

# Joint Proposal for the Orderly Replacement of Diablo Canyon Power Plant with Energy Efficiency and Renewables



JUNE 21, 2016

# Joint Proposal

PG&E, International Brotherhood of Electrical Workers Local 1245, Coalition of California Utility Employees, Friends of the Earth, Natural Resources Defense Council, Environment California, and Alliance for Nuclear Responsibility have developed a joint proposal to phase out PG&E's Diablo Canyon Power Plant (DCPP) by 2025 and replace it with energy efficiency, renewable energy and other GHG-free resources.

## The joint proposal:

- ensures the cost-effective and orderly replacement of Diablo Canyon with GHG-free resources
- provides a responsible and supportive transition for Diablo Canyon employees and the community
- facilitates renewables integration through a reliable and more flexible resource mix
- greatly diminishes Diablo Canyon impacts on fishery resources at the end of the current license period, avoiding the need to install cooling towers under California's once-through-cooling policy



MJB&A was retained by the parties to the joint proposal to facilitate development of this report and related documents.



# Background for Joint Proposal

## 1. Why Now?

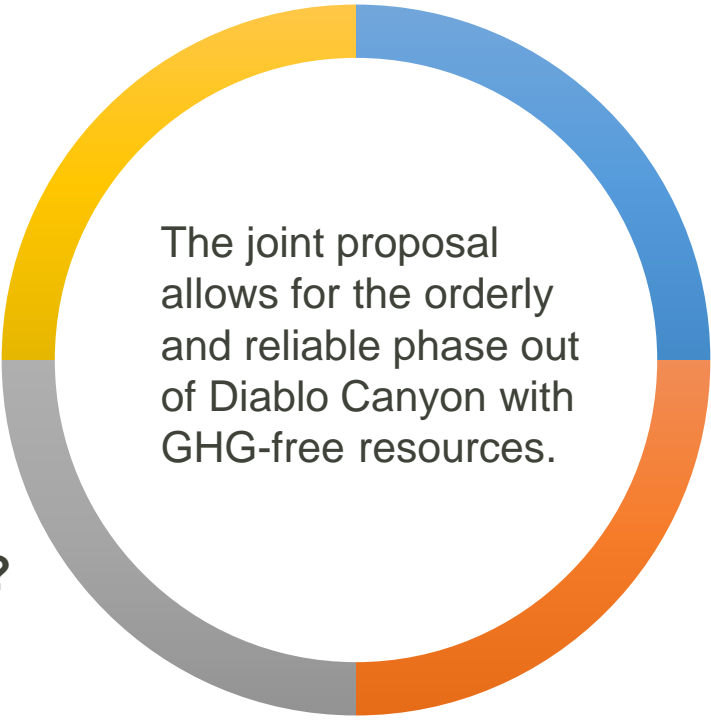


Diablo Canyon is subject to federal relicensing and state approvals to continue operations past its current license period.

## 3. How Will Diablo Canyon Be Replaced?



Diablo Canyon will be replaced with energy efficiency, renewables, and other GHG-free resources, and in the process, help reach California's climate and energy goals.



The joint proposal allows for the orderly and reliable phase out of Diablo Canyon with GHG-free resources.

## 2. What Has Changed?



Demand for Diablo Canyon's output is falling due to California energy policies and changing market conditions.

## 4. How Will PG&E Support the Employees and Community?



PG&E will provide generous retention & retraining programs for employees and financial support for the community.

# Investing in California's Energy Future

The joint proposal is a reliable, flexible, and cost-effective solution to phase out the Diablo Canyon Power Plant with GHG-free resources and will help reach California's energy and climate goals.

