



**REGULAR MEETING of the Board of Directors of the
Peninsula Clean Energy Authority (PCEA)
Thursday, March 26, 2020**

**PLEASE NOTE: for Video conference: <https://meetings.ringcentral.com/j/1489555784>
for Audio conference: dial 1-623-404-9000, or 1-773-231-9226,
then enter the Meeting ID: 148-955-5784 followed by #
You will be instructed to enter your participant ID followed by #.**
NOTE: Please see attached document for additional detailed teleconference instructions.

Supplemental Agenda Packet items. Please find attached:

Additional document for Item No. 9 Review Strategic Plan and Provide Direction (Discussion)

- 9.3 Background on Carbon Free Energy Types

Instructions for Joining a RingCentral Meeting via Computer or Phone

Best Practices:

- Please mute your microphone when you are not speaking to minimize audio feedback
- If possible, utilize headphones or ear buds to minimize audio feedback
- If participating via videoconference, audio quality is often better if you use the dial-in option (Option 1 below) rather than your computer audio

Options for Joining

- A. Videoconference with Phone Call Audio (*Recommended*) – see Option 1 below
- B. Videoconference with Computer Audio – see Option 2 below
- C. Calling in from iPhone using one-tap – see Option 3 below
- D. Calling in via Telephone/Landline – see Option 4 below

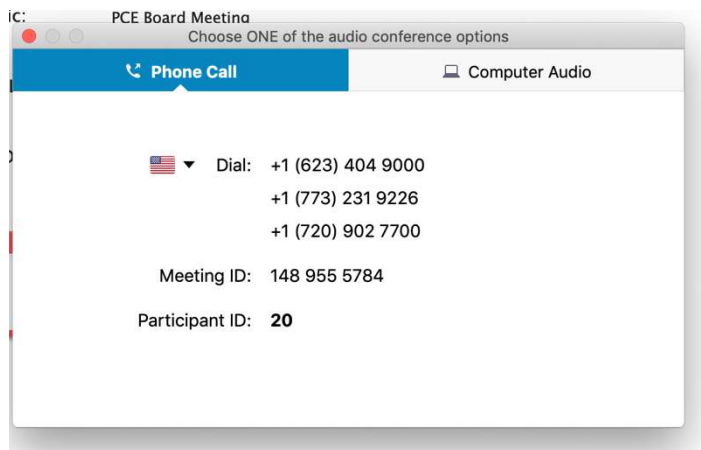
Videoconference Options:

Prior to the meeting, we recommend that you install the RingCentral Meetings application on your computer by clicking here: <https://www.ringcentral.com/apps/rc-meetings>

If you want full capabilities for videoconferencing (audio, video, screensharing) you must download the RingCentral application.

Option 1 Videoconference with Phone Call Audio (Recommended):

1. From your computer, click on the following link that is also included in the PCE Board Meeting Calendar Invitation : <https://meetings.ringcentral.com/j/1489555784>
2. The RingCentral Application will open on its own or you will be instructed to Open RingCentral Meetings.
3. After the application opens, the pop-up screen below will appear asking you to choose ONE of the audio conference options. Click on the Phone Call option at the top of the pop-up screen.



IMPORTANT: Please do not use the Participant ID that is in the picture to the left. Enter the Participant ID that appears on your personal pop-up.

