



California ISO

Los Angeles Basin Black Start Resources Selection Report

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California Independent System Operator Corporation

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LIST OF ATTACHMENTS

Attachment 1 - Los Angeles Basin Black Start Technical Variables and Criteria

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1. INTRODUCTION

This report describes the competitive solicitation process conducted by the California Independent System Operator Corporation (ISO) for the procurement of black start capability in the Los Angeles basin. Based on the ISO's review of the timelines associated with the ISO's and utilities' system restoration plans, black start resources are needed to enhance the system restoration plan in the Los Angeles basin.

The ISO conducted this competitive solicitation consistent with ISO tariff authority to contract for black start capability and use a competitive solicitation process to evaluate potential black start resources to enhance the system restoration plan in the Los Angeles basin after a widespread system outage. The ISO issued a request for proposals (RFP) and undertook (1) an analysis to determine whether each proposal for the provision of black start capability would satisfy the technical requirements and (2) a comparative analysis of the merits of the technically qualifying proposals with regard to the selection factors established by the ISO and posted on the ISO website in order to determine which of the proposals the ISO would select to provide the black start capability.

The ISO received proposals from four different prospective black start providers for the provision of black start capability in the Los Angeles basin from five different proposed black start resources. The proposals that the ISO reviewed were detailed and well-supported. However, the ISO's analysis determined that three of the proposals would not satisfy all of the technical requirements established by the ISO to ensure that the proposed black start resources would be capable of providing the black start capability identified by the ISO as needed to enhance the system restoration plan in the Los Angeles basin.

While conducting the comparative analysis of the proposals for the remaining two proposed black start resources, the ISO assessed how the black start capability proposals compared with regard to certain technical and commercial criteria in order to determine which proposals to select. The details of the ISO's comparative analysis are set forth in Sections 3.14-3.20 of this report, and the overall analysis is set forth in Section 3.21. The result of this competitive solicitation process is that the ISO has selected Sentinel Energy Center, LLC to provide black start capability from its proposed black start resource. As discussed in more detail in Section 3.17, the ISO has determined that it will procure in this solicitation only a single black start resource because the only two technically qualifying resources in the proposals in response to this solicitation do not provide sufficient locational diversity for both of them to be selected as needed for system restoration. The ISO plans to issue a subsequent RFP seeking additional black start capability in the western Los Angeles basin.

2. BACKGROUND

2.1 ISO Black Start Procurement Process and Need for Black Start Capability to Enhance the System Restoration Plan in the Los Angeles Basin

Black start capability refers to the ability of a generating unit or facility to begin operating and delivering electric power without external assistance from the electric system. Black start resources are essential to restart other generating units and to restore power to the grid in the event of a widespread system outage.¹ The ISO tariff requires black start resources to have a number of attributes, including the ability to: start without external aid from the grid, make a minimum number of starts, operate in stand-alone and parallel modes, have start-up load pickup capability, produce and absorb reactive power, and have necessary communication/control equipment.²

In the early years of its operation, the ISO relied on multiple resources to provide black start capability to the system. The ISO secured this capability through either reliability must run agreements or interim black start agreements.³ Under a reliability must run agreement, the ISO contracted for the ability to dispatch a generating unit to meet a reliability need, including the capability to provide black start. Under the interim black start agreements, the ISO contracted for black start from generating units either owned by or under contract to incumbent utilities. Over the years, the ISO has reduced its reliance on reliability must run agreements. In addition, the North American Electric Reliability Corporation (NERC) has adopted new reliability standards involving critical infrastructure and protection that have increased requirements for personnel training as well as cyber and physical security for assets critical to the reliability of the bulk electric system. These assets include generating units providing black start capability under a system restoration plan.

In 2011, the Federal Energy Regulatory Commission (FERC) approved the prior version of currently effective NERC Reliability Standard EOP-005-3 that requires, among other things, that transmission operators have a system restoration plan approved by their reliability coordinator.⁴

NERC Reliability Standard EOP-005-3 has the stated purpose to “[e]nsure plans, [f]acilities, and personnel are prepared to enable [s]ystem restoration from [b]lack [s]tart resources to assure reliability is maintained during restoration and priority is placed on restoring the Interconnection.” In addition, NERC Reliability Standard EOP-005-3 requires periodic testing of the resources, verification, and execution of the system restoration plan, and further states that each transmission operator should have testing requirements to verify that black start resources are capable of following the transmission operator’s restoration plan.⁵

¹ System Restoration Reliability Standards, FERC Order No. 749, FERC Stat. & Regs. ¶ 32,666, at P 2 (2011).

² ISO tariff, Appendix D.

³ The ISO tariff previously referred to these agreements as interim black start agreements.

⁴ System Restoration Reliability Standards 134 FERC ¶ 61215 (FERC Order 749) March 2011 at P 13. See also Requirement 1 of NERC Reliability Standard EOP-005-03 available at [EOP-005-3.pdf \(nerc.com\)](#).

⁵ NERC Reliability Standard EOP-005-3, Requirement 7.

In 2013, the ISO filed tariff revisions to specify how the ISO determines its black start needs pursuant to a system restoration plan that meets the requirements of NERC Reliability Standard EOP-005-3.⁶ Under these tariff provisions, the ISO has developed a system restoration plan in consultation with participating transmission owners, which are also required to develop system restoration plans under NERC Reliability Standard EOP-005-3.⁷ The ISO may, however, identify black start needs for the ISO system not identified in participating transmission owners' system restoration plans.⁸

Separately, the ISO, in consultation with participating transmission owners and participating generators, amended existing black start agreements to incorporate testing requirements under NERC Reliability Standard EOP-005-3. FERC accepted these amended agreements. These agreements provide black start capability the ISO relies upon in its system restoration plan under NERC Reliability Standard EOP-005-3.

In 2020, as part of its efforts to review its system restoration plan, the ISO determined that additional system black start capability is necessary to ensure adequate service restoration in the Los Angeles basin during a black start event. To secure this capability, the ISO initiated the current process to select black start resources and contract with prospective black start providers.⁹

The ISO tariff provides authority for the ISO to enter into black start agreements that compensate resources for black start capability. The ISO expects that any new agreement it enters into to procure black start capability will require the ISO to compensate the resource owner to provide that capability. Based on feedback from stakeholders, the ISO amended the ISO tariff to define this cost as a reliability services cost. The ISO will invoice the participating transmission owner where the black start resource is located, and the participating transmission owner will recover the cost from transmission customers under its reliability services tariff, as described in Section 2.2 of this report.

In addition, compensation for black start service will be at cost of service rates. Under this approach, the black start provider would submit its costs to FERC for acceptance under Section 205 of the Federal Power Act.¹⁰

Based on the results of prior stakeholder processes and approval by the ISO governing board, the ISO has adopted the following process steps for the black start procurement process:

1. The ISO, in consultation with the applicable participating transmission owner, will develop a black start technical specification document that defines requirements and key selection criteria.

⁶ ISO filing dated January 3, 2013 in FERC Docket No. ER13-699. *See also* FERC delegated order dated February 23, 2013, accepting the ISO's tariff revisions in FERC Docket No. ER13-699.

⁷ Only ISO participating transmission owners registered as transmission operators under the NERC functional model must develop system restoration plans under NERC Reliability Standard EOP-005-3.

⁸ *See* ISO tariff Section 5.1.

⁹ The ISO issued a request for proposals on May 17, 2021 requesting that interested providers submit proposals to provide black start capability to support the Los Angeles basin by August 11, 2021: <http://www.caiso.com/Documents/Presentation-LosAngelesBasinBlackStartRequest-Proposals.pdf>.

¹⁰ *See* 16 U.S.C. § 824d (c); *see also* 18 C.F.R. 35.1.

2. The ISO will conduct a stakeholder meeting to review the technical requirements and selection criteria and answer interested parties' questions.
3. The ISO will issue a request for proposals for black start resources.
4. The ISO will apply the technical criteria and evaluate the proposals. The ISO will consult with the applicable participating transmission owner with respect to how each offer meets the technical requirements.
5. The ISO will apply its selection criteria and select the most technically and commercially viable offer based on the technical and cost data submitted. As part of this selection, the ISO will consider the nature of the costs and whether they are reasonable, as well as what assurances exist that the prospective black start resource will continue to operate over the term of the black start agreement.
6. The ISO will initiate a contracting process with the black start resource. The contract will be a three party agreement among the ISO, the participating transmission owner, and the black start resource.

Regarding considerations for contracting for black start capability, the ISO has concluded that the length of any contractual commitment by the ISO and the black start service provider carry different risks and benefits to each party. A longer commitment term to the ISO will provide greater certainty of sufficient black start capability, but the ISO may also want reasonable exit provisions to address changes in circumstances. Similarly, a longer term contract provides greater certainty to the black start provider, but also could restrict future flexibility for the resource.

Given this context, the ISO considers a multi-year contract term with exit provisions to be appropriate. The ISO posted a sample black start agreement on the ISO website on May 14, 2021.

2.2 The ISO Black Start Tariff Structure

The effective ISO tariff provisions governing black start are set forth primarily in Sections 5 and 11.4 and in Appendix D of the ISO tariff. Section 5 sets forth the tariff provisions regarding the ISO's identification and procurement of necessary black start capability. The provisions of Section 11.4 address the settlement of payments for black start capability and black start energy.

Appendix D of the ISO tariff sets forth the fundamental requirements that must be met by a black start generating unit. Appendix D includes the requirement for a black start generating unit to pass performance tests to demonstrate its black start capability and the requirement that a black start generating unit comply with applicable reliability criteria.

ISO tariff Appendix D reads as follows:

The following requirements must be met by Black Start Generating Units:

- (a) Black Start Generating Units must be capable of starting and paralleling with the CAISO Controlled Grid without aid from the CAISO Controlled Grid;
- (b) Black Start Generating Units must be capable of making a minimum number of starts per event (to be without aid from the CAISO Controlled Grid as determined by the CAISO);

(c) Black Start Generating Units must be equipped with governors capable of operating in the stand alone (asynchronous) and parallel (synchronous) modes.

(d) Black Start Generating Units must have Start-Up load pickup capabilities at a level to be determined by the CAISO, including total Start-Up load (MW) and largest Start-Up load (MW) for such power output levels as the CAISO may specify. Each Black Start Generating Unit must be able to start up with a dead primary and station service bus within ten (10) minutes of issuance of an Exceptional Dispatch by the CAISO requiring a Black Start. Each Black Start Generating Unit must be capable of sustaining its output for a minimum period of twelve (12) hours from the time when it first starts delivering Energy. Black Start Agreements may specify a different minimum period.

(e) All Black Start Generating Units must be capable of producing reactive Power (boost) and absorbing reactive Power (buck) as required by the CAISO to control system voltages. Each Black Start Generating Unit must provide sufficient reactive capability to keep the energized transmission bus voltages within emergency Voltage Limits over the range of no load to full load. This requirement may be met by the operation of more than one Black Start Generating Unit in parallel providing that:

(i) the Black Start Generation supplier demonstrates that the proposed Generation resource shares reactive burden equitably;

(ii) all Participating Generators associated with the proposed Black Start source are located in the same general area.

Buck/boost capability requirement shall be dependent on the location of the proposed resource in relation to Black Start load.

(f) All Black Start Generating Units must have the following communication/control requirements:

(i) dial-up telephone;

(ii) backup radio;

(iii) manning levels which accord with Good Utility Practice.

(iv) Each Black Start Generator must ensure that normal and emergency voice communications are available to permit effective Exceptional Dispatch of Black Start Generating Units.

(g) The Scheduling Coordinator for the Black Start Generating Unit shall not use the Black Start Generating Unit to serve any Load other than station service Load required by the Black Start Generating Unit until the CAISO has confirmed that the need for such Black Start service has passed.

(h) Black Start Generating Units must pass performance tests for demonstrating Black Start capability, which the CAISO may periodically undertake in accordance with the CAISO's Operating Procedures for Black Start testing.

(i) All Black Start Generating Units will comply with Applicable Reliability Criteria.

The technical requirements and selection factors set forth in the technical specification document posted by the ISO on the ISO website for this competitive solicitation are derived in large part from the foregoing requirements of Appendix D but are more detailed and specific to the identified need for black start capability to enhance the system restoration plan in the Los Angeles basin than the more general requirements set forth in Appendix D. Consequently, the ISO has focused its analysis of the proposals of the prospective black start providers set forth in this report based on the posted technical requirements and selection factors.

