Technical Assessment II Addendum

GENERATION INTERCONNECTION

[redacted]

UPDATED BISHOP SPS

REPORT

SOUTHERN CALIFORNIA EDISON®

An *EDISON INTERNATIONAL®* Company

NOVEMBER 6, 2013

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EXECUTIVE SUMMARY

[redacted] submitted an interconnection request to the Southern California Edison Company ("SCE") for the interconnection of its [redacted] pursuant to the Cluster Large Generator Interconnection Procedures ("CLGIP") under the SCE Wholesale Distribution Access Tariff ("WDAT") as part of the East of Lugo Transition Cluster under both Phase I and Phase II. [redacted] proposed to locate their [redacted] in Mammoth Lakes, California [redacted] proposes to deliver energy and/or ancillary services to the CAISO Controlled Grid at the existing SCE Control 115 kV Substation. The originally requested commercial operating date for the [redacted] was October 1, 2011, but this date was changed to December 31, 2013 at the request of [redacted]

Upgrades identified to support projects located in North of Kramer were defined in the completed Phase II study. Since the completion of the Phase II Study, all Transition Cluster projects located north of SCE's Kramer Substation, with the exception [redacted] have since withdrawn their interconnection request. Subsequently, it has been determined that the some upgrades identified in the Transition Cluster Phase II Study would not all be necessary for the interconnection of [redacted] only. Consequently, a Technical Assessment was performed to identify the facility upgrades needed to support [redacted] only, as well as [redacted] together with the earlier-queued [redacted] (CAISO Queue #58) project.

SCE completed two Technical Assessment Studies (TAS) which evaluated the adequacy of SCE's electric system, including that portion of SCE's electrical system that is part of the CAISO controlled grid, to accommodate the proposed [redacted] generation facility. The results of the technical assessments were utilized to redefine the appropriate facilities required to interconnect [redacted] as stipulated in the August 25, 2011 Letter Agreement. The findings were delivered to the Customer and discussed at the Results Meeting on June 22, 2012.

At the Results Meeting, the Interconnection Customer requested SCE explore more economical alternatives to some of the telecommunication upgrades cited in TAS II. This Addendum provides a preliminary scope and cost estimates for utilizing a power line carrier (PLC) communication option together with the additional upgrades necessary to safely and reliably interconnec [redacted] for both Energy Only and Full Delivery interconnections. However, as SCE was in the process of evaluating the PLC communications option, SCE became aware of possible technical limitations of the PLC communication technology, limitations that might render this option unviable for the application contemplated in this TAS II Addendum. In order to definitively determine whether the PLC option will be viable for this application, SCE is required to perform a "Modal Analysis". The Modal Analysis will be required to vet the feasibility of this option, and the additional scope and cost of this Modal Analysis is included in the cost summary table below.

Additionally, the Interconnection Customer requested SCE advise if a material modification would exist if the project capacity were reduced to: 35MW net, and 30MW net. SCE evaluated this request and concluded that there was no material modification . However, SCE found that the previously identified upgrades would still be needed as defined below for Energy Only interconnection status as well as what SCE anticipates be required Full Delivery interconnection status. The Deliverability Network Upgrades will be determined in the ISO's Deliverability Assessment.

Based on the study results, the existing SCE transmission facilities are not adequate to serve [redacted] without facility upgrades. The scope of the facility upgrades required to provide for the reliable interconnection of [redacted] under **Energy Only interconnection** status includes the following:

- Interconnection Facilities for this project include associated substation, telecommunications, environmental and licensing for a new 33kV circuit to interconnect WDT315.
- Upgrade existing Inyo phase-shift transformer with a new a phase-shift transformer with larger angle and thermal capabilities and associated protection requirements
- Install new communication system, using PLC where applicable, and protection requirements to add [redacted] to the existing Bishop SPS consistent with WECC RAS Task Force requirements, which include completely redundant and diverse telecommunication facilities
- Modify the existing Bishop SPS logic design to include [redacted] in order to mitigate thermal overload and stability problems aggravated by the project which are currently mitigated with the existing special protection system
- As an alternative to building approximately 51 miles of diverse and redundant telecommunications from Control Substation to Casa Diablo Substation, install a local tripping scheme to trip [redacted] at the request of [redacted] for:
  - The loss of communications between Control-Inyokern
  - The loss of communications between Control-Casa Diablo
  - When the Bishop RAS Operates
- Expand the existing Bishop SPS logic design and install the necessary new communication system, using PLC were applicable, and protection requirements in order to mitigate additional thermal overload and stability problems regardless of the status of the Inyo Phase Shift Transformer for the following outages:
  - Loss of Control-Inyo 115 kV line
  - Loss of Inyo 115 kV Phase-Shift transformer or Inyo 115/220 kV A-Bank serving LADWP