4. Please dial one of the phone numbers for the meeting (it does not matter which one) :

+1 (623) 404 9000

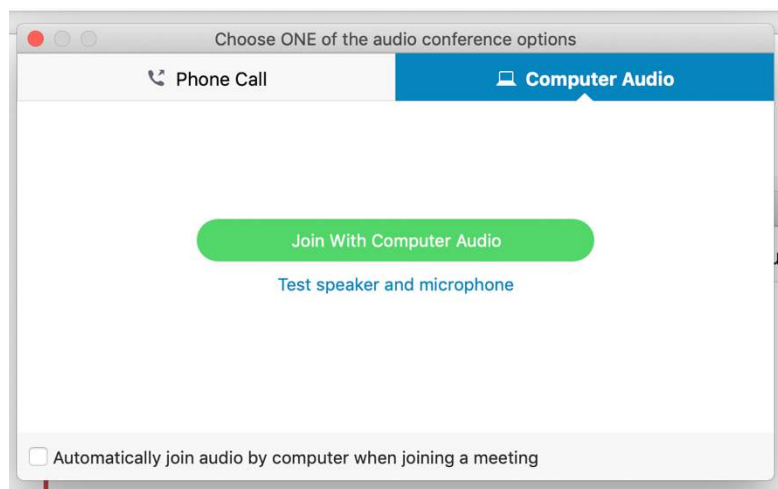
+1 (773) 231 9226

+1 (720) 902 7700

5. You will be instructed to enter the meeting ID: **148 955 5784 followed by #**
6. You will be instructed to enter in your **Participant ID followed by #**. Your Participant ID is unique to you and is what connects your phone number to your RingCentral account.
7. After a few seconds, your phone audio should be connected to the RingCentral application on your computer.
8. In order to enable video, click on “Start Video” in the bottom left hand corner of the screen. This menu bar is also where you can mute/unmute your audio.

Option 2 Videoconference with Computer Audio:

1. From your computer, click on the following link that is also included in the PCE Board Meeting Calendar Invitation : <https://meetings.ringcentral.com/j/1489555784>
2. The RingCentral Application will open on its own or you will be instructed to Open RingCentral Meetings.
3. After the application opens, the pop-up screen below will appear asking you to choose ONE of the audio conference options. Click on the Computer Audio option at the top of the pop-up screen.



4. Click the green Join With Computer Audio button
5. In order to enable video, click on “Start Video” in the bottom left hand corner of the screen. This menu bar is also where you can mute/unmute your audio.

Audio Only Options:

Please note that if you call in/use the audio only option, you will not be able to see the speakers or the PowerPoint in real time. You can still download from the PCE website ([here](#)) the PowerPoint and follow along.

Option 3: Calling in from iPhone using one-tap

Click on either of the “one-tap” numbers from your iPhone:

+1(623)4049000,,1489555784#

+1(773)2319226,,1489555784#

This is the call-in number followed by the meeting ID. Your iPhone will dial both numbers for you.

You will be instructed to **enter your participant ID followed by #**

If you do not have a participant ID or do not know it, you can stay on the line and you will automatically join the meeting

Option 4: Calling in via Telephone/Landline:

Dial either number:

+1(623)4049000

+1(773)2319226

You will be instructed to enter the meeting ID: **148 955 5784 followed by #**

You will be instructed to enter your **participant ID followed by #**.

If you do not have a participant ID or do not know it, you can stay on the line and you will automatically join the meeting



**PENINSULA CLEAN ENERGY AUTHORITY
Board Correspondence**

DATE: March 20, 2020
BOARD MEETING DATE: March 26, 2020
SPECIAL NOTICE/HEARING: None
VOTE REQUIRED: None

TO: Honorable Peninsula Clean Energy Authority Board of Directors

FROM: Jan Pepper, Chief Executive Officer
Siobhan Doherty, Director of Power Resources

SUBJECT: Background on Carbon Free Energy Types

Peninsula Clean Energy's current targets for our energy portfolio are as follows:

- 100% GHG free by 2021; and
- sourced by 100% CA RPS eligible renewable energy by 2025 on a time coincident basis, provided it is economically viable.

In planning for the 2021 GHG-free target, we have generally considered all RPS eligible energy sources and large hydro to count towards this target. There are some RPS-eligible energy sources, including biomass, biogas and geothermal that produce small amounts of greenhouse gas emissions. Generally, we have not sought out nuclear energy to fulfill our GHG-free target.

In planning for the 2025 100% renewable target on a time-coincident basis, we have considered all RPS eligible energy sources to count toward this target. As part of the strategic planning process, Board members have raised the question about how we define what resources are eligible for Peninsula Clean Energy's portfolio beyond 2025. Key to the 100% renewable goal is the ability to meet our customer's electricity consumption on an hourly basis with our selected portfolio of resources.

Figure 1 below demonstrates Peninsula Clean Energy's average hourly load for each quarter in 2019.