3. SELECTION OF THE BLACK START RESOURCE

3.1 Description of Black Start Resource Selection Process for Black Start Capability in the Los Angeles Basin

The ISO implemented the selection process for black start resources to provide black start capability to enhance the system restoration plan in the Los Angeles basin as follows:

1. The ISO, in consultation with the applicable participating transmission owner, in this case Southern California Edison Company (SCE), developed a black start technical specification document, entitled “SCE Blackstart Technical Variables and Criteria,” that defines the technical requirements and selection factors for this procurement process. The ISO posted the technical specification document on the ISO website on May 14, 2021, including a reference to the substations defined in the ISO’s local capacity requirements technical study as the 220 kV transmission system in the Los Angeles basin,¹¹ and posted a presentation for the May 17, 2021 stakeholder conference call regarding the technical specification document, including a specific listing of substations constituting the 220 kV system in the Los Angeles basin, on May 13, 2021.¹²

2. The ISO conducted a conference call for stakeholders on May 17, 2021 to review the technical requirements and selection factors and answer interested parties’ questions. The ISO subsequently posted a matrix of answers to additional stakeholder questions on the ISO website on June 7, 2021 and a revised version of the matrix on July 13, 2021.¹³

3. The ISO issued an RFP as part of its presentation to stakeholders in its conference call on May 17, 2021 requesting that interested providers submit proposals by August 11, 2021 to provide black start capability to enhance the system restoration plan in the Los Angeles basin.¹⁴ The ISO posted documents implementing the RFP on the ISO website on May 14, 2021. The RFP documents posted by the ISO on May 14, 2021 included application information requirements set forth in the “Facility/Plant Information” and “Blackstart Unit(s) Information” sections of the technical specification document (Attachment 1 to this report) and in a separate “Black Start Resource Commercial Worksheet/Questionnaire” (Attachment 2 to this report). The ISO also posted a model black start agreement.¹⁵

4. As discussed in Sections 3.4-3.11 of this report, the ISO has applied the technical requirements and evaluated the proposals in response to its RFP. The ISO consulted with the applicable participating transmission owner, SCE, with respect to how each proposal satisfies the technical requirements.

¹¹ <http://www.caiso.com/Documents/Specifications-SCEBlackStart.pdf>.

¹² <http://www.caiso.com/Documents/Presentation-LosAngelesBasinBlackStartRequest-Proposals.pdf>.

¹³ <http://www.caiso.com/Documents/RevisedBlackStartServiceQuestionsMatrix.pdf>.

¹⁴ <http://www.caiso.com/Documents/Presentation-LosAngelesBasinBlackStartRequest-Proposals.pdf>.

¹⁵ <http://www.caiso.com/Documents/SampleBlackStartContract.pdf>.

5. As discussed in Sections 3.14-3.21 of this report, the ISO has applied its selection factors and has selected the most technically and commercially viable proposal based on the technical and cost data submitted.¹⁶ As part of this selection, the ISO has considered the nature of the costs and whether they are reasonable, as well as what assurances exist that the proposed black start resource will continue to operate over the term of its black start agreement.

6. The ISO will initiate a contracting process with the owner of the black start resource that the ISO has selected to provide the black start capability. The contract will be a three party agreement among the ISO, the participating transmission owner (SCE), and the owner of the black start resource.¹⁷

The ISO received proposals from four prospective black start providers proposing to provide black start capability to enhance the system restoration plan in the Los Angeles basin from five different proposed black start resources. The ISO has evaluated each of these proposals and has selected the black start provider and proposed black start resource identified in this report to provide the black start capability.

In the course of this selection process, the ISO first evaluated all of the proposals regarding their ability to satisfy the technical requirements of the RFP with regard to provision of black start capability to enhance the system restoration plan in the Los Angeles basin. These technical requirements include:

- Must satisfy the NERC definition of “Blackstart Resource:” “A generating unit(s) and its associated set of equipment which has the ability to be started without support from the System or is designed to remain energized without connection to the remainder of the System, with the ability to energize a bus, meeting the Transmission Operator’s restoration plan needs for Real and Reactive Power capability, frequency and voltage control, and that has been included in the Transmission Operator’s restoration plan.” (Note that the ISO considers the real and reactive power requirements to include the capability of supplying start-up power to a potential target unit for use in system restoration.)
- Must be able to supply own start-up power.
- Must serve own plant load.
- Must have ability to meet fault impedance requirements of the restoration path. Generating unit protection relays should be flexible to assume temporary setting changes required to provide adequate protection during anticipated black start system configurations. This could be accommodated by, but is not limited to, utilizing microprocessor based protective relays with multiple group setting capability.
- Must follow the ISO planned outage procedures.
- Must have ability to meet minimum continuous running time for unit - 48 hours.
- Must have ability to energize a dead transmission bus within targeted timeframe: 3 hours.

¹⁶ The ISO has determined that it will procure in this solicitation only a single black start resource because the only two technically qualifying resources in the proposals in response to this solicitation do not provide sufficient locational diversity for both of them to be selected as needed for system restoration.

¹⁷ See the sample version of the black start agreement posted on the ISO website at:

<http://www.caiso.com/Documents/SampleBlackStartContract.pdf>.

- Must demonstrate the ability to comply with all applicable NERC CIP and other reliability standards as a “Blackstart Resource” (including but not limited to NERC reliability standards PRC 19-2 and 25-1, EOP 005-3, CIP 008-2, CIP 008-3, and COM-001 and ISO resource testing guidelines).

After determining which proposals satisfied these technical requirements with regard to provision of black start capability to enhance the system restoration plan in the Los Angeles basin, the ISO then evaluated the remaining proposals based on a comparative analysis of the merits of each proposal with regard to the selection factors set forth in the technical specification document for the RFP. The selection factors specified in the technical specification document are:

- (a) Calculated time to energize the 220 kV substation loop and reach a potential target unit within the Los Angeles basin;
- (b) Technical ability to meet restoration requirements (start-up time, MVARs, MW, ramps, permits, etc.) (note that the ISO also considers the restoration requirements to include frequency and voltage regulation requirements);
- (c) Restoration flexibility (resource location that provides ISO or SCE operations multiple options to restore the 220 kV system, proximity to other generating facilities);
- (d) Locational diversity of resource (location with respect to other black start resources in the area);
- (e) Resource viability over five to ten year horizon;
- (f) Cost of service financials; and
- (g) Any other strengths and advantages the proposal may have to provide the specific black start capability, as well as any specific efficiencies or benefits demonstrated in the proposal.

In selecting the black start resources, the ISO has undertaken a comparative analysis of the prospective black start providers’ proposals with regard to the foregoing selection factors as part of its comprehensive, holistic review of all factors and elements of the prospective black start providers’ proposals.

This report summarizes information provided by each prospective black start provider that was considered by the ISO to be important in analyzing their proposals with respect to each of the technical requirements and selection factors. At the beginning of each subsection of this Section 3, commencing with Section 3.3, the ISO has provided a listing of the sections of (1) the facility worksheet in the technical specification document (set forth in Attachment 1 to this report for reference) or (2) the commercial worksheet/questionnaire that the ISO posted on the ISO website on May 14, 2021 (set forth in Attachment 2 to this report for reference) that the ISO particularly considered in undertaking its analysis of the proposals’ satisfaction of the technical requirement or its comparative analysis for that selection factor. In addition, in the ISO’s summaries in this report describing the information provided by each prospective black start provider, the ISO has provided a reference to the particular sections of the prospective black start provider’s proposal that served as the source for that summary. Because this report is a summary, it does not repeat all of the information provided by the prospective black start providers. However, the ISO reviewed and considered all of the information provided by the prospective black start providers, and the ISO’s failure to reference any specific information provided by a prospective black start provider does not indicate lack of consideration of such information.

3.2 Description of Prospective Black Start Providers and Their Proposals

The ISO evaluated proposals submitted by four prospective black start providers, identified in their proposals as:

- Carson Hybrid Energy Storage, LLC (CHES)
- City of Pasadena Water & Power (PWP)
- Sentinel Energy Center, LLC (Sentinel)
- Southern California Edison Company (SCE)

Three prospective black start providers each submitted a proposal to provide black start capability from a single proposed black start resource, and PWP submitted independent proposals for the provision of black start capability from two different proposed black start resources. Although not all proposed black start resources were able to satisfy all the technical requirements, all four prospective black start providers submitted strong, competitive proposals. As a result, the ISO had to make detailed distinctions among the technically qualifying proposals to provide black start capability to enhance the system restoration plan in the Los Angeles basin in the comparative analysis process in selecting the black start resources.

In preparing this report for distribution to the public, the ISO has determined that certain information relating to the proposed black start resources is critical energy infrastructure information (CEII). Based on this determination, the ISO has drafted this report to refer only generally to the proposed black start resources identified in the proposals, including using a letter identifier (A and B) for the two proposed black start resources included in PWP's proposals. In addition, the ISO has concluded that many of the details of the proposals of the prospective black start providers are sensitive and should remain confidential. Based on this determination, the ISO has referenced the details of the proposals only generally in this report and has described (1) the ability of the proposals to satisfy the technical requirements and (2) the comparative analysis of their merits with regard to the selection factors for this competitive procurement process in qualitative terms.

Carson Hybrid Energy Storage, LLC (CHES)

CHES is the operator of a combined cycle generating facility in the Los Angeles basin and is a participating generator subject to the ISO tariff with regard to that generating facility. CHES is in the process of installing an energy storage system at its generating facility. CHES proposes to utilize the hybrid facility to provide black start capability. (Proposal cover letter; Facility/Plant Information and Blackstart Unit(s) Information 1-6)

City of Pasadena Water & Power (PWP)

PWP is the City of Pasadena's municipal electric utility, which operates as a utility distribution company within the ISO balancing authority area. PWP submitted two independent proposals to provide black start capability, one from installing new capability at an existing PWP generating facility and one from the installation of new capability at an interconnection point between the PWP electric system and the SCE

electric system. This report references PWP’s proposed black start resources by the letter designations A and B. (Proposal cover letters)

Sentinel Energy Center, LLC (Sentinel)

Sentinel proposes to provide black start capability from a proposed black start resource at an existing gas turbine generating facility in the Los Angeles basin and is a participating generator subject to the ISO tariff with regard to that generating facility. (Proposal cover letter) Sentinel indicated that it proposes modify its generating facility to add an energy storage system to enable it to provide black start capability. (Proposal cover letter)

Southern California Edison Company (SCE)

SCE, which is a utility distribution company and participating transmission owner in the ISO balancing authority area, proposes to provide black start capability from a proposed black start resource at an existing combined cycle generating facility in the Los Angeles basin regarding which it is a participating generator subject to the ISO tariff. (Proposal overview) SCE indicated that it proposes modify its generating facility to add an energy storage system to enable it to provide black start capability. (Proposal overview)

3.3 Technical Requirements for Qualification to Be Considered in Competitive Procurement Process

In order to determine that the black start resources identified in the proposals of prospective black start providers would be capable of providing the black start capability identified by the ISO as needed to enhance the system restoration plan in the Los Angeles basin, the ISO specified in the technical specifications document posted on the ISO website the basic technical requirements for the RFP. As the first step in the evaluation of the proposals submitted in response to the RFP, the ISO evaluated all of the proposals regarding their ability to satisfy these technical requirements.

3.4 Technical Requirement: Satisfy the NERC Definition of “Blackstart Resource”

(Facility/Plant Information and Blackstart Unit(s) Information bullets 6-17, 19-27; Commercial Worksheet/Questionnaire 2)

The first technical requirement for the RFP is that the proposed black start resource must satisfy the NERC definition of “Blackstart Resource.” The NERC definition of this term is: “A generating unit(s) and its associated set of equipment which has the ability to be started without support from the System or is designed to remain energized without connection to the remainder of the System, with the ability to energize a bus, meeting the Transmission Operator’s restoration plan needs for Real and Reactive Power capability, frequency and voltage control, and that has been included in the Transmission Operator’s restoration plan.” (Note that the ISO considers the real and reactive power requirements to include the capability of supplying start-up power to a potential target unit for use in system restoration.)