The non-binding costs to interconnect [redacted] under this Energy Only interconnection are:

Interconnection Facilities	$8,210,000	
Network Upgrades (Customer)[1]	$18,941,000	
Network Upgrades (SCE)[2]	$15,929,000	
Modal Analysis Study[3]	???	
Distribution Upgrades[4]	$286,000	including ITCC[5]
Total:	**$43,367,000**	

[1] Customer Responsibility (Upgraded needed for Energy Only Interconnection): The additions, modifications, and upgrades to the CAISO Controlled Grid required at or beyond the Point of Interconnection to accommodate the interconnection of the Generating Facility to the CAISO Controlled Grid. Network Upgrades shall consist of Delivery Network Upgrades and Reliability Network Upgrades.

[2] SCE Responsibility (SPS related work): The additions, modifications, and upgrades to the CAISO Controlled Grid required at or beyond the Pointof Interconnection to accommodate the interconnection of the Generating Facility to the CAISO Controlled Grid. Network Upgrades shall consist of Delivery Network Upgrades and Reliability Network Upgrades.

[3] Modal Analysis is a mathematical tool used to determine PLC performance.

[4] These upgrades are not part of the CAISO tariff and are not reimbursable

[5] Income Tax Component of Contribution.

The non-binding construction schedule to engineer and construct the facilities may be up to 96 months following execution the signing of the Cluster Large Generator Interconnection Agreement (CLGIA). The estimated time to construct is for a typical project; schedule duration may change due to the number of projects approved and their respective release dates. Stacked projects impact resources, system outage availability, and environmental windows of construction. The assumption is SCE will need to obtain CPUC licensing and regulatory approvals prior to design, procurement and construction of the proposed facilities required to serve the interconnection customer and prerequisite facilities are in service.

The incremental scope of facility upgrades SCE anticipates would be required to provide for the reliable interconnection of [redacted] under **Full Capacity Deliverability interconnection status**, assuming [redacted] and CAISO Queue #58 are both in-service, includes the following:

- Install a new Control-Inyokern 115 kV line, approximately 125 miles of 954 SAC conductor on double-circuit 115 kV structures with one side strung
- Expand the existing Bishop SPS logic design and install the necessary new communication system, using PLC where applicable, and protection requirements in order to mitigate additional thermal overload and stability problems caused by the following outages:
  - Loss of Kramer-Inyokern-Randsburg No.1 115 kV line
  - Loss of Kramer-Inyokern-Randsburg No.3 115 kV line
  - Loss of new Control-Inyokern 115 kV line
  - Loss of both new Control-Inyokern 115 kV line with the existing Control-Haiwee-Inyokern No.1 or No.2 115 kV lines
  - Loss of both Kramer-Inyokern-Randsburg No.1 and No.3 115 kV lines

The incremental non-binding costs to interconnect [redacted] under this Full Delivery interconnection are:

SPS-South of Inyokern related expansion/modification[6]	$7,265,000
Control-Inyokern No.3 115 kV T/L	$169,033,000
Associated Substation & Telecommunications Work	$28,416,000
Modal Analysis Study[7]	$???
EH&S, Real Properties, & Licensing	$244,353,000
Network Upgrade Total[8]	**$449,067,000**

The Deliverability Network Upgrades required will be determined in the ISO's Deliverability Assessment. The non-binding construction schedule to engineer and construct the facilities is approximately 96 months following execution the signing of the Cluster Large Generator

[6] Customer Responsibility (SPS related work): The additions, modifications, and upgrades to the CAISO Controlled Grid required at or beyond the Point of Interconnection to accommodate the interconnection of the Generating Facility to the CAISO Controlled Grid. Network Upgrades shall consist of Delivery Network Upgrades and Reliability Network Upgrades.