Figure 1: Peninsula Clean Energy 2019 Load

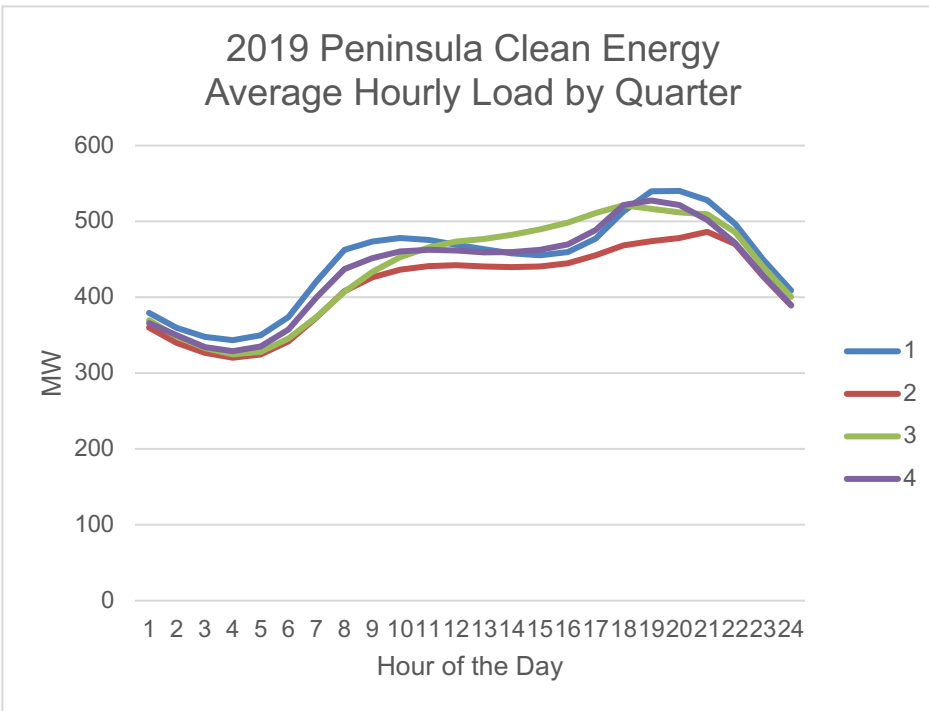


Table 1 below summarizes energy generation sources and some of the considerations in making a determination on which resources to include in Peninsula Clean Energy's portfolio in 2025 and beyond. There are several factors to consider in this decision-making process.

- Environmental impact and emissions intensity
- Generation shape and variability
- Contract structure and ability to schedule
- Availability beyond 2025
- Additionality – Building New Resources

These are further described in the sections below.

Table 1: Comparison of Electricity Generation Resources

Technology	RPS Renewable?	GHG-free?	Emissions (lbs/MWh)	Ability to procure beyond 2025?	Ability to schedule on an hourly basis?	New Build
Solar	✓	✓	0	✓	✓	✓
Wind	✓	✓	0	✓	✓	✓
Biomass / Biogas	✓	✗	22	✓	✓	✓
Geothermal	✓	✗	198	✓	✓	✓

Small Hydro (<30 MW)	✓	✓	0	✓	✓	✗
Large Hydro (>30 MW)	✗	✓	0	✓	✗	✗
Nuclear	✗	✓	0	✗	✗	✗

Environmental Impact / Emissions Intensity

All of the energy generation sources we are evaluating are zero to very low emissions. For comparison purposes, the emissions intensity of system power in California is 941.6 pounds CO₂e per MWh¹. The resources we are considering that do have some emissions, including biomass, geothermal and biogas, have the benefit of providing baseload or dispatchable power supplies.