The proposal includes:

1. Specific commitments to procure energy efficiency and renewables
2. Commitment to 55 percent renewable generation in 2031, compared to state target of 50 percent
3. Flexibility for procuring additional GHG-free resources as needed over the 2024-2045 period, in consultation with many parties and oversight of California authorities

## California's Goals

50% renewables by 2030

Double energy efficiency savings by 2030

Optimal integration of renewables

80% decline in greenhouse gases by 2050

## Joint Proposal

55% renewables by 2031 (PG&E electricity sales\*)

Implement additional energy efficiency programs between 2018-2024

More flexible generation mix to integrate renewables

Facilitates California's climate goals

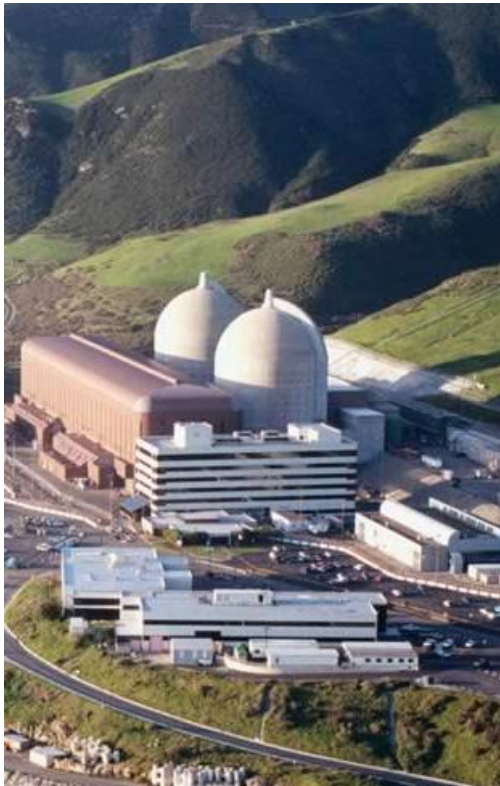
\*Throughout this presentation, "electricity sales" refers to PG&E's bundled retail sales (i.e., "bundled" electricity, transmission and distribution services).

# Challenging Policies and Market Conditions for Diablo Canyon

California's changing electric grid has a declining need for large, inflexible baseload power plants. These evolving market conditions combined with the falling costs of energy efficiency and renewables underpin the proposal to phase out the Diablo Canyon Power Plant.

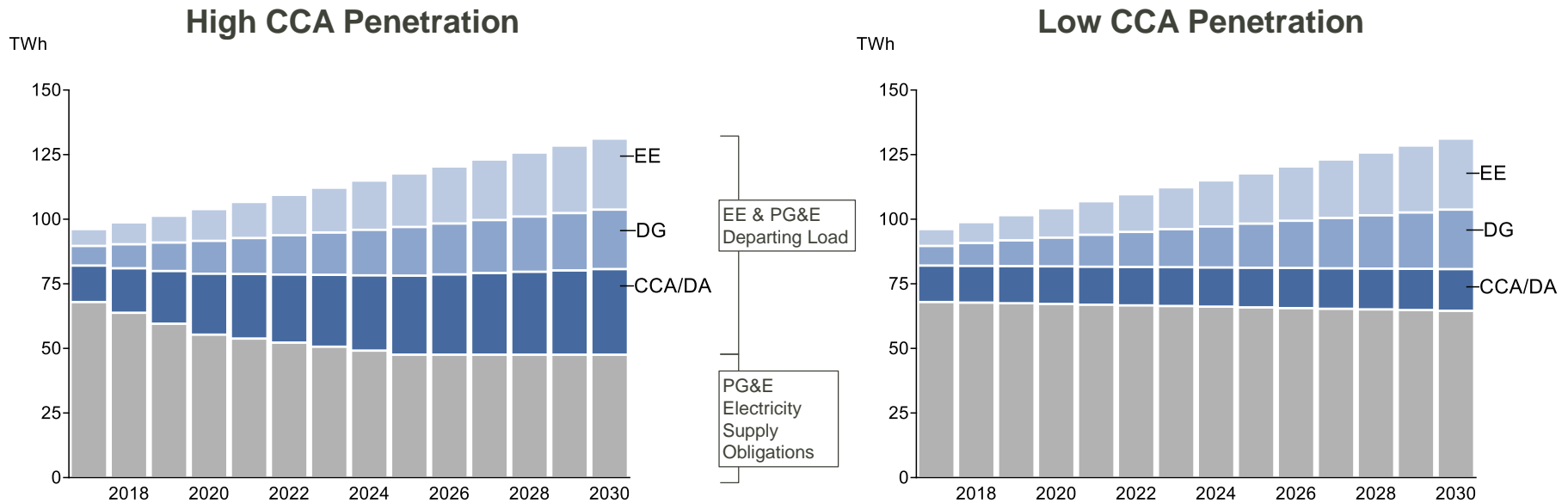
## Resource Planning Challenges Beyond Current License Period

