECT: **Report on California's 100 Percent Clean Energy Act**

BACKGROUND:

Presenter: Gillian Charles, John Ollis

Summary: On September 10, 2018, California Governor Jerry Brown signed Senate Bill 100 – also known as "The 100 Percent Clean Energy Act of 2018" – into law. The legislation is comprised of two major components: (1) it strengthens and accelerates California's existing renewable portfolio standard, setting a new target of 60% by 2030, and (2) it commits California to a 100% clean energy mix by 2045, through the supply and generation of zero-carbon resources.

Staff will present the first part of a two-part analysis on the potential effects of California's new 100% clean energy act. This first presentation will focus on the background of the legislation and how it compares to renewable and greenhouse gas initiatives and policies in other states, California's current generating resource portfolio – including imports from the Pacific Northwest, and California's current carbon emissions and carbon intensity of its electricity system. In addition, staff will preview its analysis on the potential effects this policy may have on market dynamics in the WECC.

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Relevance: As the Council readies to kick-off development of its Eighth Power Plan early next year, it is important to understand and analyze the potential effects of this legislation.

Report on California's 100% Clean Energy Act

Gillian Charles, John Ollis, Mike Starrett

Council Meeting

11/14/18

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California's SB 100 *"The 100 Percent Clean Energy Act"*

- Signed into law by Governor Brown on Sept. 10, after passing the Senate Aug. 29 and the Assembly on Aug. 28
  - Replaces and accelerates the existing 50% RPS (SB 350), which was codified October 2015
  - Strengthens existing carbon goals (see AB 32)
- Legislation comprised of two major components plus an executive order (see next 3 slides)

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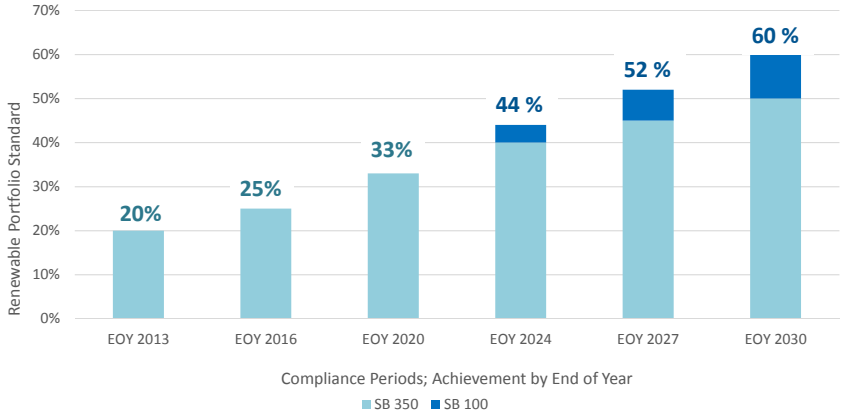
California SB 100 (1): Increase RPS from 50% to 60% in 2030



California first established an RPS in 2002. It has been revised and strengthened four times since then, with SB 100 replacing 2015 SB 350.

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California SB 100 (2): 100% zero-carbon **electricity** by 2045

By 2045, eligible renewable energy resources *and zero-carbon resources* will supply 100% of retail sales of electricity

- Without increasing carbon emissions elsewhere in the western grid or allowing resource shuffling
- Eligible zero-carbon resources beyond RPS-eligible resources include large hydro located within the state, natural gas w/ carbon capture and storage, nuclear
- Energy storage and emerging technologies expected to play a role in future CA system

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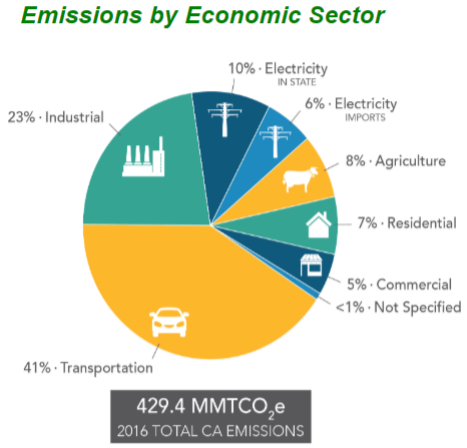
Executive Order B-55-10: 100% carbon neutrality **economy-wide**

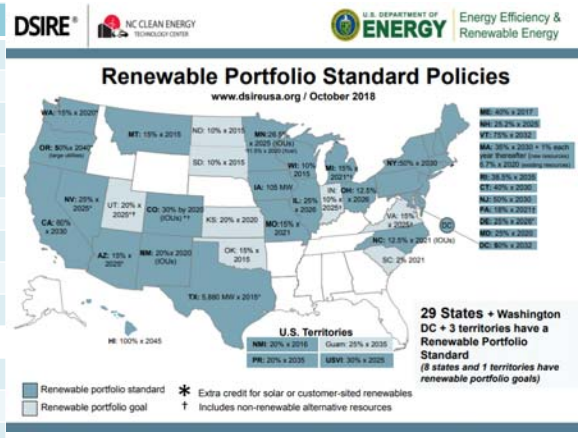
- Governor Brown signed Executive Order B-55-10, a state-wide goal established to "achieve carbon neutrality as soon as possible, no later than 2045"
- Carbon neutrality = "net" zero carbon, i.e. not eliminating all emissions, but rather balancing (offsetting) emissions with removal
- Electricity accounts for **16%** of CA's GHG emissions; this EO targets the remaining sectors
- EOs not legally binding; offer guidance and goals



