

Smart Grid Compressed Air Energy Storage Demonstration Project Request for Offers (CAES RFO)

2015 PARTICIPANTS' WEBINAR

October 29, 2015

Q&A / Audio Replay

- **PG&E will take questions via email only during the webinar.**
- **Participants should email questions to CAESRFO@pge.com during the webinar.**
 - **Questions will be answered at the end of the webinar**
 - **PG&E might not address all questions during the Q&A portion**
 - **After the webinar, PG&E will compile and post a Q&A document on PG&E's CAES RFO website, accessed via www.pge.com/rfo**
- **PG&E plans to post the presentation and a recording of the Webinar on PG&E's website (listed above)**

Agenda

Topics

- Introduction
- Background
- Solicitation Overview
- CAES Agreement Overview
- Offer Submittal Process
- Evaluation Methodology
- Interconnection
- Key Takeaways
- Intermission
- Q & A

Presenter

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Team

Document Conflicts

- **This presentation is intended to provide a summary level discussion of the information and requirements established in the RFO materials**
- **Participants should carefully review the CAES Solicitation Protocol and all RFO materials, available on PG&E's website: www.pge.com/rfo**
- **To the extent that there are any inconsistencies between the information provided in this presentation and the requirements in the RFO materials, the RFO materials published on PG&E's website shall govern**

Background

What is CAES?