3.4.1 Determination for CHES

CHES provided information describing the ability of its proposed black start resource to be started without support from the electric system, its capability to energize a bus on the electric system, and its ability to supply real and reactive power, frequency control, and voltage control. (Facility/Plant Information and Blackstart Unit(s) Information 6-17, 19-27; Commercial Worksheet/Questionnaire 2; answers to additional questions 1-2, 7-13)

Based on the ISO's analysis of the information in CHES's proposal, the ISO has determined that the proposed black start resource described in CHES's proposal would not satisfy the NERC definition of "Blackstart Resource." The ISO has determined that CHES's proposed black start resource would be able to meet the requirement of starting without support from the electric system, and the studies conducted by the ISO determined that CHES's proposed black start resource would have the capability of energizing a bus on the electric system and would have the ability to supply frequency and voltage control. However, the ISO's studies simulated a system blackout and restoration using each proposed black start resource being studied and determined that CHES's proposed black start resource would not have the capability to supply real and reactive power that meets the transmission operator's restoration plan needs. In particular, because of its electrical location, interconnection to the transmission system with respect to potential target units, and generation capabilities, CHES's proposed black start resource would lack the capability of supplying start up power to a potential target unit for use in system restoration. Consequently, the ISO finds that CHES's proposal does not satisfy this technical requirement of the RFP. Having made this determination, the ISO did not consider the proposal for CHES's proposed black start resource in the comparative analysis phase of the competitive solicitation process.

3.4.2 Determination for PWP Proposed Black Start Resource A

PWP provided information describing the ability of its proposed black start resource A to be started without support from the electric system, its capability to energize a bus on the electric system, and its ability to supply real and reactive power, frequency control, and voltage control. (Proposal transmittal letter; Facility/Unit Information lines 9-32, 35-54; Commercial Worksheet/Questionnaire 2; Pasadena answers to questions 6-7)

Based on the ISO's analysis of the information in PWP's proposal regarding proposed black start resource A, the ISO has determined that the proposed black start resource described in PWP's proposal would not satisfy the NERC definition of "Blackstart Resource." The ISO has determined that PWP's proposed black start resource A would be able to meet the requirement of starting without support from the electric system, and the studies conducted by the ISO determined that PWP's proposed black start resource A would have the capability of energizing a bus on the electric system and would have the ability to supply frequency and voltage control. However, the ISO's studies simulated a system blackout and restoration using each proposed black start resource being studied and determined that PWP's proposed black start resource A would not have the capability to supply real and reactive power that meets the transmission operator's restoration plan needs. In particular, because of its electrical location, interconnection to the transmission system with respect to potential target units, and generation capabilities, PWP's proposed black start resource A would lack the capability of supplying start-up power to a potential target unit for use in system restoration.

Consequently, the ISO finds that PWP’s proposal does not satisfy this technical requirement of the RFP. Having made this determination, the ISO did not consider the proposal for PWP’s proposed black start resource A in the comparative analysis phase of the competitive solicitation process.

3.4.3 Determination for PWP Proposed Black Start Resource B

PWP provided information describing the ability of its proposed black start resource B to be started without support from the electric system, its capability to energize a bus on the electric system, and its ability to supply real and reactive power, frequency control, and voltage control. (Proposal Option B; Pasadena answers to questions 1)

Based on the ISO’s analysis of the information in PWP’s proposal regarding proposed black start resource B, the ISO has determined that the proposed black start resource described in PWP’s proposal would not satisfy the NERC definition of “Blackstart Resource.” The ISO has determined that PWP’s proposed black start resource B would be able to meet the requirement of starting without support from the electric system, and the studies conducted by the ISO determined that PWP’s proposed black start resource B would have the capability of energizing a bus on the electric system and would have the ability to supply frequency control. However, the ISO’s studies simulated a system blackout and restoration using each proposed black start resource being studied and determined that PWP’s proposed black start resource B would not have the capability to supply real and reactive power or voltage control that meets the transmission operator’s restoration plan needs. In particular, because of its electrical location, interconnection to the transmission system with respect to potential target units, and generation capabilities, PWP’s proposed black start resource B would lack the capability of supplying start-up power to a potential target unit for use in system restoration. Consequently, the ISO finds that PWP’s proposal does not satisfy this technical requirement of the RFP. Having made this determination, the ISO did not consider the proposal for PWP’s proposed black start resource B in the comparative analysis phase of the competitive solicitation process.

3.4.4 Determination for Sentinel

Sentinel provided information describing the ability of its proposed black start resource to be started without support from the electric system, its capability to energize a bus on the electric system, and its ability to supply real and reactive power, frequency control, and voltage control. (Proposal cover letter; Facility Plant Information lines 9-32; Blackstart Unit Information lines 1-22; Commercial Worksheet/Questionnaire 2; Responses to CAISO Questions (9/13/21) 1, 3-4, 6-7)

Based on the ISO’s analysis of the information in Sentinel’s proposal, the ISO has determined that the proposed black start resource described in Sentinel’s proposal would satisfy the NERC definition of “Blackstart Resource.” The ISO has determined that Sentinel’s proposed black start resource would be able to meet the requirements of starting without support from the electric system, and the studies conducted by the ISO determined that Sentinel’s proposed black start resource would have the capability of energizing a bus on the electric system. In addition, the ISO’s studies simulated a system blackout and restoration using each proposed black start resource being studied and determined that Sentinel’s proposed black start resource would have the capability to supply real and reactive power, frequency control, and voltage control that meets the

transmission operator's restoration plan needs, including the capability to supply real and reactive power that could provide start-up power to multiple different potential target units for use in system restoration. Consequently, the ISO finds that Sentinel's proposal satisfies this technical requirement of the RFP.

3.4.5 Determination for SCE

SCE provided information describing the ability of its proposed black start resource to be started without support from the electric system, its capability to energize a bus on the electric system, and its ability to supply real and reactive power, frequency control, and voltage control. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 9-25, 27-35; Commercial Worksheet/Questionnaire 2; response to request for clarifications and additional information 2-5)

Based on the ISO's analysis of the information in SCE's proposal, the ISO has determined that the proposed black start resource described in SCE's proposal would satisfy the NERC definition of "Blackstart Resource." The ISO has determined that SCE's proposed black start resource would be able to meet the requirements of starting without support from the electric system, and the studies conducted by the ISO determined that SCE's proposed black start resource would have the capability of energizing a bus on the electric system. In addition, the ISO's studies simulated a system blackout and restoration using each proposed black start resource being studied and determined that SCE's proposed black start resource would have the capability to supply real and reactive power, frequency control, and voltage control that meets the transmission operator's restoration plan needs, including the capability to supply real and reactive power that could provide start-up power to multiple different potential target units for use in system restoration. Consequently, the ISO finds that SCE's proposal satisfies this technical requirement of the RFP.

3.5 Technical Requirement: Supply Own Start-up Power

(Facility/Plant Information and Blackstart Unit(s) Information bullets 6-17, 19-20; Commercial Worksheet/Questionnaire 2)

The second technical requirement for the RFP is that the proposed black start resource must be able to supply its own start-up power.

3.5.1 Determination for CHES

CHES provided information describing the ability of its proposed black start resource to supply its own start-up power. (Facility/Plant Information and Blackstart Unit(s) Information 6-17, 19-20; Commercial worksheet/questionnaire 2; answers to additional questions 9-13) CHES provided information on initial start-up power requirements and also provided a plant single line diagram for the proposed black start resource. CHES indicated that the proposed start-up power systems would be capable of supporting a minimum number of attempted starts. (Facility/Plant Information and Blackstart Unit(s) Information 14-17; answers to additional questions 1, 9)

Based on the ISO's analysis of the information in CHES's proposal, the ISO has determined that the proposed black start resource described in CHES's proposal would have the ability to supply its own start-up power. Consequently, the ISO finds that CHES's proposal satisfies this technical requirement of the RFP.

3.5.2 Determination for PWP Proposed Black Start Resource A

PWP provided information describing the ability of its proposed black start resource A to supply its own start-up power. (Proposal transmittal letter; Facility/Unit Information lines 9-32, 35-40; Commercial Worksheet/Questionnaire 2; Pasadena answers to questions 6-7) PWP provided information on an initial start-up power system and also provided a plant single line diagram for the proposed black start resource. PWP indicated that the proposed start-up power systems would be capable of supporting a minimum number of attempted starts. (Proposal transmittal letter; Facility/Unit Information lines 29-32)

Based on the ISO's analysis of the information in PWP's proposal regarding its proposed black start resource A, the ISO has determined that PWP's proposed black start resource A would have the ability to supply its own start-up power. Consequently, the ISO finds that PWP's proposal for its proposed black start resource A satisfies this technical requirement of the RFP.

3.5.3 Determination for PWP Proposed Black Start Resource B

PWP provided information describing the ability of its proposed black start resource B to supply its own start-up power. (Proposal Option B; Pasadena answers to questions 1) PWP provided information on an initial start-up power system. PWP indicated that the proposed start-up power system would be capable of supporting a minimum number of attempted starts. (Proposal Option B; Pasadena answers to questions 1)

Based on the ISO's analysis of the information in PWP's proposal regarding its proposed black start resource B, the ISO has determined that PWP's proposed black start resource B would have the ability to supply its own start-up power. Consequently, the ISO finds that PWP's proposal for its proposed black start resource B satisfies this technical requirement of the RFP.

3.5.4 Determination for Sentinel

Sentinel provided information describing the ability of its proposed black start resource to supply its own start-up power. (Proposal cover letter; Facility Plant Information lines 9-31; Blackstart Unit Information lines 1-4; Commercial Worksheet/Questionnaire 2; Responses to CAISO Questions (9/13/21) 1, 3-4, 6-7) Sentinel provided information on an initial start-up power system and also provided a plant single line diagram for the proposed black start resource. Sentinel indicated that the proposed start-up power system would be capable of supporting a minimum of three attempted starts. (Proposal cover letter; Facility Plant Information lines 29-32; Responses to CAISO Questions (9/13/21) 1, 3-4)

Based on the ISO's analysis of the information in Sentinel's proposal, the ISO has determined that the proposed black start resource described in Sentinel's proposal would have the ability to supply its own start-up power from its existing system. Consequently, the ISO finds that Sentinel's proposal satisfies this technical requirement of the RFP.

3.5.5 Determination for SCE

SCE provided information describing the ability of its proposed black start resource to supply its own start-up power. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 9-25, 27-28; Commercial Worksheet/Questionnaire 2; response to request for clarifications and additional information 2) SCE provided information on an initial start-up power system and also provided a plant single line diagram for the proposed black start resource. SCE indicated that the start-up power system would be capable of supporting a minimum of three attempted starts. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 21-24)

Based on the ISO's analysis of the information in SCE's proposal, the ISO has determined that the proposed black start resource described in SCE's proposal would have the ability to supply its own start-up power. Consequently, the ISO finds that SCE's proposal satisfies this technical requirement of the RFP.

3.6 Technical Requirement: Serve Own Plant Load

(Facility/Plant Information and Blackstart Unit(s) Information bullets 6-17, 19-22)

The third technical requirement for the RFP is that the proposed black start resource must serve its own plant load.

3.6.1 Determination for CHES

CHES provided information related to the ability of its proposed black start resource to serve its own plant load. (Facility/Plant Information and Blackstart Unit(s) Information 6-17, 19-22; answers to additional questions 9-13) CHES also provided a plant single line diagram for the proposed black start resource. (Facility/Plant Information and Blackstart Unit(s) Information 14) CHES provided information on an initial start-up power system and provided a load list that indicated it would be capable of supporting three attempted starts. CHES also provided a description of the steps necessary at its proposed black start resource to start the proposed facility and serve the generating facility's plant load. (Facility/Plant Information and Blackstart Unit(s) Information 6-17, 19-22; answers to additional questions 9-13)

Based on the ISO's analysis of the information in CHES's proposal, the ISO has determined that the proposed black start resource described in CHES's proposal would have the initial ability to serve its own plant load. Consequently, the ISO finds that CHES's proposal satisfies this technical requirement of the RFP.

3.6.2 Determination for PWP Proposed Black Start Resource A

PWP provided information describing the ability of its proposed black start resource A to serve its own plant load. (Proposal transmittal letter; Facility/Unit Information lines 9-32, 35-50; Commercial Worksheet/Questionnaire 2; Pasadena answers to questions 6-7) PWP provided a single line diagram for its proposed black start resource A. (Facility/Unit Information line 29) PWP also provided a description of the steps necessary at its proposed black start resource A to start the proposed facility and serve the generating facility's plant load. (Facility/Unit Information line 30)

Based on the ISO's analysis of the information in PWP's proposal regarding its proposed black start resource A, the ISO has determined that PWP's proposed black start resource A would have the ability to serve its own plant load. Consequently, the ISO finds that PWP's proposal for its proposed black start resource A satisfies this technical requirement of the RFP.

3.6.3 Determination for PWP Proposed Black Start Resource B

PWP provided information describing the ability of its proposed black start resource B to serve its own plant load. (Proposal Option B; Pasadena answers to questions 1) PWP provided a single line diagram for its proposed black start resource B. (Proposal Option B, Attachment A) PWP also provided a description of the steps necessary at its proposed black start resource B to start the proposed facility. (Pasadena answers to questions 1)

Based on the ISO's analysis of the information in PWP's proposal regarding its proposed black start resource B, the ISO has determined that PWP's proposed black start resource B would have the ability to serve its own plant load. Consequently, the ISO finds that PWP's proposal for its proposed black start resource B satisfies this technical requirement of the RFP.

