

A large, stylized graphic of a lightbulb is positioned on the left side of the slide. The outline of the bulb is a light green color, and the base is composed of several horizontal green bars. A large, light blue checkmark is superimposed over the left side of the bulb's outline.

Cost and Emissions Impacts

Imported GHG-free and PCC2 Resources

Agenda

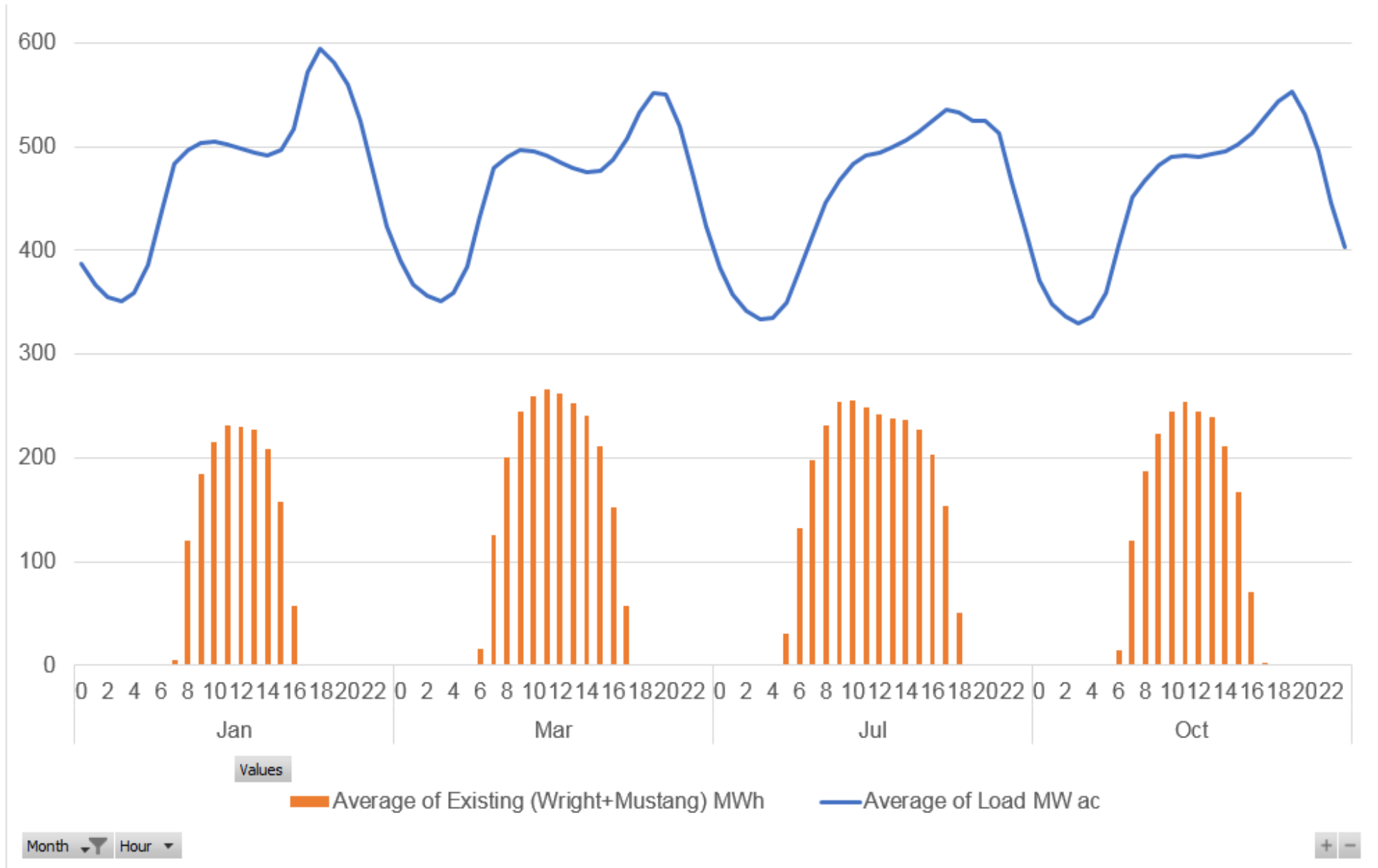
- Foundational Background
- Regulatory Update
- Power Supply Options

Power Supply Questions

- What does it mean to be 100% GHG-free?
- Should we pursue PCC2 procurement or PCC1 only?
- Are we comfortable pairing PCC2 with nuclear for GHG-free energy?
- What role should biomass and geothermal play in PCE's portfolio?
- What role should ACS contracts play in PCE's portfolio?