1. Uncertain Electricity Supply Needs for PG&E
2. Declining Need for Diablo Canyon Generation
3. Challenges with Inflexible Baseload Generation
4. Uncertain Rising Costs for Diablo Canyon



# 1. Uncertain Electricity Supply Needs for PG&E

Energy efficiency (EE) programs, growth in distributed generation (DG), and Community Choice Aggregation (CCA) & Direct Access (DA) policies create significant uncertainty for PG&E's electricity sales (Bundled Portfolio).<sup>\*</sup> Future electricity sales could fall significantly below current levels.



<sup>\*</sup>See Glossary of Terms in the appendix.

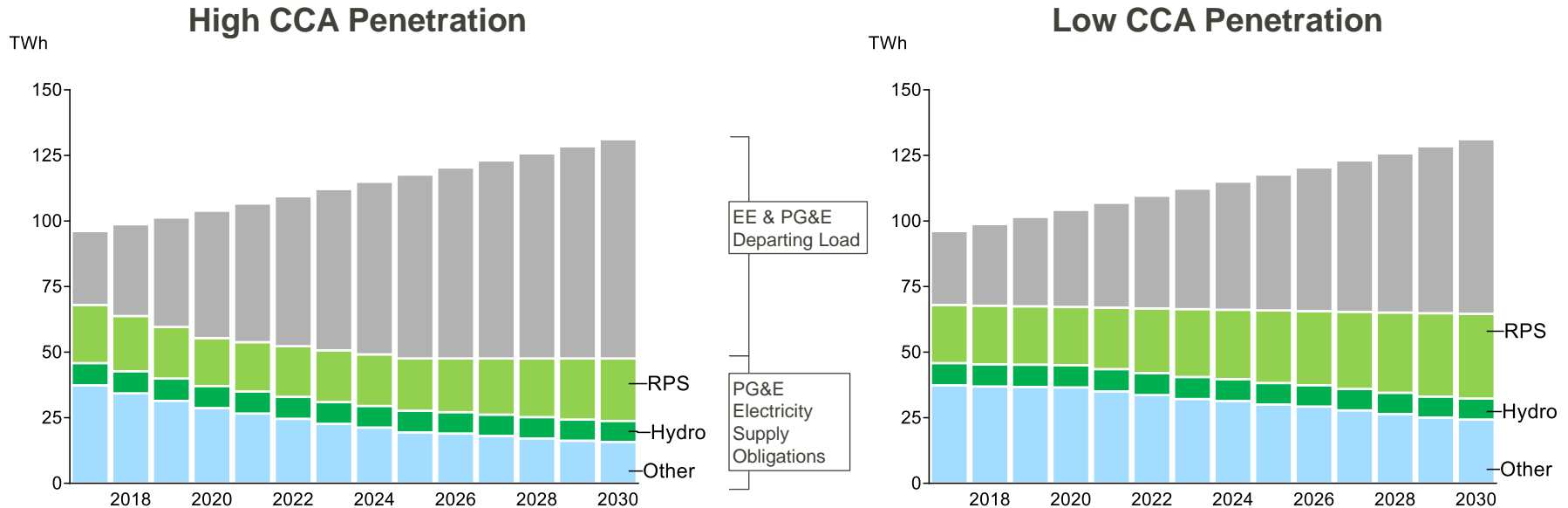
Source: MJB&A analysis based on data provided by PG&E