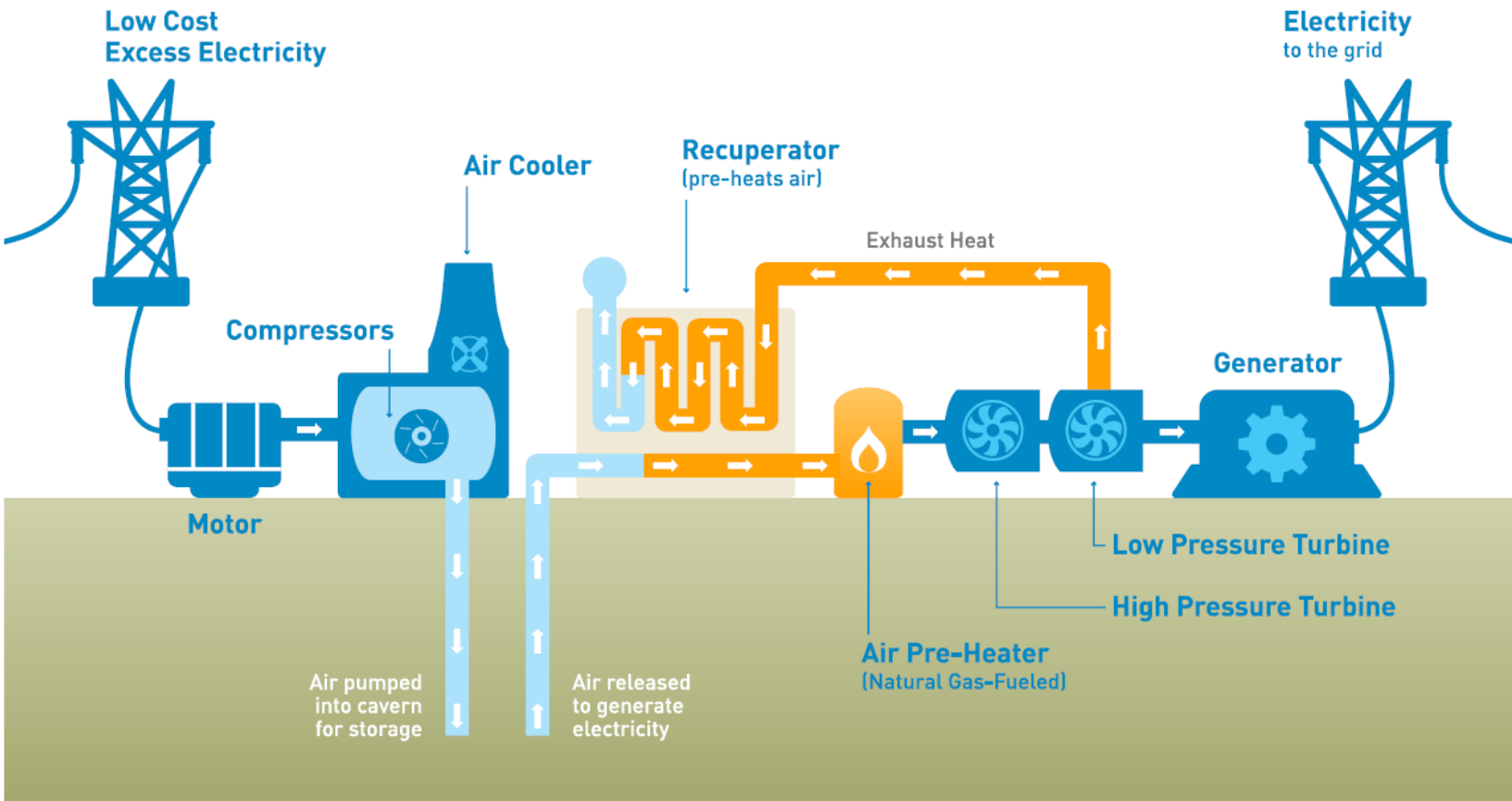
Description

- **Compressed Air Energy Storage (CAES) utilizes electricity to run large compressors that pump air into a storage medium – for this project, a large porous underground rock formation.**
- **During times of system need, the compressed air will be released to drive turbine generators, that may be capable of delivering approximately 300 MW of power for up to 10 hours.**

Phases

- **The CAES Project is divided into three phases:**
 - **Phase 1 (2011-2016) – Includes performing site selection, geologic reservoir analysis and testing, permitting, preliminary engineering/environmental review and the issuance of the Request for Offers (RFO) for building/owning/operating the facility.**
 - **Phase 2 – Consists of obtaining regulatory approval/permitting, interconnection, completing development, and beginning plant construction.**
 - **Phase 3 – Entails completing plant construction and carrying out performance testing, and two (2) years worth of data collection.**

The CAES Cycle Process



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CAES Phase 1 Background

Phase 1

Historical Timeline

Application to DOE:	Aug 2009
DOE Award:	Nov 2009
CPUC Approval:	Jan 2010
DOE Contract Execution:	Feb 2011



Phase 1 Funding (\$ million)