3.6.4 Determination for Sentinel

Sentinel provided information describing the ability of its proposed black start resource to serve its own plant load. (Proposal cover letter; Facility Plant Information lines 9-32; Blackstart Unit Information lines 1-11; Commercial Worksheet/Questionnaire 2; Responses to CAISO Questions (9/13/21) 1, 3-4, 6-7)). Sentinel provided a single line diagram for the proposed black start resource. (Facility Plant Information line 29) Sentinel also provided a black start operating procedure that details the steps necessary to start the proposed black start resource and serve the generating facility's plant load (Proposal cover letter, Exhibit B; Facility Plant Information line 30), noting that the black start source would provide power to the required plant and unit auxiliary loads for three hours plus the time for three sequential black starts. (Proposal cover letter, Exhibit B; Facility Plant Information line 32)

Based on the ISO's analysis of the information in Sentinel's proposal, the ISO has determined that the proposed black start resource described in Sentinel's proposal would have the initial ability to serve its own plant load. Consequently, the ISO finds that Sentinel's proposal satisfies this technical requirement of the RFP.

3.6.5 Determination for SCE

SCE provided information describing the ability of its proposed black start resource to serve its own plant load. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 9-25, 27-30; response to request for clarifications and additional information 2-5) SCE provided a plant single line diagram for the proposed black start resource. (Facility/Plant Information and Blackstart Unit(s) Information bullet 21) SCE also provided a black start operating guideline that details the steps necessary to start the proposed black start resource and serve the facility's plant load within two

hours of an event requiring the black start resource. (Facility/Plant Information and Blackstart Unit(s) Information bullet 22)

Based on the ISO's analysis of the information in SCE's proposal, the ISO has determined that the proposed black start resource described in SCE's proposal would have the initial ability to serve its own plant load. Consequently, the ISO finds that SCE's proposal satisfies this technical requirement of the RFP.

3.7 Technical Requirement: Meet Fault Impedance Requirements of the Restoration Path

(No facility worksheet or commercial worksheet/questionnaire section)

The fourth technical requirement for the RFP is that the proposed black start resource must have the ability to meet the fault impedance requirements of the restoration path. The technical specification document states that generating unit protection relays should be flexible to assume temporary setting changes required to provide adequate protection during anticipated black start system configurations. The technical specification document further states that this could be accommodated by, but is not limited to, utilizing microprocessor based protective relays with multiple group setting capability.

The ISO did not expressly include a request for information regarding this requirement in the facility worksheet or the commercial worksheet/questionnaire, and the proposals did not expressly address this requirement. However, the ISO did identify it as a technical requirement in the technical specification document, and no prospective black start provider requested an exception from this requirement in its proposal. In addition, the ISO has concluded that all of the proposed black start resources have or could install protective relays with the flexibility to meet the fault impedance requirements of the restoration path and that therefore all of the proposals satisfy this technical requirement of the RFP.

3.8 Technical Requirement: Follow the ISO Planned Outage Procedures

(No facility worksheet or commercial worksheet/questionnaire section)

The fifth technical requirement for the RFP is that the proposed black start resource must follow the ISO planned outage procedures. The ISO did not include a request for information regarding this requirement in the facility worksheet or the commercial worksheet/questionnaire, and the proposals did not expressly address this requirement. The ISO has determined that the proposed black start resources of all the prospective black start providers are already subject to or will be capable of meeting the ISO's planned outage procedures pursuant to ISO tariff requirements regarding outage coordination for each of the generating facilities associated with the proposed black start resources. In addition, because this is a requirement specified in the technical specification document and because no prospective black start provider requested an exception from this requirement in its proposal, the ISO has concluded that all of the proposed black start resources would follow the ISO planned outage procedures and that therefore all of the proposals satisfy this technical requirement of the RFP.

3.9 Technical Requirement: Meet Minimum Continuous Running Time for Unit - 48 Hours

(Facility/Plant Information and Blackstart Unit(s) Information bullets 5-17, 19-22)

The sixth technical requirement for the RFP is that the proposed black start resource must have the ability to meet a minimum continuous running time for the generating unit of 48 hours.

3.9.1 Determination for CHES

The information provided by CHES regarding the continuous running time for its proposed black start resource did not indicate any limitations with respect to its continuous running time. (Facility/Plant Information and Blackstart Unit(s) Information 7-9, 12-13, 15-16; answers to additional questions 2, 7-11) CHES also noted that the generating facility holds perpetual nitrogen oxide (NOx) emissions credits to cover black start operations. (Answers to additional questions 7)

Based on the ISO's analysis of the information in CHES's proposal, the ISO has determined that the proposed black start resource described in CHES's proposal does not have any technical limitations that would limit its continuous running time to less than 48 hours. Consequently, the ISO finds that CHES's proposal satisfies this technical requirement of the RFP.

3.9.2 Determination for PWP Proposed Black Start Resource A

PWP provided information regarding the continuous running time for its proposed black start resource A. (Proposal transmittal letter; Facility/Unit Information lines 10-16, 27-28, 30-31) PWP did not indicate any technical limitations with respect to running time but noted that due to permitting limitations the maximum duration at low loads is limited. (Proposal transmittal letter; Facility/Unit Information line 27)

Based on the ISO's analysis of the information in PWP's proposal regarding its proposed black start resource A, the ISO has determined that PWP's proposed black start resource A would have the ability to achieve a continuous running time of 48 hours. Consequently, the ISO finds that PWP's proposal for its proposed black start resource A satisfies this technical requirement of the RFP.

3.9.3 Determination for PWP Proposed Black Start Resource B

PWP provided information regarding the continuous running time for its proposed black start resource B. (Proposal Option B) PWP did not identify a technical limit on the running time of its generating facility. (Proposal Option B)

Based on the ISO's analysis of the information in PWP's proposal regarding its proposed black start resource B, the ISO has determined that PWP's proposed black start resource B would have the ability to achieve a continuous running time of 48 hours. Consequently, the ISO finds that PWP's proposal for its proposed black start resource B satisfies this technical requirement of the RFP.

3.9.4 Determination for Sentinel

Sentinel provided information regarding the continuous running time for its proposed black start resource. (Proposal cover letter; Facility Plant Information lines 10-15, 27-28, 30-31) Sentinel did not identify a technical limit on the continuous running time for any of the generating units at its generating facility.

Based on the ISO's analysis of the information in Sentinel's proposal, the ISO has determined that the proposed black start resource described in Sentinel's proposal would have the ability to achieve a continuous running time of 48 hours. Consequently, the ISO finds that Sentinel's proposal satisfies this technical requirement of the RFP.

3.9.5 Determination for SCE

SCE provided information regarding the continuous running time for its proposed black start resource. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 8-25, 27-30; response to request for clarifications and additional information 2-5) SCE indicated that its proposal includes the ability for its black start resource to run in isochronous mode for more than 48 hours. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 14-20; response to request for clarifications and additional information 4-5) SCE also indicated that it does not anticipate requiring a permit amendment to allow its black start resource to operate in black start mode. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullet 11; response to request for clarifications and additional information 1)

Based on the ISO's analysis of the information in SCE's proposal, the ISO has determined that the proposed black start resource described in SCE's proposal would have the ability to achieve a continuous running time of 48 hours. Consequently, the ISO finds that SCE's proposal satisfies this technical requirement of the RFP.

3.10 Technical Requirement: Energize a Dead Transmission Bus within Targeted Timeframe - 3 Hours

(Facility/Plant Information and Blackstart Unit(s) Information bullets 4, 6-17, 19-27)

The seventh technical requirement for the RFP is that the proposed black start resource must have the ability to energize a dead transmission bus within a targeted timeframe of three hours.

This requirement includes a determination of the proposed black start resource's ability to energize, within system operating voltage limits, one of the busses on the 220 kV system serving the Los Angeles basin identified in the technical specification document, particularly including the substations defined in the ISO's local capacity requirements technical study referenced in the technical specification document, as key to the restoration of service to the area. This is to be accomplished within three hours.

Regarding this requirement, the ISO considers it essential to the value of the black start capability it proposes to procure that the proposed black start resource actually be effective in restarting the system, which the ISO has identified, among other criteria, as the energization, within system operating voltage limits, of one of the busses on the 220 kV system identified in the technical specification document. To ensure that the selected

black start resource would be effective to meet the identified need, the ISO conducted technical studies to determine if each of the proposed black start resources could energize one of the identified busses on the 220 kV system serving the Los Angeles basin within system operating voltage limits and, if so, whether it could do so within three hours. The ISO simulated a system blackout and restoration using each proposed black start resource being studied to energize, within a three-hour timeframe, the closest 220 kV system bus identified in the ISO's technical specification document. Proposed black start resources that were unable to energize one of the identified 220 kV system busses within system operating voltage limits were not considered for further analysis. Those that were successfully able to restore one of the identified 220 kV busses in the simulation within system operating voltage limits were further evaluated to determine if they could do so within the targeted three-hour timeframe. In addition, proposed black start resources that were capable of energizing one of the identified 220 kV busses within system operating voltage limits were evaluated on multiple paths and considered in the comparative analysis for the selection factors in this report based on each generating facility's reactive power capabilities and other selection factors. If the ISO's further evaluation of the proposed black start resource determined that it would not be capable of providing the necessary real and reactive power to supply start-up power to a potential target unit, as addressed in Section 3.4, the resource was not included in the comparative analysis.

3.10.1 Determination for CHES

CHES provided information describing the capability of its proposed black start resource to energize a bus on the electric system. (Facility/Plant Information and Blackstart Unit(s) Information 4, 6-17, 19-27; answers to additional questions 1-2, 7-11) This information included generating unit capability curves, step up transformer impedance data, a system single line drawing, and test results from the generating facility's data and model validation compliance NERC testing. (Facility/Plant Information and Blackstart Unit(s) Information 11, 14, 19-27)

Based on the ISO's analysis of the information in CHES's proposal, as discussed in Section 3.10, the ISO has determined that the proposed black start resource described in CHES's proposal would be capable of energizing one of the busses on the 220 kV system in the Los Angeles basin identified in the technical specification document as key to the restoration of service to the area within system operating voltage limits. In addition, the ISO has evaluated the steps and associated time required to energize one of the 220 kV busses identified in the technical specification document. Based on this analysis, the ISO has determined that CHES's proposed black start resource would be capable of energizing one of the identified busses on the 220 kV system within the required three-hour timeframe. Consequently, the ISO finds that CHES's proposal satisfies this technical requirement of the RFP. However, as discussed in Section 3.4.1, the ISO's studies determined that CHES's proposed black start resource would lack the capability of supplying the required real and reactive power necessary to provide start-up power to a potential target unit for use in system restoration.

3.10.2 Determination for PWP Proposed Black Start Resource A

PWP provided information describing the capability of its proposed black start resource A to energize a bus on the electric system. (Proposal transmittal letter; Facility/Unit Information lines 4-7, 9-32, 35-54) This information included generating unit capability

curves, step up transformer impedance data, plant and system single line drawings, and test results from the generating facility's data and model validation compliance NERC testing. (Proposal transmittal letter; Facility/Unit Information lines 18-26, 29, 35-54)

Based on the ISO's analysis of the information in PWP's proposal A, as discussed in Section 3.10, the ISO has determined that the proposed black start resource described in PWP's proposal would be capable of energizing one of the busses on the 220 kV system in the Los Angeles basin identified in the technical specification document as key to the restoration of service to the area within system operating voltage limits. In addition, the ISO has evaluated the steps and associated time required to energize one of the 220 kV busses identified in the technical specification document. Based on this analysis, the ISO has determined that PWP's proposed black start resource would be capable of energizing one of the identified busses on the 220 kV system within the required three-hour timeframe. Consequently, the ISO finds that PWP's proposal satisfies this technical requirement of the RFP. However, as discussed in Section 3.4.2, the ISO's studies determined that PWP's proposed black start resource A would lack the capability of supplying the required real and reactive power necessary to provide start-up power to a potential target unit for use in system restoration.