## Key Insights

- The two projections shown above illustrate the range of uncertainty for PG&E resource planning.
- The projected amount of EE and departing load by 2030 exceeds total DCPD generation by at least several fold.
- EE, DG, CCA and DA are projected to reduce PG&E electricity sales by 3 to 21 TWh below current levels by 2030.

## 2. Declining Need for Diablo Canyon Generation

Resource needs from conventional generation sources are projected to decrease due to falling electricity sales and increasing renewables supply.



Source: MJB&A analysis based on data provided by PG&E

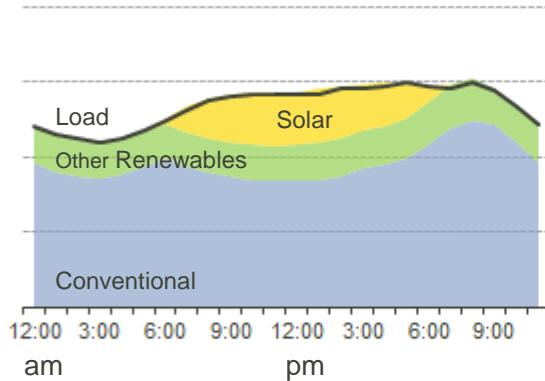
### Key Insights

- Rising renewables generation combined with flat to falling electricity sales reduces additional supply needs (labeled above as “other”) and requires that these additional resources be increasingly flexible to reliably balance supply and demand.
- In the High CCA case, output from PG&E’s hydropower and DCPD resources would exceed PG&E’s resource needs in 2030 after accounting for state renewable energy requirements.

# 3. Challenges with Inflexible Baseload Generation

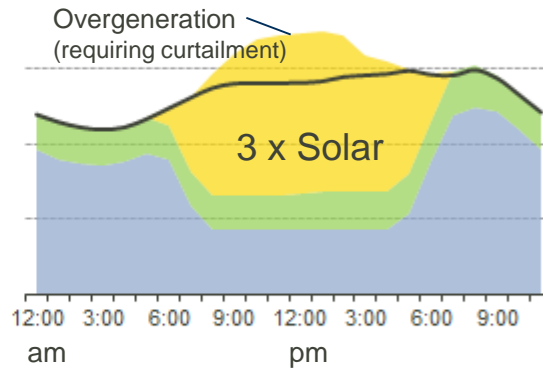
## A. California Today

Actual Spring Day – May 19, 2016



Source: plot of actual historic production and load data from CAISO (Renewables Watch website).

## B. Illustration with High Solar Penetration – Same Spring Load Profile



Source: Illustrative example assuming 3x increase in May 19, 2016 solar production and minimum baseload. This level of PV is expected in early 2020s.

## Options to Address Overgeneration

A more flexible system allows system operators to accommodate higher levels of solar penetration by relying on more flexible generating facilities, energy storage, and demand response. Some of the options to address the overgeneration illustrated in Chart B would include:

- 1 Shift to more flexible resources that can accommodate more frequent cycling and starts and stops.
- 2 Shift load from the evening hours to midday capturing more of the solar energy supply.
- 3 Shift renewable energy supply away from peak generation periods using energy storage technologies.

### A. Current System

Increasing levels of variable generation require more flexible grid operations to match changing supply and demand patterns.

California's existing grid has been able to accommodate increasing solar output with only occasional "overgeneration" events where electricity supply exceeds demand. Under these conditions, system operators must curtail the output of wind and solar resources.