Foundational Background

PCE Load Shape & Resources - 2025



Power Flow v. Attribute Tracking

- Once delivered to the grid, electrons are indistinguishable from one another
- No way to track specific electrons once they are injected to grid
- For regulatory compliance and to substantiate marketing claims, LSEs use power supply contracts to specify ownership of the “attributes” associated with supplying electricity
 - Power supply contracts specify ownership of attributes
 - Owner of attributes can make claims about renewable content and environmental impact
 - RECs are one way to track and reference such claims
 - PCE’s portfolio currently balanced over a year, not in real-time

What is a REC?

- REC = Renewable Energy Certificate
- California Law (Public Utilities Code S. 399.12[f]) defines a REC as:
 - A certificate of proof, issued through the accounting system established by the energy commission...that one unit of electricity was generated and delivered by an eligible renewable resource
 - Includes all renewable and environmental attributes associated with the production of electricity from a renewable resource

Renewable ≠ GHG Free

- RECs represent avoided GHG emissions.
 - *I.e. renewable energy delivered by a landfill gas power plant has avoided emissions that would have resulted when the gas created by decomposing waste escapes into the atmosphere*
- GHG Free means there are zero GHG emissions associated with the electricity production
- To date, GHG emissions reporting by LSEs to retail customers has been voluntary
- Common approaches have deemed renewable, hydroelectric and nuclear energy as carbon free
- Treatment has varied in GHG emissions reporting for geothermal, biofuel, and unbundled RECs

Renewable v. GHG Free

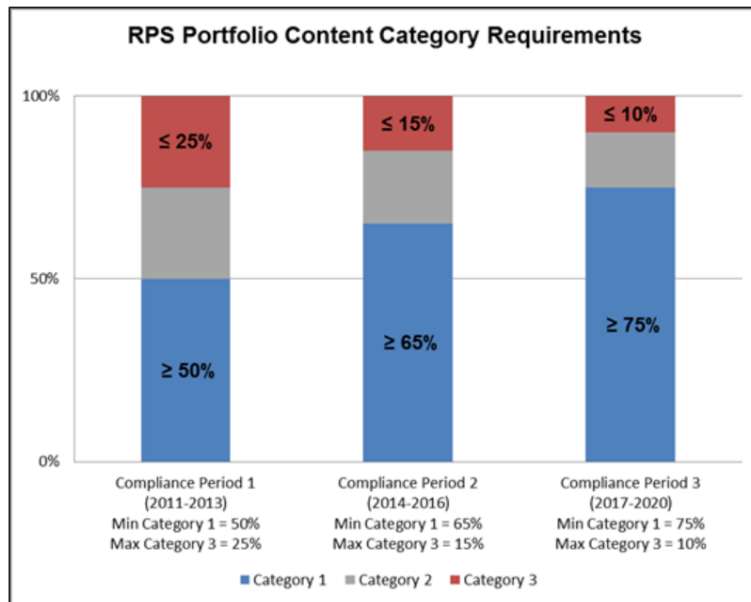
- Renewable: electricity from a source that is not depleted when used, and not derived from fossil or nuclear fuel
- GHG-free: electricity that does not emit carbon or other greenhouse gases

| Renewable | GHG Free |
|------------------------|------------------------|
| Biomass & Waste | |
| Geothermal | |
| Solar | Solar |
| Wind | Wind |
| Small / Eligible Hydro | Small / Eligible Hydro |
| | Large Hydro |
| | Nuclear |

RPS Requirements

| End of | RPS | PCE Target |
|--------|-----|------------|
| 2020 | 33% | 50% |
| 2024 | 44% | 50% |
| 2027 | 52% | 100% |
| 2030 | 60% | 100% |

- Renewable energy separated into 3 categories or buckets
- Requires minimum percentage from Bucket 1 and maximum percentage from Bucket 3



RPS Buckets

- Bucket 1: Energy & RECs delivered to a CA balancing authority (CBA) without substitute energy
- Bucket 2: Energy & RECs (typically from an out of state project) that cannot be delivered to CBA without substituting energy from another source
 - i.e. intermittent wind energy needs to substitute in another energy source to meet demand during times when wind facility is not producing energy
- Bucket 3: Unbundled RECs, RECs that do not meet Bucket 1 or Bucket 2 definition

Regulatory Update

POWER CONTENT LABEL

- Power Content Label (PCL) requirements have been in place since 2009
- California Public Utilities Code requires all retail sellers of electric energy, including Peninsula Clean Energy, to disclose “accurate, reliable, and simple-to-understand information on the sources of energy” that are delivered to their respective customers.
- The format for the required communications is highly prescriptive, offering little flexibility to retail sellers when presenting such information to customers.