DOE: \$25

CPUC: \$24

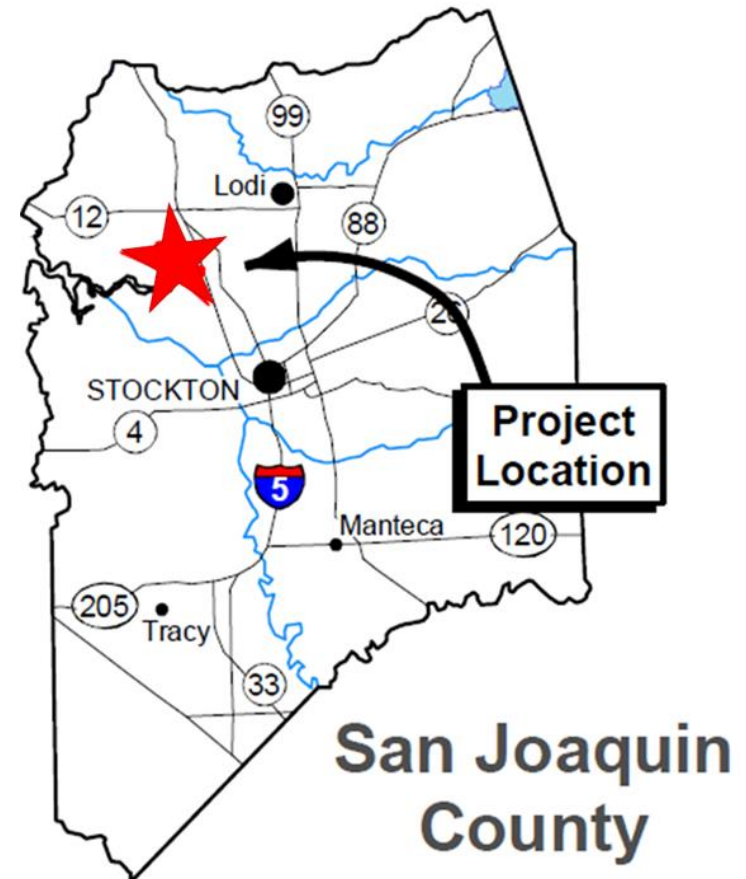
CEC: \$1

TOTAL: \$50

- Phase 1 is the only phase that is currently funded.
- Phase 1 Scope includes site selection, reservoir testing, plant design and permitting analysis, and economic analysis.
- Phases 2 and 3 to be funded by successful RFO bidder.

Site and Permitting

- Performed core drilling at two sites in order to determine geologic properties
- Top site was selected for an Air Injection and Withdrawal Test based on detailed diligence and environmental screening
- Long term site control agreements in place
- Conducted Air Injection and Withdrawal Test to determine technical viability of reservoir to support the project
- Completed Environmental Siting, Licensing, and Permitting Analysis (ESLPA) report and Conceptual Engineering for full scale development



Solicitation Overview

RFO Schedule

DATE	EVENT
October 9, 2015	PG&E issued CAES RFO
October 16, 2015	Data Room Available (subject to approved Confidentiality Agreement and completed Experience/Qualifications Appendix)
October 29, 2015	General Participants' Webinar
November 15, 2015 thru March 31, 2016	King Island Reservoir site visit and reservoir core available for viewing at CSU Bakersfield Repository
March 2016	Participants' Offer Form Webinar
May 9, 2016	Deadline for PG&E to receive offers by 1:00 pm PPT (via Power Advocate)
July 20, 2016	PG&E notifies Participants of Offer status
August 3, 2016	Participants notify PG&E whether they accept Shortlist position
August – February 2017	If applicable, PG&E and Participants negotiate and execute Agreements subject to regulatory approvals

Independent Evaluator (“IE”)

- **Primary role of the IE is to:**
 - **Monitor RFO processes to ensure fair and equal treatment of all Participants**
 - **Monitor evaluation processes to ensure PG&E has implemented methodology as described and that offers are treated consistently**
 - **Report on RFO and proposed transactions to CPUC when filed for CPUC approval**
- **The IE performs an independent review of all offers**
- **The IE may review all proposal data and monitor all negotiations of Agreements**
- **IE for the 2015 CAES RFO is Boston Pacific Company, Inc.: Frank Mossburg**
 - **Copy Frank on all correspondence at fmossburg@bostonpacific.com**

Key Performance and Operational Requirements

- **Proposal must be for a compressed air energy storage facility that utilizes the reservoir identified in the Data Room as the storage medium**
- **Discharging Capability of the offer must be between 100 MW and 350 MW**
- **Minimum Discharge Requirements**
 - **Must have at least a four (4) hour continuous minimum discharge (i.e. generation) duration**
 - **Must have the ability to transition from charging level to discharging in forty-five (45) minutes or less**
 - **Must have the ability to be dispatched seven (7) days/week, twenty-four hours per day**

Key Performance and Operational Requirements

- **Products**

- **Must offer a Project that will be capable of delivering Resource Adequacy (“RA”) and Flexible RA**
 - **RA Program:** http://www.cpuc.ca.gov/PUC/energy/Procurement/RA/ra_history.htm
 - **CAISO Reliability Requirements:**
<http://www.caiso.com/planning/Pages/ReliabilityRequirements/Default.aspx>
- **Project must meet the applicable CPUC requirements for duration and the CAISO requirements for deliverability**
- **Energy only or partial capacity deliverability projects are not eligible; Full Capacity Deliverability Status (FCDS) is required.**