### B. Overgeneration Condition

In the future, overgeneration is projected to become a more acute problem based on California's current electric grid and inflexible generating resources such as Diablo Canyon. The grid will need to be transformed with more flexible supply and load resources to integrate higher levels of solar output.

Overgeneration conditions reduce the economic value and environmental benefits of renewable energy projects.

### For more analysis of this issue:

NREL's "Overgeneration from Solar Energy in California: A Field Guide to the Duck Chart" (Nov. 2015).

California ISO's "What the duck curve tells us about managing a green grid" (2016).



# 4. Uncertain Rising Costs for Diablo Canyon

## 1 Facility Costs

The costs of operating beyond 2024/2025 are uncertain.

*Cost increases could include:*

- Facility operations and maintenance
- State cooling water compliance
- Environmental compliance costs for state approvals of extended operations period
- Potential Nuclear Regulatory Commission (NRC) regulations or orders

## 2 System Costs

Commitment to a large amount of baseload generation leads to rising and uncertain system costs due to current market trends.

*Market trends include:*

- Declining and uncertain demand outlook
- Growing need for flexible resources to integrate renewables rather than inflexible baseload generation

The joint proposal enables PG&E to focus on reliable, flexible, and cost-effective GHG-free resources that help to optimize the overall system.

## 3 Benefits Studies

Independent studies highlight the benefits of phasing out DCP.

- “We can confidently state that on a life cycle basis the investment in renewables and efficiency will, over time, provide customers with lower cost electricity than DCP...” Friends of the Earth. *Plan B Study*, January 2016. (economic analysis by William B. Marcus)
- “Climate & clean energy goals are technically feasible without significant rate impacts.” (The National Renewable Energy Laboratory modeled California emissions goals with DCP retired) The Center for Energy Efficiency and Renewable Technologies. *The Low Carbon Grid Study, Phase II Results*, February 2016.
- California’s Pathways analysis demonstrates approaches for achieving state GHG goals without DCP. E3. *California State Agencies’ Pathways Project*, April 2015.