2018 POWER CONTENT LABEL

| 2018 POWER CONTENT LABEL | | | |
|--|---|-------------|---------------------|
| Peninsula Clean Energy Authority | | | |
| https://www.peninsulacleanenergy.com/energy-sources/ | | | |
| ENERGY RESOURCES | ECOplus | ECO100 | 2018 CA Power Mix** |
| Eligible Renewable | 51% | 100% | 31% |
| Biomass & Biowaste | 5% | 0% | 2% |
| Geothermal | 2% | 0% | 5% |
| Eligible Hydroelectric | 5% | 0% | 2% |
| Solar | 7% | 50% | 11% |
| Wind | 33% | 50% | 11% |
| Coal | 0% | 0% | 3% |
| Large Hydroelectric | 35% | 0% | 11% |
| Natural Gas | 0% | 0% | 35% |
| Nuclear | 0% | 0% | 9% |
| Other | 0% | 0% | <1% |
| Unspecified sources of power* | 14% | 0% | 11% |
| TOTAL | 100% | 100% | 100% |
| * "Unspecified sources of power" means electricity from transactions that are not traceable to specific generation sources. | | | |
| ** Percentages are estimated annually by the California Energy Commission based on the electricity generated in California and net imports as reported to the Quarterly Fuel and Energy Report database and the Power Source Disclosure program. | | | |
| For specific information about this electricity product, contact: | Peninsula Clean Energy Authority 1-866-966-0110 | | |
| For general information about the Power Content Label, please visit: | http://www.energy.ca.gov/pci/ | | |
| For additional questions, please contact the California Energy Commission at: | Toll-free in California: 844-454-2908 Outside California: 916-653-0237 | | |

AB1110 & Changes to PCL Reporting

- AB1110 (Ting, 2016) modifies the Power Content Label by requiring reporting and disclosure of the GHG emissions intensity associated with electricity serving retail customers
- May result in GHG emissions reporting for geothermal, biomass, Bucket 2 (firmed-and-shaped) and Bucket 3 (unbundled) renewables
- Implementation is currently in process and will affect reporting in 2020 for 2019 electricity sales
- GHG emissions intensity (metric tons CO₂e / MWh) for a generator are assigned by CEC based on reported or assigned emissions under the Mandatory Reporting Requirement

AB1110 & Changes to PCL Reporting

- RPS Bucket 2 Treatment:
 - Will be assigned emissions profile of underlying power source, if unknown, will be assigned emissions profile for unspecified power
 - Default emissions factor is 0.428 MTCO₂e / MWh
 - Allow grandfathering for contracts signed prior to February 2018
- Biomass Treatment:
 - Consistent with guidance from IPCC, CARB GHG Emission Inventory and EPA Emission Inventory
 - Biogenic CO₂ emissions are not attributed to the electricity sector
 - Emissions of non-biogenic CO₂ as well as CH₄ and N₂O would be included
- Geothermal Treatment:
 - Emissions factor for geothermal estimated around .09 MTCO₂e / MWh

PROPOSED AB1110 POWER CONTENT LABEL

| (ENTITY NAME) | | | | | | |
|---|-------------|---------------|--|--|------------------------|---------------|
| 2019 POWER CONTENT LABEL | | | | | | |
| Greenhouse Gas Emissions Intensity (in kg CO ₂ e/MW) | | | Energy Resources | Product 1 Power Mix | Product 2 Power Mix | CA Total Mix |
| (Product 1) | (Product 2) | State Average | Eligible Renewables¹ | 31.0% | 75.0% | 22.0% |
| 334 | 87 | 305 | Biomass & biowaste | 8.0% | 0.0% | 3.0% |
| <p>500 400 300 200 100 0</p> <p>■ (Product 1) ■ (Product 2) ■ State Average</p> | | | Geothermal | 4.0% | 0.0% | 4.0% |
| | | | Eligible hydroelectric | 1.0% | 0.0% | 1.0% |
| | | | Solar | 16.0% | 75.0% | 6.0% |
| | | | Wind | 2.0% | 0.0% | 8.0% |
| | | | Coal | 3.0% | 0.0% | 6.0% |
| | | | Large Hydroelectric | 8.0% | 4.0% | 5.0% |
| | | | Natural Gas | 46.0% | 10.0% | 44.0% |
| | | | Nuclear | 0.0% | 0.0% | 9.0% |
| | | | Other | 0.0% | 0.0% | 0.0% |
| | | | Unspecified Electricity² | 12.0% | 11.0% | 14.0% |
| TOTAL | | | | 100.0% | 100.0% | 100.0% |
| <i>Unbundled RECs retired as a percentage of these electric service products' retail sales:</i> | | | | 12% | 25% | |
| <p>¹ Unbundled renewable energy credits (RECs) represent renewable investments that do not deliver electricity to the retail supplier's customers. Unbundled RECs are not reflected in the power mix or GHG emissions intensities above.</p> <p>² Unspecified power is electricity that was purchased through open market transactions and is not traceable to a specific generation source or sources.</p> | | | | | | |
| For specific information about this electricity product, contact: | | | (Entity Name) | (Entity Phone Number) | | |
| | | | | (Entity Website) | | |
| For general information about the Power Content Label, consult: | | | California Energy Commission | 1-844-217-4925 www.energy.ca.gov/pcl/ | | |