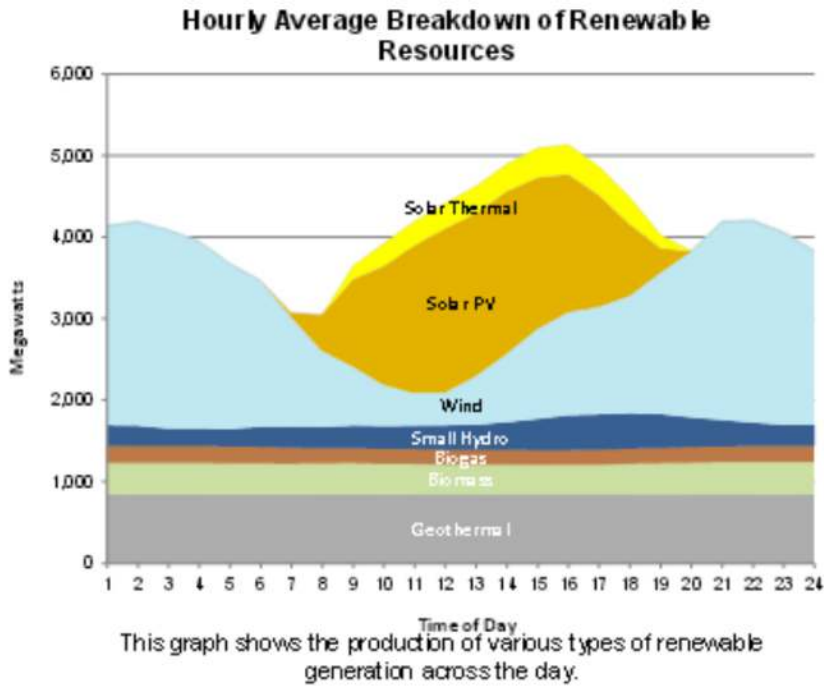
Generation Shape and Variability

Generation sources have different energy generation profiles. Please refer to Figure 2 for a depiction of the generation profiles for renewable resources. Geothermal, biomass, large hydro, and nuclear are considered baseload energy sources, meaning that they can generate power virtually all the time – 24 hours a day, 7 days a week. Solar energy output ramps up as the sun rises and then decreases as the sun sets. Wind generation is dependent on wind patterns and varies based on geographic location. Small hydro is generally “run-of-river” and is dependent on rainfall and snow melt. Although large hydro is dependent on annual snow and rainfall, it is generally considered baseload.

To meet Peninsula Clean Energy customer’s electricity usage, we will need to rely on a combination of these resources. As you will notice, none of the resources matches up perfectly with Peninsula Clean Energy’s load in Figure 1.

¹ As defined in the Mandatory Greenhouse Gas Reporting Requirements - CCR 95111(b)(1)

Figure 2: Hourly Average Renewable Generation Profiles



An additional consideration is daily production variability. For example, although solar generation tends to be predictable, there may be small decreases in generation due to cloud cover. See Figure 3 below for an example of generation from one solar facility. On the other hand, wind can be significantly variable day to day. See Figure 4 below for an example from a wind facility.

Figure 3: Solar Generation on 10 Second Intervals for Solar Project in Arizona

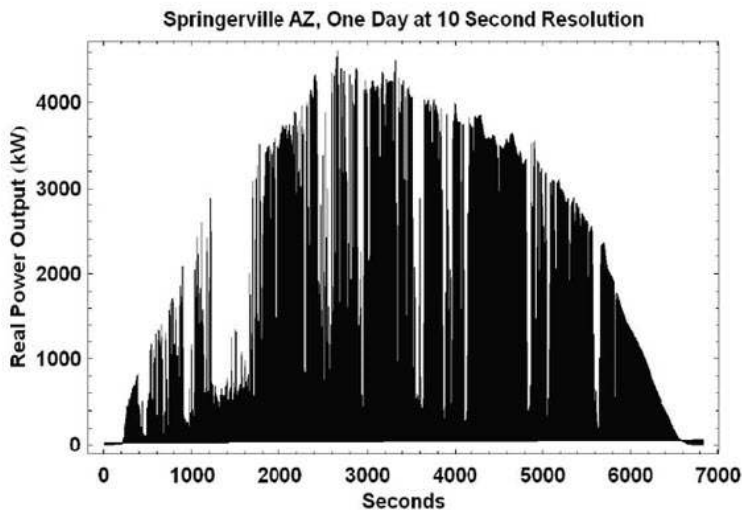
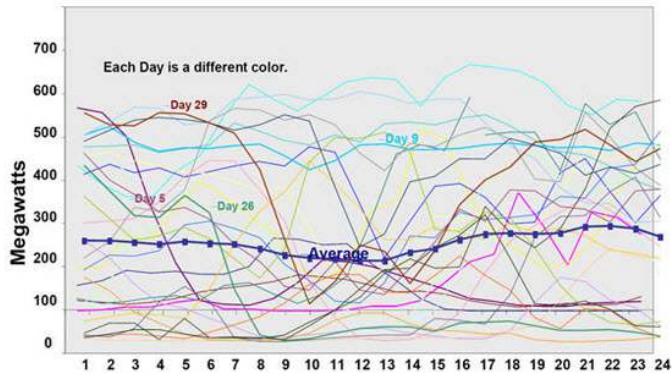