- **Interconnection**

- **Must directly connect to the CAISO transmission grid and have at least one dedicated CAISO meter on the high side of the step-up transformer**
- **Project must meter each compressor or generation unit with revenue quality meters**
- **Project must be able to respond to the electronic dispatch and power control signals**

Key Performance and Operational Requirements

- **PG&E is the sole off-taker of the Products from the Project**
- **Specific operating flexibility or constraints must be defined by the Participant**
 - **Constraints must be substantiated in terms of technical limitations, permit limitations and/or environmental limitations**
- **PG&E holds the sole rights to control operations (compression and generation) of the Project**
- **Project must be designed, developed, constructed, commissioned, operated and maintained in conformance with Prudent Electrical Practices (see Appendix F)**

Offer Price Assumptions

The price that Participant submits in the Offer must include the following, but not limited to:

- **Collateral Requirements**
 - Factor in costs, if any, to provide Project Development Security and Delivery Term Security
- **All Interconnection Costs¹**
 - Customer-owned interconnection facilities
 - Participating Transmission Owner (PTO) Interconnection Facilities and Network Upgrade Costs²
 - Interconnection Financial Security Postings

¹ Refer to the CAISO website (<http://www.caiso.com/rules/Pages/Regulatory/Default.aspx>) for the most recent tariff information.

² Developer may be entitled to repayment of some or all upgrade costs with interest over a 5-year period following initial operation.

Credit/Collateral Requirements

Compressed Air Energy Storage Agreement	
Pre-Agreement	
Shortlist Offer Deposit	\$3/kW due by 5:00 P.M. PPT on the tenth (10th) business day after receiving Shortlist Notice.
Post-Agreement Execution and Pre-Commercial Operation Date (DOC)	
Project Development Security (“PDS”)	\$15/kW at Execution, and an additional \$45/kW at CPUC Approval (total posted PDS of \$60/kW)
Post-COD	
Delivery Term Security (“DTS”)	\$125/kW or 10% of monthly fixed payments up to 3 years, whichever is higher

CAES Agreement Overview

Key Performance Metrics

- **Discharge Rate, MW**
- **Charge Rate, MW**
- **Discharge Duration, hours**
- **Discharge Energy, MWh**
- **Compression Effectiveness, MWh per pound of stored air**
- **Discharge Power Density, MWh per pound of stored air**
- **Reservoir Self- Discharge Rate, pounds air**
- **Heat rate**
- **Part-load performance**

Seller's Performance Model

- **As a part of the offer, Participants will provide a performance model with expected performance of key metrics as a function of operating conditions (ambient temperature, run hours, state of charge, other)**
- **Actual performance that is less than expected performance will lead to a decrease in the payment and possible default.**
- **PG&E would like to meet with potential Participants with access to the Data Room to discuss payment structures and measurement of metrics.**

CAES Agreement

- **The CAES Agreement will have many similar features to the Energy Storage and Tolling Agreements that PG&E has previously used, including:**
 - PG&E provides charging energy and natural gas based on expected performance, as specified by Seller in Offer Form.
 - Variable payment per MWH, start, or fired hour to cover variable costs
 - Fixed monthly payment
 - Reductions to the payments if actual performance is less than expected performance.
- **PG&E is buying services, which encompasses the project's ability to:**
 - Charge energy at a specified compression effectiveness
 - Store energy, with a specified self-discharge rate
 - Discharge energy at a specified heat rate and discharge power density
- **Seller conveys to PG&E the exclusive rights to all Product (i.e. Capacity Attributes, Energy, Ancillary Services, Other Products)**