Source: https://www.arb.ca.gov/cc/inventory/data/data.htm

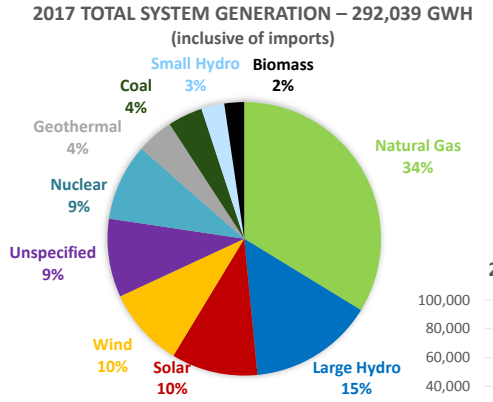
Renewable Portfolio Standards in WECC

State	Standard
Washington	15% by 2020
Oregon	50% by 2040
Montana	15% by 2015
California	60% by 2030
Nevada	25% by 2025
Colorado	30% by 2020
Arizona	15% by 2025
New Mexico	20% by 2020
Texas	5,880 MW by 2015
Other mentions:	
Hawaii	100% by 2045
Vermont	75% by 2032
New York, New Jersey	50% by 2030
District of Columbia	50% by 2032

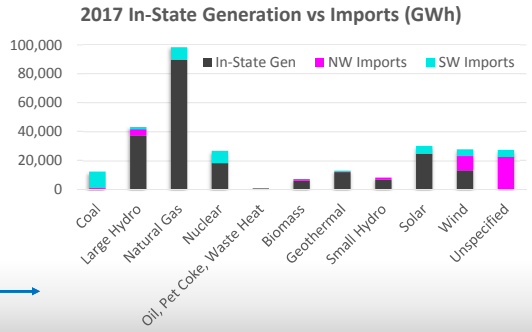


Note: How aggressive a state's RPS is depends on more than just target and target year; Each RPS is unique with different resource eligibility rules, requirements, and ramp rates.

California's Current Resource Mix



- Natural gas (34%) currently largest source of generation, followed by renewables, large hydro, and nuclear
- Zero-carbon resources accounted for ~53% of 2017 resource mix (56% in-state)
- Renewables made up 29% (RPS target is 25% for 2017)



- NW imports accounted for ~14% of 2017 resource mix
- Most notable were wind and large hydro imports and market purchases (presumably hydro)

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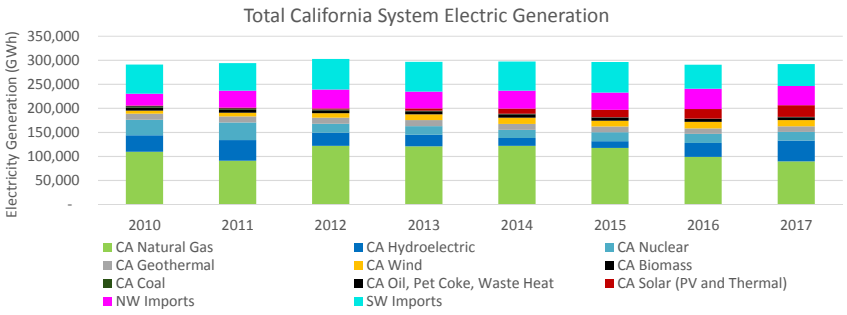
Data from the CEC-1304 and SB 1305 reporting forms
California Energy Commission – 2017 Almanac

2017 compared to previous years



- In 2017, in-state generation:
  - Hydropower increased to highest amount since 2006
  - Natural gas displaced by hydro, dropping production to lowest amount in 17 years
  - Solar PV and thermal increased 22% over 2016
  - Wind and nuclear dropped 5%
- SONGS closed permanently in 2013 and Diablo Canyon (last remaining nuclear plant in CA) scheduled to close in 2024 and 2025