Figure 4: Daily Energy Generation for a Wind Project

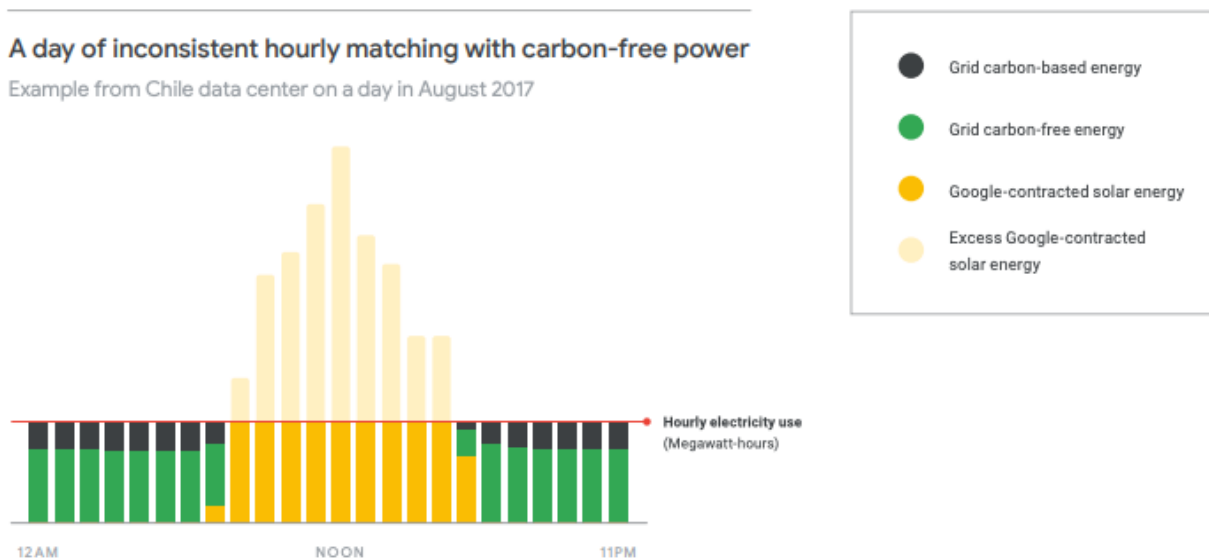


Some of the differences in energy generation shape and variability can be managed with the use of energy storage. As part of the integrated resource planning work, PCE staff is modeling how energy storage can help us meet our 2025 time-coincident goal and what type of energy storage is needed. A variety of energy storage options will likely be needed. The current standard is 4-hour storage from lithium ion battery systems. Other longer duration storage options will be needed for large scale energy storage. Staff is engaged with developers of new longer duration energy storage technology to demonstrate economics and use cases. While it is unlikely that these technologies will be available at scale by 2025, by working with developers and enabling pilot projects, we hope to accelerate the development and deployment timelines of these technologies.

Contract Structure and Ability to Schedule

Peninsula Clean Energy currently meets its renewable targets based on an annual accounting. For example, if our annual load is 3,600 GWh, then we procure 1,800 GWh of renewable energy to reach a 50% renewable content for our ECOplus product. There may be certain hours when we are receiving at least 50% renewable energy from the grid for a given hourly load, and there are certain hours when we are receiving less than 50% renewable energy from the grid for a given hourly load, and thus relying on carbon-based resources during those hours. However, on a net basis for the year, we are delivering renewable energy to the grid equal to 50% of our annual load. Figure 5 shows an example of a Google data center (with a completely flat load) and how certain hours are covered by renewables and other hours are not.²

Figure 5: Example of How Google Evaluates Time Coincident Renewables for a Data Center



As we transition to a time-coincident approach, we need to look at our load for every hour of the year, which is 8,760 hours/year. For any one hour, we seek to procure a volume of renewable energy generated in that hour equal to the volume of electricity that our customers consume for that hour.

² "Moving toward 24x7 Carbon-Free Energy at Google Data Centers: Progress and Insights, page 6, <https://storage.googleapis.com/gweb-sustainability.appspot.com/pdf/24x7-carbon-free-energy-data-centers.pdf>

PCE staff is trying to solve a jigsaw puzzle with different pieces of renewable power that can be put together to equal our load for every hour of every day in the year.

To meet our goal to provide time-coincident energy, PCE needs data and control over when energy is being delivered to the electricity grid for each of the projects in our portfolio. This will allow us to match projects with different generation shapes and variabilities with energy storage options to meet customers' energy demand. Different contract structures provide different amounts of data and control.