3.10.3 Determination for PWP Proposed Black Start Resource B

PWP provided information describing the capability of its proposed black start resource B to energize a bus on the electric system. (Proposal Option B; Pasadena answers to questions 1) This information included generating unit capabilities, step up transformer data, and plant and system single line drawings. (Proposal Option B, Attachments A and B)

Based on the ISO's analysis of the information in PWP's proposal regarding proposed black start resource B, as discussed in Section 3.10, the ISO has determined that proposed black start resource B as described in PWP's proposal does not satisfy this requirement in the manner necessary to meet the specific requirements of the RFP. Although the ISO has determined that PWP's proposed black start resource B would be able to energize a dead bus at the generating facility's interconnected voltage level, the studies conducted by the ISO determined that PWP's proposed black start resource B would lack the capability of energizing any of the busses on the 220 kV system serving the Los Angeles basin identified in the technical specification document as key to the restoration of service to the area within system operating voltage limits. Consequently, the ISO finds that PWP's proposal does not satisfy this technical requirement of the RFP. Having made this determination, the ISO did not consider the proposal for PWP's proposed black start resource B in the comparative analysis phase of the competitive solicitation process.

3.10.4 Determination for Sentinel

Sentinel provided information describing the capability of its proposed black start resource to energize a bus on the electric system. (Proposal cover letter; Facility Plant Information lines 4-7, 9-32; Blackstart Unit Information lines 1-22; Responses to CAISO Questions (9/13/21) 1, 3-4, 6-7; Responses to CAISO Questions (10/14/21) 1-2) This information included generating unit capability curves, step up transformer impedance data, single line diagrams, and test results from the generating facility's data and model

validation compliance NERC testing. (Facility Plant Information lines 17-26, 29; Blackstart Unit Information lines 1-22)

Based on the ISO's analysis of the information in Sentinel's proposal, the ISO has determined that the proposed black start resource described in Sentinel's proposal would be capable of energizing one of the busses on the 220 kV system in the Los Angeles basin identified in the technical specification document as key to the restoration of service to the area within system operating voltage limits. In addition, as discussed in Section 3.14 of this report, the ISO has evaluated the steps and associated time required to energize one of the 220 kV busses identified in the technical specification document. Based on this analysis, the ISO has determined that Sentinel's proposed black start resource would be capable of energizing one of the identified busses on the 220 kV system within the required three-hour timeframe and, as discussed in Section 3.4.4, that the resource would meet the real and reactive power requirements necessary to provide start-up power to a potential target unit for use in system restoration. Consequently, the ISO finds that Sentinel's proposal satisfies this technical requirement of the RFP.

3.10.5 Determination for SCE

SCE provided information describing the capability of its proposed black start resource to energize a bus on the electric system. (Proposal overview; (Facility/Plant Information and Blackstart Unit(s) Information bullets 4-7, 9-25, 27-35; response to request for clarifications and additional information 2-5) This information included generating unit capability curves, step up transformer impedance data, single line diagrams, and test results from the generating facility's data and model validation compliance NERC testing. (Facility/Plant Information and Blackstart Unit(s) Information bullets 18, 21, 27-35); response to request for clarifications and additional information 2-5)

Based on the ISO's analysis of the information in SCE's proposal, the ISO has determined that the proposed black start resource described in SCE's proposal would be capable of energizing one of the busses on the 220 kV system in the Los Angeles basin identified in the technical specification document as key to the restoration of service to the area within system operating voltage limits. In addition, as discussed in Section 3.14 of this report, the ISO has evaluated the steps and associated time required to energize one of the 220 kV busses identified in the technical specification document. Based on this analysis, the ISO has determined that SCE's proposed black start resource would be capable of energizing one of the identified busses on the 220 kV system within the required three-hour timeframe and, as discussed in Section 3.4.5, that the resource would meet the real and reactive power requirements necessary to provide start-up power to a potential target unit for use in system restoration. Consequently, the ISO finds that SCE's proposal satisfies this technical requirement of the RFP.

3.11 Technical Requirement: Comply with All Applicable NERC CIP and Reliability Standards as a "Blackstart Resource" (Compliance bullet)

The eighth technical requirement for the RFP is that the prospective black start provider must demonstrate that the proposed black start resource will have the ability to comply with all applicable NERC CIP and other reliability standards as a "Blackstart Resource,"

including but not limited to NERC reliability standards PRC 19-2 and 25-1, EOP 005-3, CIP 008-3, CIP 009-3, and COM-001 and ISO resource testing procedures.

3.11.1 Determination for CHES

CHES asserted that its proposed black start resource would have the ability to comply with all applicable NERC CIP and other reliability standards as a “Blackstart Resource.” (Compliance 28)

Based on the ISO’s analysis of the information in CHES’s proposal, the ISO has determined that CHES would have the ability to comply with all applicable NERC CIP and other reliability standards for operating a “Blackstart Resource.” Consequently, the ISO finds that CHES’s proposal satisfies this technical requirement of the RFP.

3.11.2 Determination for PWP Proposed Black Start Resource A

PWP provided information describing its intent to develop its proposed black start resource A to comply with all applicable NERC CIP and other reliability standards as a “Blackstart Resource.” (Facility/Unit Information 56)

Based on the ISO’s analysis of the information in PWP’s proposal regarding its proposed black start resource A, the ISO has determined that PWP would have the ability to comply with all applicable NERC CIP and other reliability standards for operating a “Blackstart Resource.” Consequently, the ISO finds that PWP’s proposal for its proposed black start resource A satisfies this technical requirement of the RFP.

3.11.3 Determination for PWP Proposed Black Start Resource B

PWP provided information describing its intent to develop its proposed black start resource B to comply with all applicable NERC CIP and other reliability standards as a “Blackstart Resource.” (Proposal Option B)

Based on the ISO’s analysis of the information in PWP’s proposals regarding its proposed black start resource B, the ISO has determined that PWP would have the ability to comply with all applicable NERC CIP and other reliability standards for operating a “Blackstart Resource.” Consequently, the ISO finds that PWP’s proposal for its proposed black start resource B satisfies this technical requirement of the RFP.

3.11.4 Determination for Sentinel

Sentinel provided information describing the ability of its proposed black start resource to comply with all applicable NERC CIP and reliability standards as a “Blackstart Resource.” (Sentinel BESS Statement of Compliance; EPS MOD-025-2 report; CTG 5 Model Verification Report; EPS relay review) Sentinel provided records of its compliance with specific NERC reliability standards. (Sentinel BESS Statement of Compliance; EPS MOD-025-2 report; CTG 5 Model Verification Report; EPS relay review)

Based on the ISO’s analysis of the information in Sentinel’s proposal, the ISO has determined that Sentinel, pursuant to its registration with NERC as a generating unit owner and operator, has had the obligation to comply with all applicable NERC CIP and

other reliability standards and would have the necessary experience to comply with the specific NERC CIP requirements and other reliability standards for operating a “Blackstart Resource.” Consequently, the ISO finds that Sentinel’s proposal satisfies this technical requirement of the RFP.

3.11.5 Determination for SCE

SCE provided information describing the ability of its proposed black start resource to comply with all applicable NERC CIP and other reliability standards as a “Blackstart Resource.” (Compliance) SCE noted that its proposed black start resource is currently a WECC registered entity and complies with all applicable NERC and WECC standards. (Compliance)

Based on the ISO’s analysis of the information in SCE’s proposal, the ISO has determined that SCE, pursuant to its registration with NERC as a generating unit owner and operator, has had the obligation to comply with all applicable NERC CIP and other reliability standards and that therefore SCE would have the necessary experience to comply with the specific NERC CIP requirements and other reliability standards for operating a “Blackstart Resource.” Consequently, the ISO finds that SCE’s proposal satisfies this technical requirement of the RFP.

3.12 Determination of Capability to Satisfy Technical Requirements

Based on the foregoing analysis, the ISO has determined that the proposals for Sentinel’s proposed black start resource and SCE’s proposed black start resource satisfy all of the technical requirements established by the ISO to ensure that the proposed black start resources would be capable of providing the black start capability identified by the ISO as needed to enhance the system restoration plan in the Los Angeles basin.

Based on the foregoing analysis, the ISO has determined that the proposals for CHES’s proposed black start resource and PWP’s proposed black start resources A and B do not satisfy all of the technical requirements established by the ISO to ensure that the proposed black start resources would be capable of providing the black start capability identified by the ISO as needed to enhance the system restoration plan in the Los Angeles basin. As discussed in Section 3.4.1, the ISO has determined that CHES’s proposal to provide black start capability from its proposed black start resource does not satisfy the requirement that it meet the NERC definition of a “Blackstart Resource” in that its proposed black start resource lacks the capability of supplying real and reactive power that meets the transmission operator’s restoration plan needs. In particular, CHES’s proposed black start resource would lack the capability of supplying start-up power to a potential target unit for use in system restoration. As discussed in Section 3.4.2, the ISO has determined that PWP’s proposal to provide black start capability from its proposed black start resource A does not satisfy the requirement that it meet the NERC definition of a “Blackstart Resource” in that its proposed black start resource lacks the capability of supplying real and reactive power that meets the transmission operator’s restoration plan needs. In particular, PWP’s proposed black start resource A would lack the capability of supplying start-up power to a potential target unit for use in system restoration. As discussed in Sections 3.4.3 and 3.10.3, the ISO has determined that PWP’s proposal to provide black start capability from its proposed black start

resource B does not satisfy either the requirement that it meet the NERC definition of a “Blackstart Resource” or the requirement that it be capable of energizing a bus on the 220 kV system serving the Los Angeles basin identified in the technical specification document as key to the restoration of service to the area within system operating voltage limits. As discussed in Section 3.4.3, PWP’s proposed black start resource B lacks the capability of supplying real and reactive power that meets the transmission operator’s restoration plan needs. In particular, PWP’s proposed black start resource B would lack the capability of supplying start-up power to a potential target unit for use in system restoration. As discussed in Section 3.10.3, PWP’s proposed black start resource B would lack the capability of energizing any of the busses on the 220 kV system serving the Los Angeles basin identified in the technical specification document as key to the restoration of service to the area within system operating voltage limits. Consequently, the ISO did not evaluate the proposals for these proposed black start resources in its comparative analysis in selecting the proposed black start resources to provide the identified black start capability to enhance the system restoration plan in the Los Angeles basin.

Pursuant to the foregoing determinations, the ISO has conducted its comparative analysis for the RFP of the proposals for the following proposed black start resources:

Sentinel’s proposed black start resource
SCE’s proposed black start resource

3.13 Selection Factors for Comparative Analysis for Competitive Procurement Process

After determining which proposals satisfied the technical requirements of the RFP, the ISO then evaluated the remaining two technically qualifying proposals based on a comparative analysis of the merits of each proposal with regard to the selection factors set forth in the technical specification document for the RFP. In selecting the black start providers and proposed black start resources to provide black start capability to enhance the system restoration plan in the Los Angeles basin pursuant to this comparative analysis, the ISO has evaluated the proposals with regard to the specified selection factors as part of its comprehensive, holistic review of all factors and elements of the prospective black start providers’ proposals.

3.14 Selection Factor: Calculated Time to Energize the 220 kV Substation Loop and Reach a Potential Target Unit within the Los Angeles Basin

(Facility/Plant Information and Blackstart Unit(s) Information bullets 4, 6-17, 19-27)

The first selection factor is the calculated time for the proposed black start resource to energize the 220 kV substation loop and reach a potential target unit within the Los Angeles basin.

3.14.1 Information Provided by Sentinel

Sentinel provided information relating to the time by which its proposed black start resource could energize one of the busses on the 220 kV system in the Los Angeles

basin identified in the technical specification document as key to the restoration of service to the area within system operating voltage limits and information demonstrating that it could reach a potential target unit. (Proposal cover letter; Facility Plant Information lines 4-7, 9-32; Blackstart Unit Information lines 1-22; Responses to CAISO Questions (9/13/21) 1, 3-4, 6-7; Responses to CAISO Questions (10/14/21) 1-2) Sentinel provided information regarding the location, interconnecting substation, start-up time, and time to close to a dead bus for its proposed black start resource and whether it is a manned facility. (Proposal cover letter; Facility Plant Information lines 3-7, 15, 27, 29-31; Responses to CAISO Questions (9/13/21) 3) Sentinel provided its proposed black start resource's start-up time, indicated that the facility is a manned facility, and provided a summary of the steps necessary to energize a dead transmission bus following a system wide outage. (Proposal cover letter; Facility Plant Information lines 15, 24, 30-31) Sentinel also provided voltage and impedance data, power flow models, and dynamic modeling for stability studies for its proposed black start resource. (Proposal cover letter; Blackstart Unit Information lines 1-22)

3.14.2 Information Provided by SCE

SCE provided information relating to the time by which its proposed black start resource could energize one of the busses on the 220 kV system in the Los Angeles basin identified in the technical specification document as key to the restoration of service to the area within system operating voltage limits and information demonstrating that it could reach a potential target unit. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 4-7, 9-25, 27-35; response to request for clarifications and additional information 2-5) SCE provided information regarding the location, interconnecting substation, start-up time, and time to close to a dead bus for its proposed black start resource and whether it is a manned facility. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 3-7, 12, 14-17, 19, 21-23) SCE provided its proposed black start resource's start-up time, indicated that the facility is a manned facility, and provided a summary of the steps necessary to energize a dead transmission bus following a system wide outage. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 12, 14-18, 22-23) SCE also provided voltage and impedance data, power flow models, and dynamic modeling for stability studies for its proposed black start resource. (Facility/Plant Information and Blackstart Unit(s) Information bullets 27-35)

3.14.3 ISO Comparative Analysis

For purposes of the comparative analysis for this factor, the ISO has considered the representations by SCE and Sentinel relating to the time by which each of their proposed black start resources could energize one of the identified busses on the 220 kV system in the Los Angeles basin within system operating voltage limits. Both of the proposed black start resources in the analysis are manned facilities, so the ISO does not anticipate that either of the proposed black start resources would have an advantage in that regard. According to their proposals, Sentinel's proposed black start resource would require the least amount of time for startup, and SCE's proposed black start resource would require somewhat longer for startup.