[7] Modal Analysis is a mathematical tool used to determine PLC performance.

[8] The additions, modifications, and upgrades to the CAISO Controlled Grid required at or beyond the Point of Interconnection to accommodate the interconnection of the Generating Facility to the CAISO Controlled Grid. Network Upgrades shall consist of Delivery Network Upgrades and Reliability Network Upgrades.

Interconnection Agreement (CLGIA). The estimated time to construct is for a typical project; schedule duration may change due to the number of projects approved and their respective release dates. Stacked projects impact resources, system outage availability, and environmental windows of construction. An underlying assumption for this 96-month construction schedule is that SCE will need to obtain CPUC licensing and regulatory approvals prior to design, procurement and construction of the proposed facilities required to serve the interconnection customer and prerequisite facilities are in service. [redacted] will be required to operate in accordance with the requirements in SCE's Interconnection Handbook to maintain voltage and power factor requirements. Also, the Project will be subjected to all other applicable SCE rules, and Federal Energy Regulatory Commission (FERC) approved rules, tariffs, and regulations. SCE has concerns regarding the magnitude of the estimated costs for the Delivery Network Upgrades in comparison to the additional transmission capacity that would be provided by these upgrades. Because these upgrades do not appear to be cost effective, SCE believes that the licensing and permitting of the Delivery Network Upgrades may prove challenging.

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FIGURES

[redacted]

TECHNICAL ASSESSMENT 2 – ADDENDUM

I. PROJECT INTERCONNECTION IMPACTS TO ENERGY ONLY STATUS

Serial and Transition Cluster projects located within the North of Kramer Subarea identified the need for further expansion of the existing Bishop SPS. Such expansion will add the Serial ([redacted] and the Transition Cluster Phase II (WDT315 project) as participants in this SPS as means to mitigate overloads, transient instability, and localized system voltage collapse following several single and simultaneous outages of 115 kV transmission lines around the Control Substation area.

For Energy Only status, SCE's TAS completed on November 23, 2011 indicated the existing SCE transmission facilities are not adequate to accommodate the [redacted] without facility upgrades. The study determined that the Inyo phase-shift transformer be upgraded to provide for additional phase-shift capability and [redacted] be added as a participant to the Bishop SPS. The inclusion of [redacted] in the Bishop SPS is required to address thermal overload and transient instability problems under outage conditions.

Without an upgrade to the existing Inyo phase shift transformer, the study determined that [redacted] could be subject to curtailment of up to 33 MW with an expected curtailment exposure of approximately 52 percent of the year to mitigate the overload of the Inyo phase-shift transformer. Increasing the phase-shift angle capability would allow for additional power flow push back, thereby reducing the peak curtailment from 33 MW down to 5 MW (i.e., increasing the angle could allow for an additional 28 MW of push back). With the inclusion of both [redacted] n the Energy Only scenario, [redacted] would be subject to both increased curtailment and curtailment exposure.

The need for the Inyo Phase Shift Transformer Upgrade was originally triggered by [redacted] As requested, SCE assessed the system with and withou [redacted] and deemed that the phase shift transformer upgrade is required to mitigate thermal overloads on the existing phase shift transformer with the addition of [redacted] by itself or together with [redacted]

[redacted] could elect to advance their interconnection, under an Energy Only or Full Capacity Deliverability scenario, by assuming the upgrades currently triggered by and allocated to queued ahead project CAISO Queue#58. The following upgrades are necessary to support an **Energy Only Interconnection**:

The following are the **Interconnection Facilities** identified for the [redacted] Project:

- Distribution: WDT315 33 kV Generation Line
  - Install parallel runs of 1500JCN and pole mounted 33 kV primary metering (PTs, CTs, and metering cabinet).
- Substation: Casa Diablo Substation
  - Equip a new 33 kV position to terminate the WDT315 33 kV line.