Our power purchase agreements (PPAs) with individual projects, such as the Wright Solar project, provide the maximum amount of control and data. Under these contracts, Peninsula Clean Energy generally acts as the "Scheduling Coordinator". This means we know how much renewable power we will receive in any particular hour and we tell the California Independent System Operator how much power to expect from the facility in each hour.

Under other contract structures, we have limited control and access to data. We have been in discussion with the investor-owned utilities (IOUs), including PG&E, around allocating their excess GHG-free and renewable portfolios to the load serving entities (LSEs) including CCAs. In these conversations, PG&E has agreed to allocate to each eligible LSE its load share of PG&E's large hydro (hydro pool) and/or nuclear resources (nuclear pool). However, PG&E will not provide information ahead of time as to how much power we can expect in any one hour from any one project. They may not even provide hourly data after the fact, but only the total volume delivered to us each quarter. This would make it impossible to meet our time-coincident target with these resources.

We have also been in conversations with owners of renewable energy projects to contract for a specific hourly profile from a portfolio of renewable projects. In this scenario, the counterparty that we contract with would be required to deliver a specific volume of electricity in each hour from renewable projects. We would then use the generation from the projects that we control to fill in the differences between energy use and energy delivered in each hour.

To meet Peninsula Clean Energy's goal to provide customers with time coincident clean or renewable energy, Peninsula Clean Energy needs to either: (1) contract for specific hourly generation profile(s) or (2) contract with projects where we are the scheduling coordinator and have the data and control regarding as to how many MWh are generated in each hour to meet our customers' load.

Availability Beyond 2025

Diablo Canyon Power Plant is the only nuclear plant currently operating in California but is slated to be closed by 2025. After 2025, there will not be an option to purchase nuclear power in California. While there is small, nuclear technology in development, this is still relatively early stage and will not likely be available for commercial deployment until the 2030s. Additionally, construction of new nuclear is currently prohibited in California.

There are a number of other technologies, particularly in the long-duration storage area that are in early stage development but may not be commercially available before 2025. We are tracking developments in these technologies and working to identify opportunities for Peninsula Clean Energy to help pilot technologies that align with our mission and goals.

Additionality – Building New Resources

Additionality means that a project or activity would not have occurred without the buyer. In Peninsula Clean Energy's 2018 Strategic Integrated Resource Plan, we set a guideline to target a minimum 50% of the portfolio be procured from new projects by 2025. New means projects that Peninsula Clean Energy causes to be built or repowered. Repowered projects are typically wind energy projects where older turbines are replaced by new state-of-the-art turbines. For a repowered facility to count towards the definition of "additionality", it would require a significant investment for the repowering of the facility.

Not all energy sources will be considered "additional". New solar projects are being built with the highest frequency in California. There are some new wind projects being built in California and neighboring states, and there are a small number of new geothermal projects that are starting development in California with operation dates in approximately five years.

In contrast, there is unlikely to be new large or small hydro, or biomass built in California in the near future. This is due to a combination of reasons including environmental concerns and lack of location for new hydro projects. Additionally, the construction of new nuclear is prohibited in California.

For reference, Table 2 below identifies the percentage that each resource represents in the CAISO interconnection queue. This is a good proxy for understanding what utility-scale energy projects are in development throughout California. The entire queue is 59,583 MW of new projects.

Table 2: % of MW in CAISO Queue by Resource

Resource	%
Battery Storage	52.77%
Solar	36.93%
Wind	8.18%
Pumped Storage	1.68%
Natural Gas	0.27%
Solar Steam Turbine	0.08%
Gravity via Rail Storage	0.07%
Biofuel Steam Turbine	0.01%

Staff Recommendation

Based on the analysis presented above, staff recommends that our definition of “clean” energy for meeting our 100% time coincident goal in 2025 be California RPS-eligible renewable energy. For the reasons described in the previous pages, we need to be able to control when resources are generating energy to meet Peninsula Clean Energy’s customer use. At this time, California RPS-eligible renewables are the only resources available to PCE that we can either contract for during specific hourly time periods and/or for which we can be the scheduling coordinator. Under this definition, PCE’s energy mix starting in 2025 would be comprised of the following energy generation resources:

- Biomass, biogas, biofuel;
- Geothermal;
- Small hydro;
- Solar; and
- Wind (including offshore when available).

These generation resources will be complemented by energy storage technologies which will initially be lithium-ion batteries, and then expanding to include pumped hydro energy storage and other long-duration energy storage options as these become available.