Offer Submittal Process

Website and Communications

- The CAES RFO website (select “CAES RFO” link at www.pge.com/rfo) includes everything you need to submit for an offer, including but not limited to:
 - RFO documents
 - Detailed instructions for submitting offer(s) through Power Advocate
 - Updates and Q&A
- All communications should be directed to: CAESRFO@pge.com, with a copy to the Independent Evaluator at Boston Pacific:
 - Frank Mossburg: fmossburg@bostonpacific.com

Power Advocate

- Documents for access to the Data Room and complete Offer packages must be submitted via the online platform Power Advocate.
 - In order to submit an Offer, participants *must first pre-register* with Power Advocate, at:
 - <https://www.poweradvocate.com/pR.do?okey=50932&pubEvent=true>
 - Event ID: 50932
- Early Registration to Power Advocate is strongly encouraged.
- Detailed instructions for submitting offer(s) and using Power Advocate are available on PG&E's website www.pge.com/rfo under "CAES RFO."

Data Room

- **Participants will need to review the materials in the Data Room to develop the Project and submit an Offer**
- **Submit completed documents to the “Pre-bid” tab on Power Advocate:**
 - **Appendix 1 - Confidentiality Agreement, including MS Word version**
 - **Appendix 2 - Experience, Qualifications, and Organization**
- **Participants who lack a mutually acceptable and executed Confidentiality Agreement and/or sufficient experience and qualifications will not be provided access to the Data Room.**
- **Participants with fully executed Confidentiality Agreements and sufficient experience and qualifications will be provided access to the Data Room via a link to the Data Room site.**
- **2,000+ files and 500+ GB of data**

Site Visit

- **What: Optional individual CAES Project site visits**
- **Who: Participants with approved access to the Data Room**
- **Where:**
 - **Lodi: King Island reservoir site and generator site**
 - **California State University Bakersfield: View reservoir cores**
- **When & How:**
 - **November 15, 2015 – March 31, 2016**
 - **To schedule a visit email CAESRFO@pge.com with the number of people in party and preferred dates.**

Offer Submittal Process

- **PG&E will consider submitted Offers that, as of the submittal deadline (May 9, 2016 by 1:00 PM PPT), are complete and conforming Offers.**
 - **Large documents take more time to upload on Power Advocate. Be sure to include this time as part of your submission process.**
- **Offer package must contain all required information, and must be organized as described in the Solicitation Protocol Section VI.D, Required Information.**
- **Failure to respond to inquiries by PG&E regarding incomplete or incorrect information could result in disqualification for the RFO.**
- **By submitting an Offer in this RFO, each Participant is required to abide by the confidentiality obligations specified in Section XI of the Solicitation Protocol and by selecting “Yes” in the Acknowledgements and Authorizations section of the Offer Form.**

Offers and Variations Allowed Per Participant

- Participants may submit up to six (6) variations of each offer, including the base offer (i.e., base offer plus 5 variations).
 - A variation may alter attributes such as delivery term, price, commercial operation date, capacity, duration, or other operational characteristics such as ramp rate

Offer Submittal

Complete Energy Storage Offer Package (by May 9, 2016 by 1:00 PM PPT)

- **Introductory Letter**
- **Appendix A: Offer Form (MS Excel format)**
- **Appendix B1: Project Description**
- **Appendix B2: Project Milestone Schedule**
- **Appendix B3: Project Interconnection and Transmission**
- **Appendix C: FERC 717 Waiver**
- **Appendix D1: Finance Information**
- **Appendix E1: Redline of CAES Agreement**
- **Appendix E2: Redline of Assignment Agreement**
- **Appendix F: Safety**

Post-Shortlist Documents

- **Shortlist Deposit**
- **Appendix D2: Letter of Credit (if applicable)**
- **Appendix G: Request for Taxpayer ID Form (if applicable)**

Offer Form

- **CAES Offer Form Version 1 is currently on the CAES RFO website (Appendix A).**
 - **Please review and provide feedback to PG&E.**
- **There will be a separate Offer Form Webinar in March 2016 to go over the most current version at that time.**