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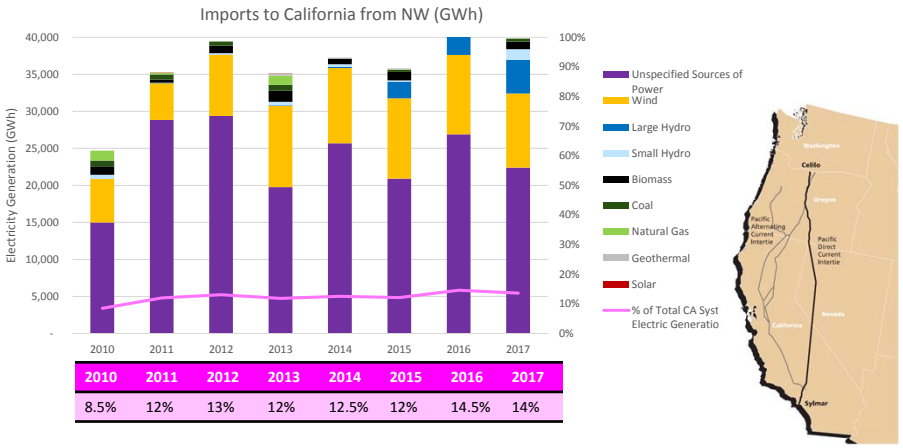
Breakdown of imports to CA from NW



2010	2011	2012	2013	2014	2015	2016	2017
8.5%	12%	13%	12%	12.5%	12%	14.5%	14%

- Over the past 8 years, NW imports have contributed to between 8.5% and 14.5% of California's total electric system generation mix
  - Of that, the majority is from unspecified sources of power, wind, and large hydro

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Unspecified sources include spot market purchases, typically served by surplus hydro and newer gas-fired plants

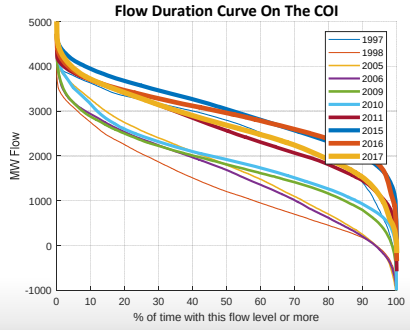
Flow volumes from NW to CA

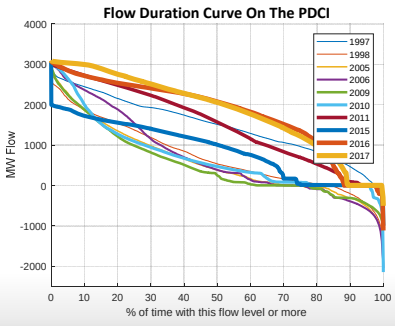
COI

- Typically capable of sending 4,000-5,000 MW in N-S direction
- Actual flows generally between 2,500-4,000 MW N-S and almost never S-N direction

PDCI

- Typically capable of sending 2,500-3,000 MW in N-S direction
- Actual flows generally between 1,000-3,000 MW N-S and very rarely S-N direction





Note: Thicker lines = more recent years

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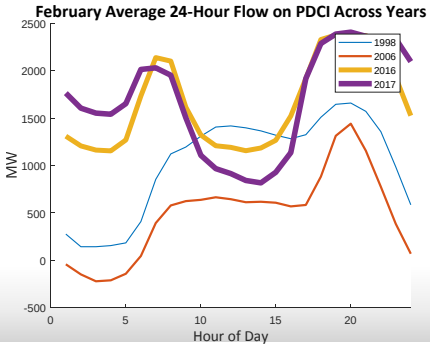
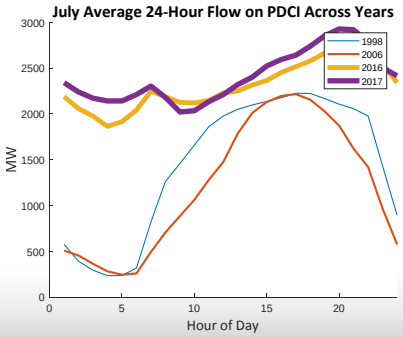
Flow Shape from NW to CA

PDCI Hourly Shape

- Shape of net load drives mid-day prices down due to thermal resource inflexibility
- Energy transfers (shown below) follow price shape; recent trend shows higher N-S transfers in off-peak hours and much lower N-S transfers during mid-day compared to historical patterns
- Shape of COI transfers reflects similar N-S trend; will be explored in follow up presentation





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California's Broader GHG Targets and Legislation

- California Global Warming Solutions Act of 2006 (AB 32) mandates GHG reductions **across multiple sectors** responsible for ~85% of total GHGs
  - 1990 levels by 2020 (~15% reduction *vs.* business as usual), 40% below 1990 levels by 2030 (SB32)
- Cap and Trade Program (started in 2012) provides transparent carbon allowance pricing in $/Tonne-$CO_2e$
- Decreasing the carbon intensity of the electricity sector could lead to process electrification to save on carbon allowance costs

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To be continued…

- In future meeting, analysis will be presented from AURORA runs comparing how this policy effects the following:
  1. WECC-wide buildout of resources
  2. Wholesale Prices – shape and seasonality
  3. Expected regional import/export dynamics
  4. Carbon emissions and production costs in the WECC.