# Orderly Replacement with Energy Efficiency and Renewables

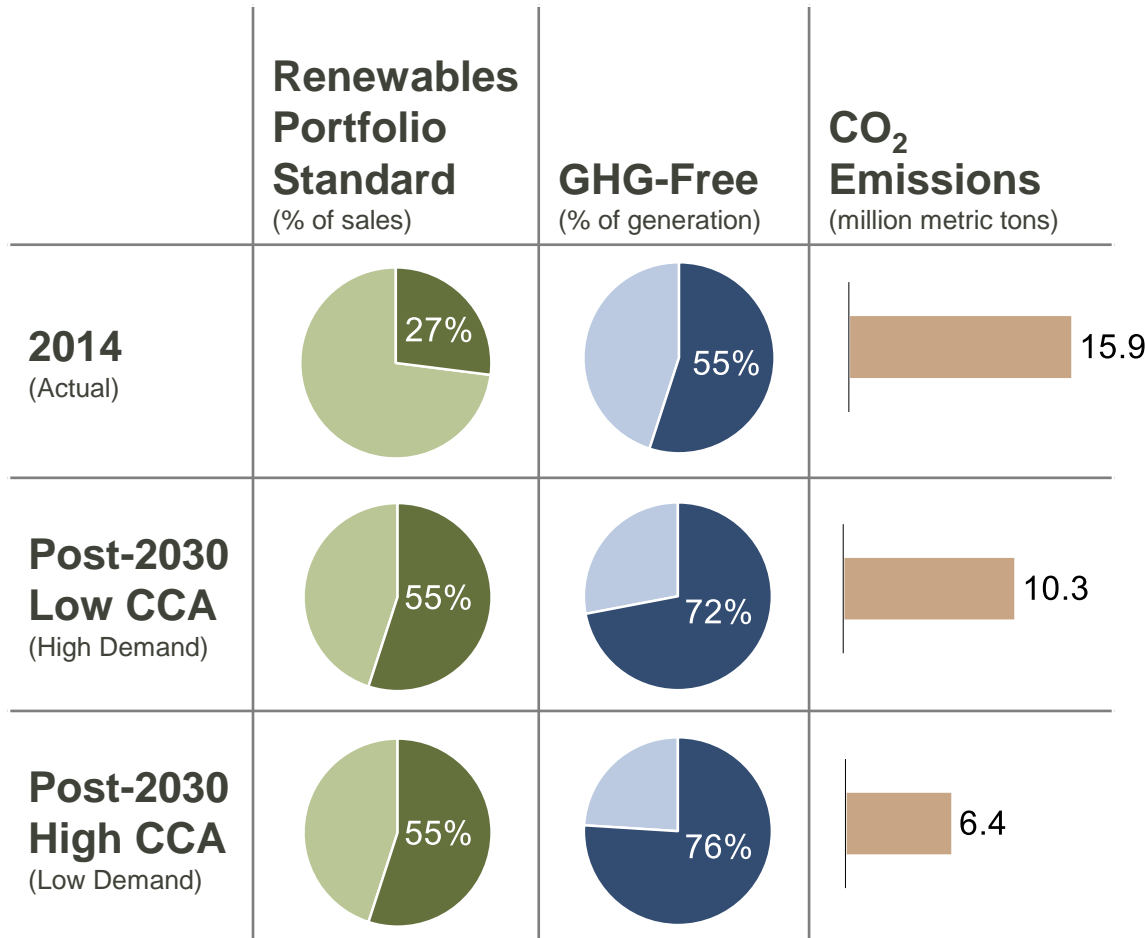
The joint proposal commits PG&E to specific energy efficiency and renewable energy targets and to a 55 percent Renewables Portfolio Standard while setting a responsible and achievable transition for replacing Diablo Canyon.

<b>Step 1:</b> PG&E procures 2,000 GWh of new energy efficiency projects and programs to be installed from 2018 to 2024.			<b>Step 2:</b> PG&E procures 2,000 GWh of GHG-free energy or energy efficiency offerings to be initiated between 2025 and 2030.		<b>Step 3:</b> PG&E procures GHG-free energy to meet 55 percent Renewables Portfolio Standard.
2018	2019-2023	2024	2025	2026-2030	2031 and Beyond
Diablo Canyon:		Unit 1 Retirement	Unit 2 Retirement		

## Potential for Additional GHG-free Resources

In addition to the specific energy efficiency and renewables provisions, parties agree to support (before the CPUC and CAISO) use of additional GHG-free resources, including but not limited to pumped hydroelectric storage, for reliability and resource integration solutions that may be required to replace Diablo Canyon.

# More Renewables and Fewer CO<sub>2</sub> Emissions



## Key Insights

- PG&E commits to achieving a 55 percent Renewables Portfolio Standard under any future demand trajectory.
- The percentage of GHG-free generation increases and fossil generation decreases in all scenarios.
- Decline in fossil generation drives down CO<sub>2</sub> emissions in all scenarios.
- The joint proposal facilitates California's renewable and GHG emissions goals by supporting a more flexible electric grid and maximizing the value of renewable resources.

Source: PG&E

# Maintaining Reliability and Competitive Costs

The joint proposal includes a mix of GHG-free resources that facilitate reliability, renewables integration, and other long-term cost-effective benefits for the electric grid.

- The California Independent System Operator (CAISO) has studied the reliability implications of the Diablo Canyon facility: “This study determined that there was no material mid- or long-term transmission system impacts associated with the absence of Diablo Canyon.” *CAISO 2012-2013 Transmission Plan*
- The transmission system is maintained to withstand the loss of both DCCPP units. *PG&E-CAISO Nuclear Plant Interface Coordination Agreement for Diablo Canyon Power Plant*
- By maintaining operations through the current license period, the joint proposal allows for the orderly and reliable replacement of Diablo Canyon.
- PG&E will procure GHG-free replacement resources through California Public Utility Commission-approved competitive bidding processes.
- The joint proposal is a cost-effective solution for phasing out Diablo Canyon with renewables and energy efficiency.