  The Interconnection Facilities will be installed as follows:
  - 33 kV U.G. cables inside 100' duct bank between Position 9 to the substation perimeter fence.
  - Protection relays:
    - Two SEL-311C
    - One SEL-311C with setting group selector switch
- Telecommunications
  - Install channel and associated equipment supporting SCADA for WDT315 line.
- Environmental Health and Safety
  - Perform all required activities related to support the SCE portion of the WDT315 line.
- Licensing
  - Perform all required activities related to support the SCE portion of the WDT315 line.
- Real Properties
  - Perform all required activities related to support the SCE portion of the WDT315 line.
- Metering Services Organization
  - *Install Revenue Meters required to meter the Retail load at the Generating Facility.*
- Power System Control
  - Install one RTU at the Generating Facility to monitor the typical Generation elements such as MW, MVAR, terminal Voltage and Circuit Breaker Status at each Generating Unit and the Plant Auxiliary Load and transmit this information to the SCE Grid Control Center.
- Upgrade two existing obsolete RTUs at Casa Diablo 33 kV Substation.

- Replace existing Inyo 115 kV phase-shift transformer and also install a hybrid circuit breaker to isolate the 115 kV phase-shift transformer from the 115/220 kV A-Bank transformer

- Expand existing Bishop SPS logic design and installation of necessary communication system, using PLC where applicable, and protection equipment

The operating date of the Control to Inyokern Corridor upgrades is currently unknown. In order to safely interconnect Control Area projects, the Bishop SPS would require extensive modification involving redundant telecommunications. If a PLC alternative was utilized as a second path for WECC required redundancy, the following facilities would be required:

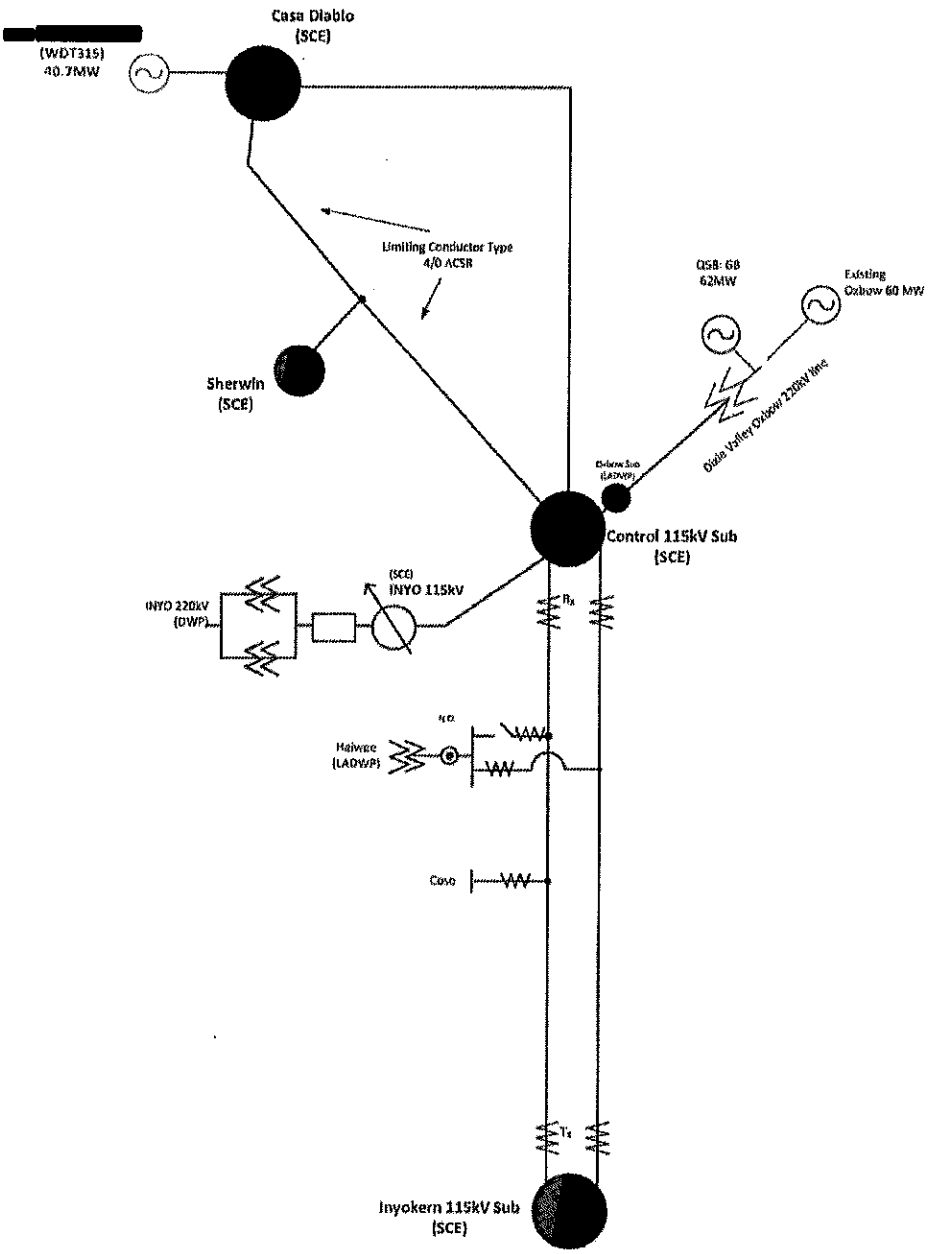
- **Install wave traps at the following stations:**
  - **Control Substation**
    Install wave traps at the Control terminal of the Control-Coso-Haiwee-Inyokern and Control-Haiwee-Inyokern 115 kV lines
  - **Coso Substation**
    Install wave traps at the Coso terminal of the Control-Coso-Haiwee-Inyokern 115kV and Control-Haiwee-Inyokern 115 kV lines
  - **Haiwee Substation**[9]
    Install wave traps at the Haiwee terminal of the Control-Coso-Haiwee-Inyokern 115kV and Control-Haiwee-Inyokern 115 kV lines. Note, that such wave traps will require acquiring property outside of LADWP's Haiwee Substation
  - **Inyokern Substation**
    Install wave traps at the Inyokern terminal of the Control-Coso-Haiwee-Inyokern 115kV and Control-Haiwee-Inyokern 115 kV lines
- **Install relays at the following substations:**
  - **Control Substation**
    Install additional protection relays
  - **Inyokern Substation**
    Install additional protection relays
- **Install transfer trip scheme for WDT315:**
  Install a transfer trip scheme to trip [redacted] Plant [redacted] for any of the following contingencies:

  Automatic Local Tripping of the CD4 Project:
  - Loss of communication on any or all of the Control-Coso-Haiwee-Inyokern 115 kV or Control-Haiwee-Inyokern 115 kV line, or Control-Casa Diablo telecommunication circuits with a 1 sec delay
  - Loss of any or all of the Control-Coso-Haiwee-Inyokern 115kV or Control-Haiwee-Inyokern 115 kV line with a 1 sec delay
  - Protection relays are needed at SCE's Casa Diablo 115kV Substation

Figure 1 provides a diagram of the facilities needed for the Energy Only Interconnection.

[9] **It is assumed that SCE would be able to install a wave trap at Haiwee Substation. Haiwee Substation is owned and operated by LADWP. SCE does not at this time have an agreement in place with LADWP to install a wave trap at Haiwee Substation. This wave trap solution will be infeasible if SCE cannot install a wave trap at Haiwee Substation.**

Figure 1
Energy Only Interconnection



Regarding the PLC, SCE would recommend a Modal Analysis be done to ascertain if a PLC with wave trap solution would be technically sufficient due to signal degradation concerns over the long distance between Control Substation and Inyokern Substation, which is approximately 125 miles.Unfortunately, SCE could not find a consultant that would provide a scope and cost of this Modal Analysis. The obsolecense of this technology rendered this option unfeasible.