Evaluation Methodology

Evaluation Methodology

- **QUANTITATIVE CRITERIA**
 - Net Market Value
 - Portfolio Adjusted Value
- **QUALITATIVE CRITERIA**
 - Project Viability
 - Contract Modifications
 - Credit
 - Supplier Diversity
 - Safety

Net Market Value (1)

Net (Present) Market Value = $(E + A + C) - (V + F) = \text{Benefits} - \text{Costs}$

- **E = Energy value** is based on the market value of the energy deliveries (charging and discharging) for each offer based on price scenarios at Project's location and charging/ discharging time series over the offer's delivery term
- **A = Ancillary Services (A/S) value** is based on the incremental benefit of having A/S capability based on Offer's co-optimized Ancillary Services time series
 - Spin and Reg Up/Down in a limited-depth market
- **C = Capacity value** is based on
 - Offer's contribution to meeting PG&E's future Resource Adequacy requirements
 - Projected monthly quantity of Net Qualifying Capacity (NQC) for System RA, and Effective Flexible Capacity (EFC) for Flexible RA. See CPUC decision 14-06-050 and CPUC decision 15-06-063.

Net Market Value (2)

Net (Present) Market Value = $(E + A + C) - (V + F) = \text{Benefits} - \text{Costs}$

- V = Variable Cost is based on
 - Variable Operations and Maintenance (O&M) for discharging, cost of fuel (other than grid energy), start-up costs for discharge, fired-hour charges for charge/discharge, Charge shut-down costs
 - Cost of grid energy for charging (compression)
 - Does not include station use, which cost is borne by Participant
- F = Fixed Cost is based on
 - Sum of projected monthly fixed payments
 - Annual fixed overhead, for administrative costs and costs for scheduling into CAISO market

Portfolio Adjusted Value (“PAV”)

- **PAV modifies the NMV to account for elements that impact a particular Offer’s value in the context of PG&E’s electric portfolio**
- **PAV calculations make explicit and systematic adjustments to NMV to reflect portfolio effects and preferences that benefit PG&E customers**
- **PAV adjustments may include, but are not limited to:**
 - **Transmission Network Upgrade Cost**
 - **Increased Generation Efficiency**
 - **Based on in-out system-wide production simulation runs; longer duration will show greater benefit with diminishing return**
 - **Includes impacts on GHG cost as well**
 - **Avoided RPS Curtailment**
 - **Captures economic benefits from reduced need for RPS procurement due to reduction in RPS curtailments**
 - **Also from production simulation runs; longer duration will show greater benefit with diminishing return**

Qualitative Factors

- **Project Viability**
 - The likelihood that the Project can be successfully developed and provide the Product and Services required for the period stated in the Offer.
- **Contract Modification**
 - PG&E may assess the materiality and cost impact of any of Participant's proposed modifications to Solicitation requirements and the CAES Agreement. The Assignment Agreement (Appendix E2) may not be modified unless Participant proposes an alternative site for the Energy Conversion Facility and/or alternative rights to the necessary pipelines.

Qualitative Factors (continued)

- **Credit**

- **PG&E may consider the Participant's capability to perform all of its financial and financing obligations under the Agreements and PG&E's overall credit concentration with the Participant or its banks, including any of Participant's affiliates.**

- **Safety**

- **PG&E will seek information from Participants regarding the safety history and practices of the entities that will design, develop, construct, commission, operate, and/or maintain the Project and safety information related to the technology for the Project.**

Qualitative Factors (continued)

- **Supplier Diversity**
 - **Supplier diversity is an important initiative at PG&E**
 - **In 2014, PG&E achieved its highest level of diversity spending at \$2.1 billion or 41% of all spending on Diverse Business Enterprises (DBEs)**
 - **The company could not have achieved this milestone without the help of our largest suppliers**
 - **We urge prime suppliers to give DBEs the maximum practicable opportunity to provide products and services to PG&E**
 - **DBEs are women-, minority-, service disabled veterans- and lesbian-, gay-, bisexual-, transgender- business enterprises.**