Power Supply Options

Power Supply Questions

- What does it mean to be 100% GHG-free?
- Should we pursue PCC2 procurement or PCC1 only?
- Are we comfortable pairing PCC2 with nuclear for GHG-free energy?
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PCC2 v PCC1

- Under new reporting requirements, PCC2 assigned emissions factor for underlying power source
- If underlying power source is unknown, will be assigned emissions factor for unspecified currently 0.428 MTCO₂e / MWh
- Can purchase up to 25% of renewable energy in portfolio from PCC2

PCC2 v PCC1 – Cost Impact

- Purchasing all PCC1 and no additional PCC2 has a ~**\$5 MM / year** impact on PCE's budget
- ~2.5% of PCE's energy budget

PCC2 v PCC1 – Scenarios

| | 0% PCC2 | 2.5% PCC2 | 5% PCC2 | 7.5% PCC2 | 10% PCC2 | 12.5% PCC2 |
|---|---------|-----------|---------|-----------|----------|------------|
| Emissions MTCO ₂ e | 0 | 38,520 | 77,040 | 115,560 | 154,080 | 192,600 |
| Emissions Factor MTCO ₂ e / MWh | 0 | 0.011 | 0.021 | 0.032 | 0.043 | .054 |

GHG-Free PCC2

- If PCC2 is paired with a GHG-Free resource, it will be represented as GHG-Free
- Large Hydro: not available due to CCAs commitments to lower carbon
- Nuclear: Can pair with nuclear for GHG-free emissions intensity
- Nuclear will not show up on Product Content Label distributed to customers
- Will show on our Power Source Disclosure report
 - Public regulatory filing, but not distributed to customers

Role of Biomass & Geothermal

- Biomass and geothermal are baseload resources; can operate all 24 hours
- Important in a 100% or heavily renewable portfolio
- They also have small amounts of emissions, which will be reported on our Product Content Label
 - Geothermal ~ 0.09 MT CO₂e per MWh
 - Biomass (non-biogenic emissions) ~ 0.01 MT CO₂e per MWh
- Complicates messaging around 100% GHG-free in 2021

Biomass & Geothermal – Scenarios

| Biomass | 0% | 5% | 10% | 15% | 20% | 25% |
|--|----|--------|--------|--------|--------|--------|
| Emissions MTCO ₂ e | 0 | 1,800 | 3600 | 5400 | 7200 | 9000 |
| Emissions Factor MTCO ₂ e / MWh | 0 | 0.0005 | 0.0010 | 0.0015 | 0.0020 | 0.0025 |

| Geothermal | 0% | 5% | 10% | 15% | 20% | 25% |
|--|----|--------|--------|---------|--------|--------|
| Emissions MTCO ₂ e | 0 | 16,200 | 32,400 | 48,600 | 64,800 | 81,000 |
| Emissions Factor MTCO ₂ e / MWh | 0 | 0.0045 | 0.0090 | 0.01350 | 0.0180 | 0.0225 |

Asset Controlling Suppliers

- Created by CARB for Mandatory Reporting of GHG Emissions (MRR)
- Specific electric power entity registered with CARB
- Heavily hydro portfolios, but cannot / difficult separate to specific source
- Owns or operates interconnected electricity generating facilities or serves as an exclusive marketer
- Assigned an emissions factor by CARB for electricity purchased from these suppliers

Asset Controlling Suppliers

- Currently there are 3 Asset Controlling Suppliers
- CARB-Assigned emissions factor is based on data reported to CARB annually

| Asset Controlling Supplier | CARB-Assigned Emissions Factor |
|---------------------------------------|-------------------------------------|
| Bonneville Power Administration (BPA) | 0.0129 MT CO ₂ e per MWh |
| Powerex | 0.0233 MT CO ₂ e per MWh |
| Tacoma Power | 0.0200 MT CO ₂ e per MWh |

For reference:

Default system emissions factor = 0.428 MT CO₂e per MWh

Geothermal emissions factor ~ 0.09 MT CO₂e per MWh

ACS Scenarios

| | 0% ACS | 10% ACS | 20% ACS | 30% ACS | 40% ACS | 50% ACS |
|----------------------------------|--------|---------|---------|---------|---------|---------|
| Emissions MTCO2e | 0 | 7,200 | 14,400 | 21,600 | 28,800 | 36,000 |
| Emissions Factor MTCO2e / MWh | 0 | 0.002 | 0.004 | 0.006 | 0.008 | .01 |

For reference:

Default system emissions factor = 0.428 MT CO2e per MWh

Geothermal emissions factor ~ 0.09 MT CO2e per MWh