In addition, any project that requests to interconnect to the Dixie-Valley Oxbow 220 kV Transmission Line, will be required to obtain the proper rights and permissions from the owner(s)

of the Line for SCE to open the tie serving the Dixie-Valley Oxbow 220 kV Line under abnormal system conditions exacerbated with the inclusion of the project in order to maintain system reliability. Should the project fail to secure necessary permissions for this action, it will be necessary for the project to build diverse communication paths from their project site to SCE's Control Substation so that an SPS can be developed that specifically trips this project without opening the Line.

II. PROJECT INTERCONNECTION IMPACTS TO FULL CAPACITY DELIVERABILITY STATUS

With the inclusion of [redacted], the study results show that without facility upgrades, the existing system is insufficient to provide for the requested Full Capacity Deliverability status. The following incremental scope of facility upgrades SCE anticipates will be required to provide for the reliable interconnection of [redacted] under **Full Capacity Deliverability interconnection status**, assuming [redacted] and CAISO Queue #58 are both in-service, includes the following:

- Install a new Control-Inyokern 115 kV line, approximately 125 miles of 954 SAC conductor on double-circuit 115 kV structures with one side strung.

- Expand the existing Bishop SPS logic design and install the necessary new communication system, using PLC where applicable, and protection requirements in order to mitigate additional thermal overload and stability problems caused by the following outages:
    - Loss of Kramer-Inyokern-Randsburg No.1 115 kV line
    - Loss of Kramer-Inyokern-Randsburg No.3 115 kV line
    - Loss of new Control-Inyokern 115 kV line
    - Loss of both new Control-Inyokern 115 kV line with the existing Control-Haiwee-Inyokern No.1 or No.2 115 kV lines
    - Loss of both Kramer-Inyokern-Randsburg No.1 and No.3 115 kV lines

  The operating date of the Control to Inyokern Corridor upgrades is currently unknown. In order to safely interconnect Control Area projects, the Bishop SPS would require extensive modification involving redundant telecommunications. If a PLC alternative was utilized as a second path for WECC required redundancy, the following facilities in addition to the facilities mentioned for the Full Delivery Interconnection would be required:

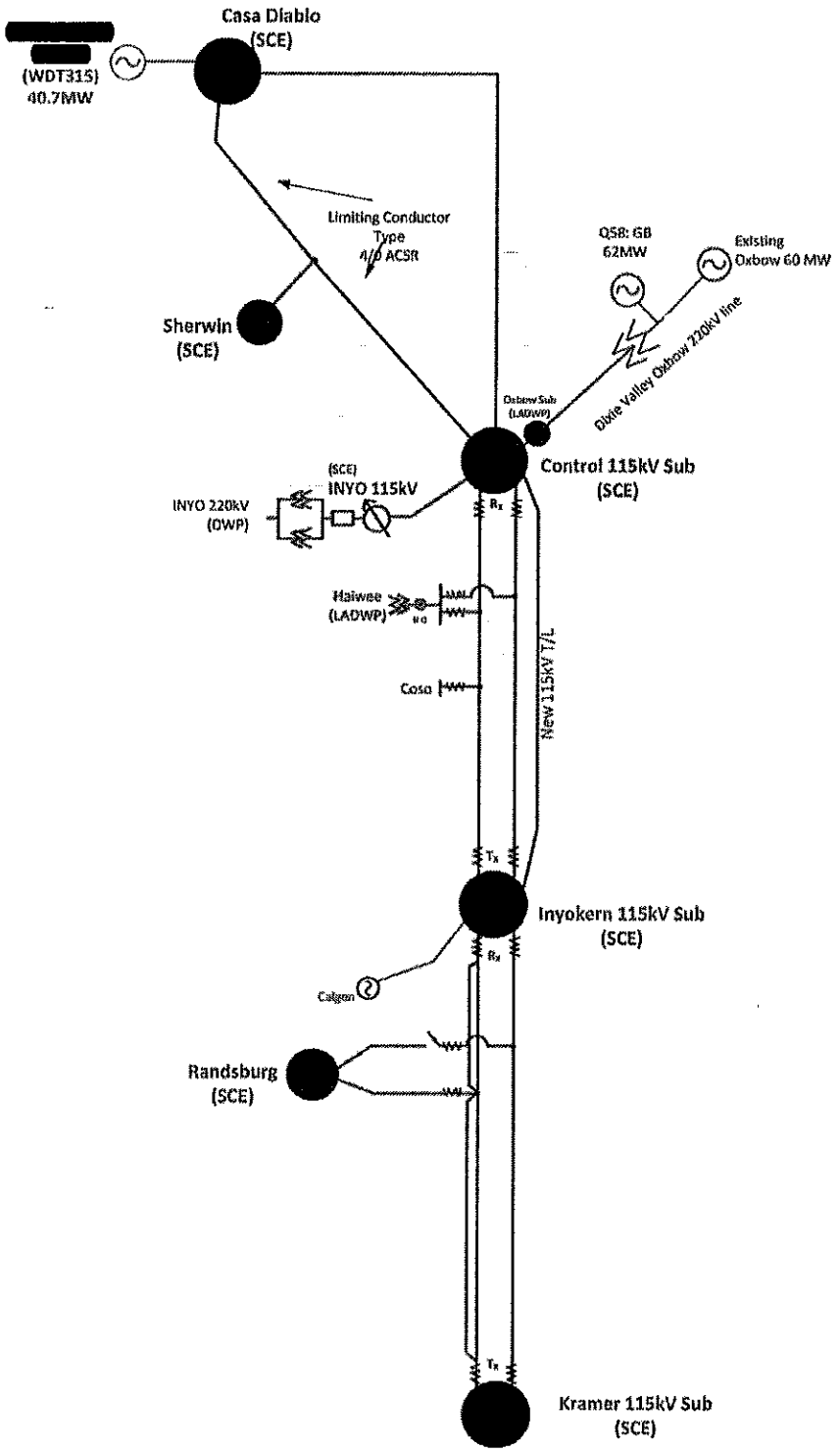
- **Install wave traps at the following stations:**
    - **Inyokern Substation**
      Install wave traps at the Inyokern terminal of the Inyokern-Randsburg-Kramer No.1 115kV and Inyokern-Randsburg-Kramer No.3 115kV lines.
    - **Randsburg Substation**
      Install wave traps at the Randsburg terminal of the Inyokern-Randsburg-Kramer No.1 115kV and Inyokern-Randsburg-Kramer No.3 115kV lines.
    - **Kramer Substation**
      Install wave traps at the Kramer terminal of the Inyokern-Randsburg-Kramer No.1 115kV and Inyokern-Randsburg-Kramer No.3 115kV lines.

- **Install relays at the following substations:**
    - **Inyokern Substation**
      Install additional protection relays
    - **Kramer Substation**
      Install additional protection relays

The required upgrades for Full Capacity Deliverability Interconnection shall be determined in the context of the ISO's Deliverability Assessment.

Figure 2 provides a diagram of the facilities needed for the Full Delivery Interconnection.

Figure 2
Full Deliverability Interconnection



Regarding the PLC, SCE would recommend a Modal Analysis be done to ascertain if a PLC with wave trap solution would be technically sufficient due to signal degradation concerns over the long distance between Control Substation and Inyokern Substation, which is approximately 125 miles.Unfortunately, SCE could not find a consultant that would provide a scope and cost of this Modal Analysis. The obsolecense of this technology rendered this option unfeasible.
In addition, any project that requests to interconnect to the Dixie-Valley Oxbow 220 kV Transmission Line, will be required to obtain the proper rights and permissions from the owner(s) of the Line for SCE to open the tie serving the Dixie-Valley Oxbow 220 kV Line under abnormal system conditions exacerbated with the inclusion of the project in order to maintain system reliability. Should the project fail to secure necessary permissions for this action, it will be necessary for the project to build diverse communication paths from their project site to SCE's Control Substation so that an SPS can be developed that specifically trips this project without opening the Line.