The ISO also utilized the interconnecting substation information provided in the proposals to determine the number of breaker operations required to energize one of the 220 kV busses identified in the technical specification document as key to the restoration

of service to the area. Each operation was assumed to take a set amount of time. In this way, the ISO was able to determine an anticipated restoration time. The ISO's analysis of the number of breaker operations necessary to reach one of the identified busses on the 220 kV system in the Los Angeles basin has determined that SCE's proposed black start resource would require the fewest breaker operations, and Sentinel's proposed black start resource would require one additional breaker operation.

The ISO also considered the time for Sentinel's and SCE's proposed black start resources to reach a potential target unit. The ISO determined that there is no material difference between Sentinel's and SCE's proposed black start resources regarding this consideration.

Weighing the foregoing considerations, the ISO has concluded that the slightly quicker startup time for Sentinel's proposed black start resource would provide it a slight advantage over the fewer breaker operations for SCE's proposed black start resource with regard to the time to energize one of the identified busses on the 220 kV system serving the Los Angeles basin. Consequently, based on the foregoing considerations and information, in conjunction with all the other considerations included in the ISO's analysis for this factor, the ISO has determined that Sentinel's proposed black start resource has a slight advantage over SCE's proposed black start resource with regard to this factor.

3.15 Selection Factor: Technical Ability to Meet Restoration Requirements

(Facility/Plant Information and Blackstart Unit(s) Information bullets 3-4, 6-17, 19-27)

The second selection factor is the technical ability of the proposed black start resource to meet system restoration requirements, which are described in the technical specification document as including start-up time, MVARs, MW, ramps, permits, etc. (note that the ISO also considers the restoration requirements to include frequency and voltage regulation requirements). The ISO considers this factor to include an evaluation of steady state voltage regulation capabilities within system operating voltage limits at the closest identified 220 kV substation as determined by ISO studies of the proposed black start resources' reactive power capabilities. In addition, the ISO reviewed and considered operational studies and technical analysis supplied by the applicable participating transmission owner.

3.15.1 Information Provided by Sentinel

Sentinel provided detailed information relating to the technical ability of its proposed black start resource to meet system restoration requirements, including reactive and real power capability, frequency and voltage regulation capability, impedance data, ramping capability, and single line diagrams. (Proposal cover letter; Facility Plant Information lines 3-7, 9-32; Blackstart Unit Information lines 1-22; Responses to CAISO Questions (9/13/21) 1, 3-4, 6-7; Responses to CAISO Questions (10/14/21) 1-2) Sentinel particularly provided voltage and impedance data, resource reactive and real power capabilities, power flow models, and dynamic modeling for stability studies for its proposed black start resource, as well as a description of the control system and protective relaying modifications to support black start operation, and a description of how the individual generating units that would comprise its proposed black start resource

would function with the other individual generating units in its generating facility to enhance its ability to meet system restoration. (Proposal cover letter; Facility Plant Information lines 16-28; Blackstart Unit Information lines 1-22)

3.15.2 Information Provided by SCE

SCE provided detailed information relating to the technical ability of its proposed black start resource to meet system restoration requirements, including reactive and real power capability, frequency and voltage regulation capability, impedance data, ramping capability, and single line diagrams. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 3-7, 9-25, 27-35; response to request for clarifications and additional information 2-5) SCE particularly provided voltage and impedance data, resource reactive and real power capabilities, power flow models, and dynamic modeling for stability studies for its proposed black start resource, as well as a description of the control system and protective relaying modifications to support black start operation. (Facility/Plant Information and Blackstart Unit(s) Information bullets 13-20, 27-35)

3.15.3 ISO Comparative Analysis

For purposes of the comparative analysis for this factor, the ISO has considered the representations by SCE and Sentinel relating to the technical ability of their individual generating units that would comprise their proposed black start resources to meet system restoration requirements, including reactive and real power capability, frequency and voltage regulation capability, ramping capability, single line diagrams, power flow models, and dynamic modeling for stability studies. The ISO's analysis has concluded that both of the proposed black start resources meet the voltage control and other technical capabilities to restore the electric system serving the Los Angeles basin successfully. However, system studies supplied by the applicable participating transmission owner and considered by the ISO in its analysis indicated that the individual generating units comprising Sentinel's proposed black start resource would have slightly less reactive power capability than the individual generating units comprising SCE's proposed black start resource. The ISO has determined that the slightly greater reactive power capability associated with SCE's proposed individual generating units gives SCE's proposed individual black start resource a slight advantage over Sentinel's proposed individual black start resource with regard to their technical ability to meet system restoration requirements.

Based on the foregoing considerations and information, in conjunction with all the other considerations included in the ISO's analysis for this factor, the ISO has determined that SCE's proposed black start resource has a slight advantage over Sentinel's proposed black start resource with regard to this factor.

3.16 Selection Factor: Restoration Flexibility

(Facility/Plant Information and Blackstart Unit(s) Information bullets 3-4, 6-17, 19-27)

The third selection factor is system restoration flexibility, described in the technical specification document as including resource location that provides ISO or SCE operations multiple options to restore the 220 kV system and proximity to other generating facilities. In considering this factor as applied to the proposals for the

proposed black start resources, the ISO has based its analysis for this factor on path diversity associated with restoring the 220 kV system, proximity to other generating facilities and stabilizing load, and any other benefits or limitations with regard to system restoration flexibility.

3.16.1 Information Provided by Sentinel

Sentinel provided location and plant operation information for its proposed black start resource, as well as additional generating facility capabilities and start up times and a description of how the individual generating units that would comprise its proposed black start resource would function with the other individual combustion turbine generating units in its generating facility to enhance its ability to provide system restoration flexibility. (Proposal cover letter; Facility Plant Information lines 3-7, 9-32; Blackstart Unit Information lines 1-22; Responses to CAISO Questions (9/13/21) 1, 3-4, 6-7; Responses to CAISO Questions (10/14/21) 1-2)

3.16.2 Information Provided by SCE

SCE provided location and plant operation information for its proposed black start resource, as well as additional generating facility capabilities and start-up times. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 3-7, 9-25, 27-35; response to request for clarifications and additional information 2-5)

3.16.3 ISO Comparative Analysis

For purposes of the comparative analysis for this factor, the ISO has considered the information provided by SCE and Sentinel regarding the flexibility of each proposed black start resource based on its location to provide operations multiple options to restore the 220 kV system. The ISO has also considered the proximity of each proposed black start resource to other generating facilities and stabilizing load, as well as any other benefits or limitations with regard to system restoration flexibility, along with bulk electric system information, to determine each proposed black start resource's potential contribution to system restoration flexibility.

The ISO's analysis has determined that SCE's proposed black start resource and Sentinel's proposed black start resource each interconnect with a substation with several transmission lines connecting into it, providing multiple potential options for restoration of the 220 kV system. While SCE's proposed black start resource interconnects with a substation with fewer transmission lines connecting into it than Sentinel's proposed black start resource, both SCE's and Sentinel's proposed black start resources provide significant restoration flexibility.

With regard to proximity to other generating facilities, the ISO's analysis has determined that both SCE's proposed black start resource and Sentinel's proposed black start resource are in close proximity to other generating facilities in the Los Angeles basin. The ISO has concluded that there is no material difference between the proposed black start resources of Sentinel and SCE with regard to this consideration.

Related to the matter of proximity of stabilizing load required for system restoration, the ISO's analysis also considered the proximity of the proposed black start resources to stabilizing load centers. The ISO's analysis has determined that there is no material

difference between the proposed black start resources of Sentinel and SCE with regard to their proximity to load centers.

The ISO's analysis also took into account any other benefits or limitations of each proposed black start resource with regard to system restoration flexibility. The ISO concluded that Sentinel's proposed black start resource would be in a better position than SCE's proposed black start resource to start service restoration because Sentinel's black start system can quickly bring on additional real and reactive power capabilities and has the ability to share isochronous control among multiple generating units at the proposed black start resource, while SCE's proposed black start resource lacks this capability.

Based on the foregoing considerations and information, in conjunction with all the other considerations included in the ISO's analysis for this factor, the ISO has determined that Sentinel's proposed black start resource has a slight advantage over SCE's proposed black start resource with regard to this factor.

3.17 Selection Factor: Locational Diversity of Resource

(Facility/Plant Information and Blackstart Unit(s) Information bullets 3-4, 14-15)

The fourth selection factor is the locational diversity of the resource, which is described in the technical specification document as including its location with respect to other black start resources in the area. As discussed in Section 3.17.3, the ISO has determined to select only a single black start resources in this solicitation to enhance the system restoration plan in the Los Angeles basin, and this factor compares the locational diversity of the two technically qualifying resources in relation to other black start resources in the Los Angeles basin.

3.17.1 Information Provided by Sentinel

Sentinel provided information regarding the location of its proposed black start resource. (Proposal cover letter; Facility Plant Information lines 3-7)

3.17.2 Information Provided by SCE

SCE provided information regarding the location of its proposed black start resource. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 3-7, 16)

3.17.3 ISO Comparative Analysis

The ISO has determined that the two technically qualifying resources do not provide sufficient locational diversity from each other to justify selecting more than one of them in this solicitation and that it will procure in this solicitation only a single black start resource as needed for system restoration.

In performing the comparative analysis for this factor for this solicitation, the ISO has considered the location of the two technically qualifying proposed black start resources in relation to each other with regard to their ability to impact system restoration. SCE's proposed black start resource and Sentinel's proposed black start resource are both geographically and electrically located sufficiently close to each other that they do not

provide any materially different system restoration benefits due to their proximity to each other.

Based on the foregoing considerations and information, in conjunction with all the other considerations included in the ISO's analysis for this factor, the ISO has determined that there is no material difference between the proposals for SCE's proposed black start resource and Sentinel's proposed black start resource with regard to this factor.

3.18 Selection Factor: Resource Viability over Five to Ten Year Horizon

(Commercial Worksheet/Questionnaire 1-5)

The fifth selection factor is the viability of the proposed black start resource over a five to ten year horizon. The ISO considers this factor to relate primarily to the existence of a power purchase agreement and any other agreements providing a source of revenue for the proposed black start resource for that five to ten year period that would be the potential term of the black start agreement.

3.18.1 Information Provided by Sentinel

Sentinel provided information regarding the contracts currently in place for its proposed black start resource. (Commercial Worksheet/Questionnaire 1) Sentinel also described its proposed capital improvements and schedule for converting its generating facility into a black start resource. (Proposal cover letter; Commercial Worksheet/Questionnaire 2-4)

Sentinel indicated that it has multiple commercial agreements, including a power purchase agreement and a resource adequacy agreement, for its proposed black start resource. These contracts extend only partially through the potential ten-year term of the black start agreement. (Commercial worksheet/questionnaire 1)

3.18.2 Information Provided by SCE

SCE provided information regarding the contracts currently in place for its proposed black start resource. (Commercial Worksheet/Questionnaire 1) SCE indicated that proposed black start resource is utility owned and expected to be in operation through the proposed term of the black start agreement. (Commercial Worksheet/Questionnaire 1) SCE also described its proposed capital improvements and schedule for converting its generating facility into a black start resource. (Commercial Worksheet/Questionnaire 2-4)

3.18.3 ISO Comparative Analysis

The ISO considers this factor to relate primarily to the existence of a power purchase agreement and any other agreements providing a source of revenue for the proposed black start resource for the potential five to ten year term of the black start agreement. The ISO has determined that both SCE's and Sentinel's proposed black start resources have costs and schedules that should permit either of them to complete the term of its black start agreement so long as it finds it economical to do so. However, the ISO has determined that SCE's utility ownership of its proposed black start resource makes it slightly more likely that it would complete the term of its black start agreement than

Sentinel's proposed black start resource's reliance on power purchase and other commercial agreements- as the source of the viability of its proposed black start resource.