Interconnection Information

Interconnection Requirements

- **Participant is responsible for all activities and costs associated with obtaining interconnection, including interconnection study costs³, network upgrades, and interconnection facilities.**
 - **Interconnection must include charging and discharging⁴.**
 - **Participant also is responsible for achieving Full Capacity Deliverability Status for the Project.**
- **Project must have an executed Interconnection Agreement in place with the CAISO and PTO prior to commercial operation.**
- **Participant must ensure that the resource is correctly modeled in the CAISO's market systems and installing any needed metering and telemetry equipment required for participation in the wholesale power market⁵.**

³ Except for the portion of the interconnection study deposit that PG&E will reimburse to the Participant, as noted in later slide.

⁴ Refer to the CAISO website for updates on the Energy Storage Interconnection stakeholder initiative at <http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyStorageInterconnection.aspx>

⁵ CAISO's new resource implementation process is described at: <http://www.caiso.com/participate/Pages/NewResourceImplementation/Default.aspx>

Interconnection Status

- **There is no interconnection queue position currently associated with this CAES project.**
 - **PG&E does not require Offers to have entered the CAISO process at the time of Offer submission.**
 - **A third party, independent report on interconnection (for informational use only) is available in the PG&E Data Room.**
- **Actual interconnection costs and schedule can be obtained by participating in the CAISO's Generator Interconnection and Deliverability Allocation Process (GIDAP)⁶**

⁶Refer to the CAISO website (<http://www.caiso.com/rules/Pages/Regulatory/Default.aspx>) for the most recent tariff information.

Interconnection Costs

The price that Participant submits in the Offer must include the following, but not limited to:

- **All Interconnection Costs⁷**
 - **Interconnection Studies**: Interconnection study deposit reimbursed by PG&E up to \$250,000 for successful Participant⁸.
 - **Interconnection Facilities**: Seller bears the cost of Interconnection Facilities because there is no reimbursement of these costs to Seller.
 - **Network Upgrades**: Seller may bear all or a portion of the costs for Reliability Network Upgrades and Delivery Network Upgrades, in addition to any costs of financing reimbursable Network Upgrades⁹.
 - **Interconnection Financial Security Postings**: May be required to progress through the interconnection study process.

⁷ Refer to the CAISO website (<http://www.caiso.com/rules/Pages/Regulatory/Default.aspx>) for the most recent tariff information.

⁸ See Section X of the RFO Protocol for further information.

⁹ Developer may be entitled to repayment of some or all upgrade costs with interest over a 5-year period following initial operation.

Interconnection Timeline

- **Timeline for interconnection takes several years and is the responsibility of the Participant.**
 - **If PG&E executes an Agreement with a Participant, then Participant would be required to submit a CAISO interconnection request for Full Capacity Deliverability Status at the first available time.**
 - **CAISO interconnection study process to obtain an interconnection agreement (IA) can take several years.**
 - **After executing the IA, Participant is responsible for working with PTO to engineer, procure, and construct the interconnection.**

Sample Interconnection Timeline (Illustrative Purposes Only)

CAISO Cluster Group	Application Window	Phase I	Phase II	Interconnection Agreement	Network Upgrades & Interconnection Facilities	COD and FCDS
10	April 2017	Target December 2017	Target November 2018	Target Fall 2019	May take several years	Based on Offer Submission

Key Takeaways

Key Takeaways

- **Data Room Access**
 - Register on Power Advocate as soon as possible
 - Submit Appendix 1 and Appendix 2 for review by PG&E
- **Review RFO materials and provide feedback**
 - Project proposals
 - Commercial terms
 - Offer Form
 - Version 2015.1
 - Review key fields

Intermission

Q & A