# Commitment to PG&E Employees and Community

PG&E and all of California has benefited from a well-trained, highly skilled and dedicated workforce at DCPD for its 31 years of operations. PG&E is committed to the employees and the community.

- Diablo Canyon has operated reliably since 1985 with an average capacity factor of more than 90% between refueling and maintenance outages.
- Under the joint proposal, the facility would continue to operate through its current license period.
- PG&E employs more than 1,500 workers at the facility, plus additional temporary workers during scheduled refueling outages. It is critical to retain these highly qualified personnel at DCPD during the remaining years of operations.
- PG&E will provide generous resources and assistance to employees including incentives to retain employees, a retraining and development program to facilitate redeployment of a portion of plant personnel to the decommissioning project, and severance payments upon completion of employment.
- PG&E proposes to offset loss in property taxes while the facility is depreciated to 2025 to create a source of stable community funding during the transition period.



# Clear Targets and Flexible Implementation

The joint proposal commits PG&E to specific energy efficiency and renewables targets and provides flexibility for additional GHG-free resources to accommodate market uncertainties.

- The energy efficiency and renewables provisions proposed in this joint proposal are not intended to capture everything that will be needed to ensure the orderly replacement of DCCP with GHG-free resources.
- The full solution will emerge over the 2024-2045 period, in consultation with many parties and with the oversight of the California Public Utilities Commission (“CPUC”), the California Independent System Operator (“CAISO”), the California Energy Commission, the Governor, and the Legislature.
- The parties will file to implement the joint proposal after the State Lands Commission has extended the Diablo Canyon lands lease through the current license period.
- The energy efficiency and renewables provisions are conditioned upon CPUC approval and assurance of cost recovery.
- Additional GHG-free resources beyond that specified in the joint proposal may be needed on a system-wide basis and the parties envision that this issue will primarily be addressed through the CPUC’s integrated resource planning process.
- PG&E will formally withdraw its NRC license renewal application following CPUC approval of the joint proposal.
- The parties will strongly support at the CPUC and before the CAISO the use of GHG-free resource solutions, including additional large pumped storage.
- PG&E will prepare a site-specific decommissioning plan for Diablo Canyon by 2018 that will include a schedule for post-shutdown transfer of spent fuel to dry cask storage as promptly as is feasible.

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# Appendix

# Glossary of Terms

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**Bundled Service Customers** refers to full-service customers who purchase both energy delivery services and energy generation from PG&E. This is in contrast to customers who purchase energy from a third-party Energy Service Provider, and pay PG&E for transmission and distribution costs.

**Community Choice Aggregation**, or CCA, is a program available within the service areas of investor-owned utilities, such as PG&E, which allows cities and counties to purchase and/or generate electricity for their residents and businesses. Under CCA, PG&E continues to deliver the electricity through its transmission and distribution system and provide meter reading, billing, maintenance, and outage response services.

**Direct Access Service** is an optional service that allows customers to purchase electric supplies and additional energy services from a competitive Energy Service Provider (ESP), rather than from PG&E. Although customers will purchase their electricity from an ESP under direct access service, PG&E will continue to deliver the electricity through its transmission and distribution systems.

**Distributed Generation** refers to small-scale electric generation facilities typically owned by non-utility entities, such as generation developers or utility customers, that offset all or part of the customer's on-site electrical load. Distributed generation is often sited at a customer's location or close to a load center. In contrast, central station generation is not used primarily to serve the on-site electrical load, but instead serves the electrical needs of a large number of offsite customers. Distributed generation may or may not be interconnected to the electrical transmission grid.





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