Based on the information provided by SCE and Sentinel, the ISO has concluded that there is a slightly greater likelihood that SCE would complete the potential five to ten year term of a black start agreement for its proposed black start resource than would be the case for Sentinel for its proposed black start resource. Based on the foregoing considerations and information, in conjunction with all the other considerations included in the ISO's analysis for this factor, the ISO has determined that, for this particular factor, SCE's proposal has a slight advantage over Sentinel's proposal..

3.19 Selection Factor: Cost of Service Financials (Commercial Worksheet/Questionnaire 3-13)

The sixth selection factor is the projected cost of service financials for the proposal.

3.19.1 Information Provided by Sentinel

Sentinel provided information regarding its proposed capital costs, operations and maintenance costs, capital structure, return on equity, and projected total revenue requirement for its addition of black start capability to its proposed black start resource. (Commercial Worksheet/Questionnaire 3-13; Responses to CAISO Questions (9/13/21) 2, 5, 10; Responses to CAISO Questions (11/3/21)) Sentinel also proposed a limited cost cap to its proposed capital costs, subject to specified conditions. (Commercial Worksheet/Questionnaire 7-10; Responses to CAISO Questions (9/13/21) 10)

3.19.2 Information Provided by SCE

SCE provided information regarding its proposed capital costs, operations and maintenance costs, capital structure, return on equity, and projected total revenue requirement for its addition of black start capability to its proposed black start resource. (Commercial Worksheet/Questionnaire 3-13) SCE also proposed a limited cost cap on capital and total project expenditures, subject to specified conditions. (Commercial Worksheet/Questionnaire 7-10; response to request for clarifications and additional information 11)

3.19.3 ISO Comparative Analysis

For purposes of the comparative analysis for this factor, the ISO has considered the representations by SCE and Sentinel regarding the proposed capital costs, operations and maintenance costs, capital structure, return on equity, and projected total revenue requirements for their proposed black start resources. In conducting the analysis, the ISO focused its comparison particularly on the projected total revenue requirement for each proposed black start resource. The ISO's analysis determined that that the projected revenue requirement for Sentinel's proposed black start resource is less than the projected revenue requirement for SCE's proposed black start resource.

Based on the foregoing information and considerations, in conjunction with all the other considerations included in the ISO's analysis for this factor, the ISO has determined that

the proposal of Sentinel for its proposed black start resource has an advantage over the proposal of SCE for its proposed black start resource with regard to this factor.

3.20 Selection Factor: Any Other Strengths and Advantages the Proposal May Have to Provide the Specific Black Start Capability, as well as Any Specific Efficiencies or Benefits Demonstrated in the Proposal

(Facility/Plant Information and Blackstart Unit(s) Information bullets 5, 11-18; Commercial Worksheet/Questionnaire 2-4; responses to request for clarifications and additional information)

The seventh selection factor is any other strengths and advantages the proposal may have to provide the specific black start capability, as well as any specific efficiencies or benefits demonstrated in the proposal. The ISO considered the following information regarding the proposed black start resources in its comparative analysis for this factor: the in-service date for the black start capability from the generating facility, age of the generating facility, reliability data for the generating facility, and specific generating facility dynamics, including the generating facility's maximum generating capability.

3.20.1 Information Provided by Sentinel

Sentinel provided information regarding its proposed in-service date for its addition of black start capability to its proposed black start resource. (Proposal cover letter, Exhibit B Detailed Project Description and Exhibit C Schedule; Commercial Worksheet/Questionnaire 2-4) Sentinel indicated that its proposed in-service date for black start capability from its proposed black start resource would be approximately October 2, 2023. (Proposal cover letter, Exhibit B Detailed Project Description and Exhibit C Schedule; Commercial Worksheet/Questionnaire 3-4)

Sentinel provided start reliability and availability data for its proposed black start resources, as well as the age and power capabilities of its generating facility. (Proposal cover letter; Facility Plant Information lines 8, 20-21, 33; Responses to CAISO Questions (9/13/21) 9) Sentinel indicated that the generating facility for its proposed black start resource s approximately eight years old and has a total facility output capability of greater than 600 MW. (Proposal cover letter; Facility Plant Information lines 8, 20-21) Sentinel provided reliability data indicating that the generating facility for its proposed black start resource had an average equivalent availability factor (EAF) of greater than 97% during its first six years of operations and had a start reliability of greater than 99%. (Facility Plant Information line 33; Responses to CAISO Questions (9/13/21) 9)

Sentinel provided generating facility operating data, noting that the proposed black start system has been designed to allow all of the generating units at the facility to be available to provide real and reactive power to the system within a three-hour period. In addition, Sentinel indicated that the proposed black start system has been designed such that any of the generating units can black start and that all of the generating units can operate in isochronous mode, noting that multiple units are capable of operating in isochronous load share mode. (Proposal cover letter; Facility Plant Information lines 17-32; Responses to CAISO Questions (10/14/21) 1-2)

3.20.2 Information Provided by SCE

SCE provided information regarding its proposed in-service date for its addition of black start capability from its proposed black start resource. (Commercial Worksheet/Questionnaire 4, 12-13) SCE indicated that its proposed in-service date for black start capability from its proposed black start resource would be approximately July 1, 2024. (Commercial Worksheet/Questionnaire 4, 12-13)

SCE provided start reliability and availability data for its proposed black start resource, as well as the age and power capabilities of its generating facility. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 8, 18, 26) SCE indicated that the generating facility for its proposed black start resource is approximately 16 years old and has a total facility output of greater than 600 MW. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 8, 18) SCE provided reliability data for 15 years of operations indicating that the generating facility for its proposed black start resource had a start reliability of greater than 99% and an average equivalent availability factor (EAF) of greater than 90.4%. (Facility/Plant Information and Blackstart Unit(s) Information bullet 26)

SCE provided generating facility operating data, noting that the proposed black start resource would be available to provide additional real and reactive power, up to the facility's rating, within 6-10 hours. (Proposal overview; Facility/Plant Information and Blackstart Unit(s) Information bullets 14-25; response to request for clarifications and additional information 2-5)

3.20.3 ISO Comparative Analysis

For purposes of the comparative analysis for this factor, the ISO has reviewed the additional information included in the proposals of SCE and Sentinel to determine if there are other advantages provided by the proposals that were not addressed in other parts of the selection process. The ISO considers the in-service date, age, output capability, past reliability, and overall isochronous control capabilities of the generating facilities for the proposed black start resources to be potentially significant when evaluating the timing, reliability, longevity, and system restoration capabilities of the generating facilities proposed to provide black start to enhance the system restoration plan in the Los Angeles basin. However, the ISO has not included these considerations in the analysis of the other selection factors and has determined to evaluate them with regard to this factor.

Regarding the in-service date for the black start capability from the generating facilities, the ISO has considered the representations by SCE and Sentinel regarding their schedules for the commencement of availability of black start capability from their black start resources. The ISO has determined that the proposed schedules are reasonable and feasible. Based on the projection that the schedule for Sentinel's proposed black start resource would result in the availability of black start capability earlier than the availability for SCE's proposed black start resource, the ISO has determined that Sentinel's proposal for its proposed black start resource has a slight advantage over SCE's proposal for its proposed black start resource with regard to this consideration.

Regarding the age of the generating facilities, the ISO has determined that the relatively newer age of the generating facility for Sentinel's proposed black start resource provides

Sentinel's proposed black start resource a slight advantage over SCE's proposed black start resource with regard to this consideration.

Regarding the output capability of the generating facilities, the ISO has determined that both Sentinel's and SCE's generating facilities have significant additional output capability to aid in the restoration process. However, the ISO has determined that Sentinel's generating facility would be able to provide the complete plant capacity much quicker than SCE's generating facility and that the isochronous load sharing capabilities of Sentinel's proposed black start resource would provide additional benefits in the restoration process. Consequently, the ISO has determined that Sentinel's generating facility for its proposed black start resource provides a slight advantage over SCE's generating facility for its proposed black start resource with regard to this consideration.

Regarding the past reliability of the generating facilities, the ISO has determined that both Sentinel's and SCE's generating facilities have had a start reliability greater than 99% and that the greater average equivalent availability factor (EAF) of Sentinel's proposed black start resource provides a slight advantage over SCE's proposed black start resource. Based on this analysis, the ISO has determined that Sentinel's proposed black start resource has a very slight advantage over SCE's proposed black start resource with regard to this consideration.

Based on the foregoing considerations and information, in conjunction with all the other considerations included in the ISO's analysis for this factor, the ISO has determined that Sentinel's proposal for its proposed black start resource has a slight advantage over the proposal from SCE for its proposed black start resource with regard to this factor.

3.21 ISO Overall Comparative Analysis for Selection of Black Start Resources to Enhance the System Restoration Plan in the Los Angeles Basin

As discussed above, the ISO has conducted this competitive solicitation because, based on its consideration of the timelines associated with the ISO's and utilities' system restoration plans, black start resources are needed to enhance the system restoration plan in the Los Angeles basin. The ISO has conducted this competitive solicitation pursuant to ISO tariff authority to contract for black start capability. The ISO issued an RFP and received proposals from CHES, PWP, SCE, and Sentinel for the provision of black start capability to enhance the system restoration plan in the Los Angeles basin from five different proposed black start resources. The proposals that the ISO reviewed were detailed and well-supported. The ISO first undertook an analysis to determine whether each proposal for the provision of black start capability would satisfy the technical requirements set forth in the technical specification document posted on the ISO website in order to determine which of the proposals the ISO would consider in the comparative analysis regarding the selection factors to provide the black start capability to enhance the system restoration plan in the Los Angeles basin. In the ISO's analysis of the ability of the proposals for each of the proposed black start resources to satisfy the technical requirements of the RFP, the ISO determined that the proposals for the proposed black start resources of CHES and PWP do not satisfy one of the technical requirements and therefore could not be considered in the comparative analysis with regard to the selection factors.

The ISO then conducted a comparative analysis of the merits of the two technically qualifying proposals with regard to the selection factors set forth in the technical specification document for the RFP. In selecting the black start service provider and proposed black start resource to provide black start capability to enhance the system restoration plan in the Los Angeles basin pursuant to this comparative analysis, the ISO has evaluated the technically qualifying proposals with regard to the specified selection factors as part of its comprehensive, holistic review of all factors and elements of the prospective black start providers' proposals. While conducting the comparative analysis, the ISO had to make detailed distinctions between the technically qualifying black start proposals submitted by SCE and Sentinel in order to determine the selected proposal.

Sentinel's proposal has an advantage over SCE's proposal with regard to more selection factors. In fact, as discussed in Sections 3.14-3.20, Sentinel's proposal has an advantage over SCE's proposal or there is no material difference between the two proposals with regard to every selection factor with the exception of two. Sentinel's individual generating units comprising Sentinel's proposed black start resource would have slightly less reactive power capability, as discussed in Section 3.15, and Sentinel is slightly less likely to complete the five to ten year term of the black start agreement, as discussed in Section 3.18. On the other hand, Sentinel's proposed black start resource has an advantage over SCE's proposed black start resource with regard to cost (Section 3.19) and a slight advantage with regard to three others. Sentinel's proposal has a slight advantage with regard to time to energize the system (Section 3.14), flexibility to restore the system (Section 3.16), and other potential benefits of the proposals, including that the schedule for Sentinel's proposed black start resource would result in the availability of black start capability earlier than the availability for SCE's proposed black start resource, as discussed in Section 3.20. There is no material difference between the two proposals with regard to locational diversity (Section 3.17). The ISO has concluded that the slightly lesser reactive power and slightly lesser likelihood of completion of the term of the black start agreement of Sentinel's proposal are outweighed by the other advantages that Sentinel's proposal has over SCE's proposal.

For the foregoing reasons, the ISO has determined that Sentinel, with regard to its proposed black start resource, has provided the best proposal to provide black start capability to enhance the system restoration plan in the Los Angeles basin. Sentinel's proposal has an advantage over the other technically qualifying proposal, SCE's proposal, with regard to more selection factors. Based on the ISO's review of the proposals and a comparative analysis with regard to all of the selection factors, the ISO has determined that Sentinel's proposal is better than SCE's proposal with regard to this competitive solicitation process and the particular need for black start capability to enhance the system restoration plan in the Los Angeles basin. The result of this competitive solicitation process is that the ISO has selected Sentinel, with regard to its proposed black start resource, to enter into a black start agreement with the ISO to provide black start capability to enhance the system restoration plan in the Los Angeles basin.

Attachment 1

Los Angeles Basin Black Start Technical Variables and Criteria

SCE BLACKSTART TECHNICAL VARIABLES and CRITERIA

Geographic Area of Consideration

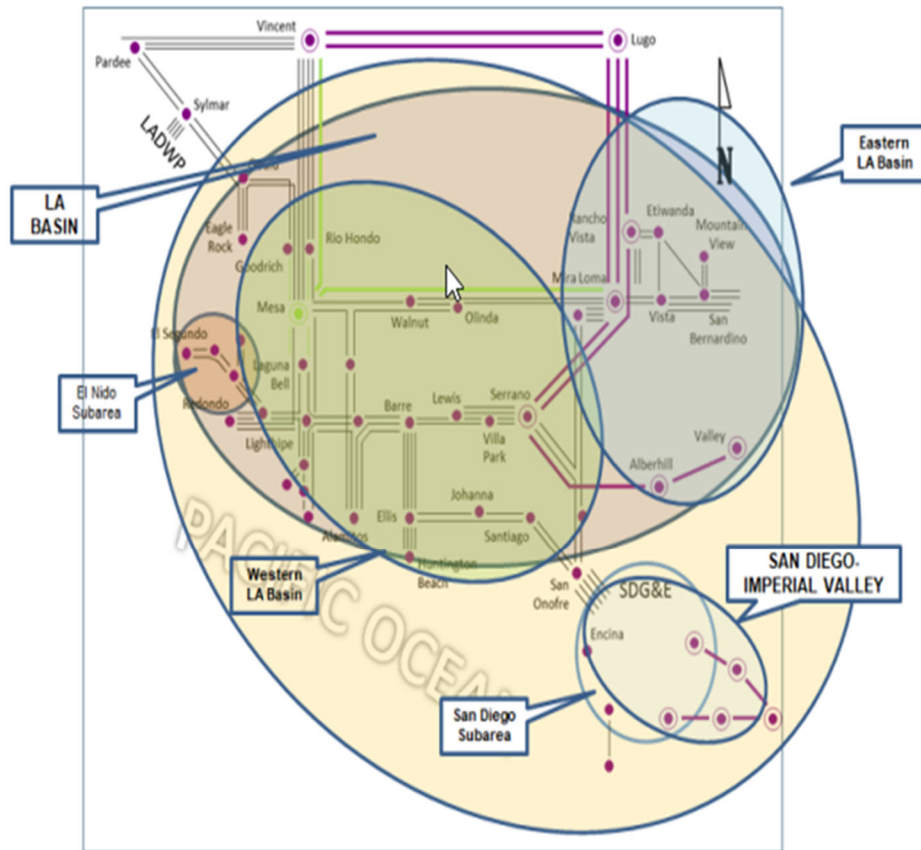
Upon the loss of AC power to the Los Angeles Basin or LA Basin, the potential black start resource must support the restoration of the 220kV transmission system supporting the LA Basin. The LA Basin includes a significant footprint of SCE's service territory. This area includes Los Angeles, Orange County, and portion of San Bernardino and Riverside counties. Overall the LA Basin consists approximately 80 percent of SCE's total loads. The area is divided into major two sub areas: Western and Eastern LA Basin. The El Nido sub area is a smaller sub area partially in the Western LA Basin sub area.

- o The Western LA Basin sub area includes cities in Los Angeles and Orange counties. Some of the major cities are Pasadena, Monterey Park, San Gabriel, Walnut, Long Beach, Huntington Beach, Anaheim, Santa Ana, Garden Grove, and Irvine. It is noted that that City of Los Angeles is included in the Los Angeles Department of Water & Power's service territory and is not part of the CAISO-Balancing Authority footprint. The El Nido sub area is a smaller sub area partially in the Western LA Basin sub area. This sub area includes the cities of Redondo Beach, Commerce, El Segundo and Culver City.

- o The Eastern LA Basin sub area includes cities in the very eastern side of Los Angeles county and in the San Bernardino and Riverside counties. Some of the major cities are Pomona, Riverside, Ontario, Chino, Fontana, Redlands, Rancho Cucamonga, Redlands, Montclair, San Bernardino, Palm Springs, and Temecula.

LA Basin LCR Area Diagram

Figure 3.3-87 LA Basin LCR Area



The 220kV transmission system in the LA Basin Area consists of the substations defined in the CAISO's Local Capacity Requirements (LCR) Technical Study. The list of included facilities can be found on page 123 of the report (<http://www.aiso.com/Documents/Final2021LocalCapacityTechnicalReport.pdf>)

- Generating resources that are not located within the defined geographic area may submit a proposal provided that they show that they can meet the technical requirements of energizing a bus and establishing an island in the LA Basin 220kV system as defined in the CAISO LCR report.

Selection Factors and Evaluation Criteria

- Calculated time to energize 220kV substation loop and reach a potential target unit within the LA Basin
- Technical ability to meet restoration requirements (start-up time, MVARs, MW, ramps, permits, etc)
- Restoration flexibility (resource location that provides CAISO or SCE operations multiple options to restore the 220kV system, proximity to other generators.)
- Locational diversity of resource (location with respect to other black start resources in the area)
- Resource viability over 5 to 10 year horizon

- Cost of Service financials
- Other

Blackstart Unit Requirements

- Must satisfy the NERC definition of Blackstart Resource¹⁸
- Must be able to supply own startup power.
- Must serve own plant load.
- Ability to meet fault impedance requirements of the restoration path. Generator protection relays should be flexible to assume temporary setting changes required to provide adequate protection during anticipated blackstart system configurations. This could be accommodated, but is not limited to, by utilizing microprocessor based protective relays with multiple group setting capability.
- Follows the CAISO planned outage procedure

ADDITIONAL OPERATIONAL REQUIREMENTS:

- Ability to meet minimum continuous running time for unit - 48 hours
- Ability to energize a dead transmission bus within targeted timeframe: 3 hours

Facility/Plant Information

- Name
- Owner
- Location / Address
- Interconnection point
 - Terminal Voltage Level
 - Voltage Level of Interconnecting substation
 - Interconnecting Substation
- Age
- Type (e.g. hydro, combined-cycle, combustion turbine, etc.)
- Inoperable Regions
 - Operational Deadbands
 - Configuration limitations (i.e. unit configurations 1x0, 2x1, etc.)
 - Other operational limitations

¹⁸ Glossary of Terms Used in NERC Reliability Standards: http://www.nerc.com/files/glossary_of_terms.pdf

Blackstart Resource: A generating unit(s) and its associated set of equipment which has the ability to be started without support from the System or is designed to remain energized without connection to the remainder of the System, with the ability to energize a bus, meeting the Transmission Operator's restoration plan needs for Real and Reactive Power capability, frequency and voltage control, and that has been included in the Transmission Operator's restoration plan.



- What, if any, are the current emission restrictions under system emergency conditions?
- Is this a manned facility (24x7)(Y/N)? If not, what are remote capabilities?
- Minimum start-up power
- Indicate for each unit
 - Identification
 - Pmins (stabilizing loads)
 - Pmax
 - Do Pmaxs vary on length of time without AC power? If so, what are they?
 - Reactive capabilities (a MVAR capability curve and a table including up to 8 MW points (if possible) with associated minimum and maximum MVAR points. Include the maximum sustained leading and lagging capability and any anticipated operational restrictions to the MVAR capability curve (MOD-025 compliance report or equal)).
 - Start-up time (hot and cold trip)
 - Fuel Type and supply source
 - MW/min ramp capability
- How long can facility operate at full speed no load?
- How will the generator transition from isochronous control to speed droop control at the end of the black start event?
- Please provide a one-line diagram for the facility including all associated auxiliary loads, and transmission and distribution level equipment.
- The steps that the plant would follow immediately following a full black out to start the Black Start Unit, close to a dead bus, and any anticipated GO/TO coordination for load pickup. The description should reference the submitted one-line diagram.
- Indicate the anticipated time to close to a dead bus, and the time to ramp to minimum load.
- Provide a detailed load list, startup sequence of operations, running load calculations and detailed resource requirements used to determine the proposed sizing of the black start resource energy source (diesel or gas reciprocating engine, BESS, etc.). Load data should be based on actual verified load information available facility data (OSI Pi, etc.). Provide calculations based on a worst case scenario following a facility hot trip, considering a minimum of 3 start attempts. All sizing calculations shall include the assumptions and basis for any oversizing of the identified black start resource energy source.
- Provide facility and individual specific generator reliability and availability information (GADS or equal)

Blackstart Unit(s) Information

- Number of black start units in the Facility/Plant
- Identification
 - Of the identified black start unit(s), do any parameters for facility/plant information change in black start mode?



California ISO

- Droop Capability
 - Does the unit need to be off-loaded in order to change droop setting (to zero, from zero)?
- Droop setting change via SCADA or manual operation?
- Terminal voltage range (i.e. +/- 5% nominal?)
- Generator impedance data (pu) (include base quantities) (Later must supply Test Report)(Protection Studies)
 - X''_d
 - X'_d
 - X_d
 - X_2
 - X_0
- GSU transformer impedance(pu) (include base quantities):
 - X_1
 - X_0
- GSU tap settings
- Tie-line impedance
- Must provide steady study models for power flow studies in PSLF format
- Must provide dynamic model for stability studies in PSLF format

Compliance

- Demonstrate the ability to comply with all applicable NERC CIP and Reliability Standards as a Blackstart Resource (including but not limited to PRC 19-2, 25-1, EOP 005-2, CIP008-2, 3, COM-001 and CAISO Resource Testing Guidelines.)

Attachment 2

Black Start Resource Commercial Worksheet/Questionnaire

Black Start Resource
Commercial Worksheet/Questionnaire

Existing Facility information:

1. Provide details on existing contracts including interconnection agreements and any contracts to provide energy, capacity, etc. Include the term of the agreement and summary of the services or products being provided.

Description of Contract	Term or expiration date

2. If upgrades are required, briefly describe the modifications necessary to convert the facility to be black start capable.

Capital Costs:

3. Are capital improvements to your facility required? If so, please provide the associated capital costs, in 2021 dollars. Please provide assumptions for the capital expenditure estimates (e.g. design assumptions, manpower requirements, work schedule, planned outages needed, etc.)



Description of Expenditure	Cost in \$2021
Engineering, Procurement, and Construction Cost	
Development Cost	
Owner's Costs	
Consultant Fees	
Regulatory Fees	
Other	
Project Contingency	
Taxes	
Property tax	
Other taxes	
Financing costs (AFUDC)	
Total Capital Costs	

Assumptions:

4. Provide a schedule for Black Start service implementation and testing. Anticipated date of initial performance testing?
5. What are other expenditures over and above the capital expenditures, if any?

Proposed Facility Capital Structure:

6. What is your proposed Debt to Equity ratio on capital expenditures?

Proposed Debit/Equity Ratio =

7. Please indicate if you are proposing a cap on the Debt to Equity ratio and what that cap will be.
8. Please provide the pre-tax percentage total Return on Equity (ROE) that you intend to seek from FERC.

Proposed Pre-Tax Return on Equity (ROE) =

9. Please indicate whether you are proposing a cap on capital expenditures and the size of the cap. Please indicate whether you are proposing a cap on total project expenditures and the size of cap.



- a. Please provide, in year of occurrence dollars and present year dollars, proposed cap on capital expenditures, if applicable.

- b. Please provide, in year of occurrence dollars and present year dollars, proposed cap on total project expenditures, if applicable.

- c. Please indicate if all costs prior to the commencement date are included. If not, please explain.

- 10. Please indicate whether you are proposing a cap on ROE and / or debt cost. Please describe any conditions under which the ROE and / or debt cap would not apply.

- 11. Please explain your depreciation strategy for both book and tax over the life of the proposed project.

O&M Costs:

12. Please provide, in year-of-occurrence dollars, estimated operation and maintenance(O&M) expenses and estimated Administrative and General (A&G) expenses, by year and by FERC account, for all such expenses. Please include training, testing and compliance costs.

Description (FERC Acct. code)	Operating Costs (O&M, A&G, training, Compliance, testing, etc.)				
	2022	2023	2024	2025	2026

13. Please provide, in year-of-occurrence and present year dollars, the estimated annual revenue requirement each year from commercial operation through the end of the term of the contract for both a 5 year and 10-year contract term.
14. Please indicate who will be performing the maintenance, testing and verification services for the Black Start resource.