III. CONCLUSIONS

The existing SCE transmission facilities are not adequate to serve [redacted] without facility upgrades. The scope of Facility Upgrades required to provide for the reliable interconnection of [redacted] under **Energy Only interconnection status** includes the following:

- Interconnection Facilities for this project include associated substation, telecommunications, environmental and licensing for a new 33kV circuit to interconnect WDT315.
- Upgrade existing Inyo phase-shift transformer with a new a phase-shift transformer with larger angle and thermal capabilities and associated protection requirements
- Install new communication system, using PLC where applicable, and protection requirements to add the [redacted] to the existing Bishop SPS consistent with WECC RAS Task Force requirements, which include completely redundant and diverse facilities
- Modify the existing Bishop SPS logic design to include the [redacted] in order to mitigate thermal overload and stability problems aggravated by the project which are currently mitigated with the existing special protection system
- As an alternative to building approximately 51 miles of diverse and redundant telecommunications from Control Substation to Casa Diablo Substation, install a local tripping scheme to trip [redacted] at the request of [redacted] for:
    - The loss of communications between Control-Inyokern
    - The loss of communications between Control-Casa Diablo
    - When the Bishop RAS Operates
- Expand the existing Bishop SPS logic design and install the necessary new communication system, using PLC where applicable, and protection requirements in order to mitigate additional thermal overload and stability problems regardless of the status of the Inyo Phase Shift Transformer for the following outages:
    - Loss of Control-Inyo 115 kV line
    - Loss of Inyo 115 kV Phase-Shift transformer or Inyo 115/220 kV A-Bank serving LADWP

The non-binding costs to interconnect [redacted] under this **Energy Only** interconnection are:

Interconnection Facilities	$8,210,000	
Network Upgrades (Customer)[10]	$18,941,000	
Network Upgrades (SCE)[11]	$15,929,000	
Modal Analysis Study[12]	???	
Distribution Upgrades[13]	$286,000	including ITCC[14]
Total:	**$43,367,000**	

The non-binding construction schedule to engineer and construct the facilities may be up to 96 months following execution the signing of the Cluster Large Generator Interconnection Agreement (CLGIA). The estimated time to construct is for a typical project; schedule duration may change due to the number of projects approved and their respective release dates Stacked projects impact resources, system outage availability, and environmental windows of construction. An underlying assumption for this 96-month construction schedule is that SCE will need to obtain CPUC licensing and regulatory approvals prior to design, procurement and construction of the proposed facilities required to serve the interconnection customer and prerequisite facilities are in service.

The Deliverability Network Upgrades will be determined in the ISO's Deliverability Assessment. The incremental non-binding costs expected to interconnect [redacted] under **Full Capacity Deliverability status**, assuming [redacted] are both in-service interconnection, are:

SPS-South of Inyokern related expansion/modification[15]	$7,265,000
Control-Inyokern No.3 115 kV T/L	$169,033,000
Associated Substation & Telecommunications Work	$28,416,000
Modal Analysis Study[16]	???
EH&S, Real Properties, & Licensing	$244,353,000
Network Upgrade Total[17]	**$449,067,000**

[10] Customer Responsibility (Upgraded needed for Energy Only Interconnection): The additions, modifications, and upgrades to the CAISO Controlled Grid required at or beyond the Point of Interconnection to accommodate the interconnection of the Generating Facility to the CAISO Controlled Grid. Network Upgrades shall consist of Delivery Network Upgrades and Reliability Network Upgrades.

[11] SCE Responsibility (SPS related work): The additions, modifications, and upgrades to the CAISO Controlled Grid required at or beyond the Point of Interconnection to accommodate the interconnection of the Generating Facility to the CAISO Controlled Grid. Network Upgrades shall consist of Delivery Network Upgrades and Reliability Network Upgrades.

[12] Modal Analysis is a mathematical tool used to determine PLC performance.

[13] These upgrades are not part of the CAISO tariff and are not reimbursable

[14] Income Tax Component of Contribution.

[15] Customer Responsibility (SPS related work): The additions, modifications, and upgrades to the CAISO Controlled Grid required at or beyond the Point of Interconnection to accommodate the interconnection of the Generating Facility to the CAISO Controlled Grid. Network Upgrades shall consist of Delivery Network Upgrades and Reliability Network Upgrades.

[16] Modal Analysis is a mathematical tool used to determine PLC performance.

[17] The additions, modifications, and upgrades to the CAISO Controlled Grid required at or beyond the Point of Interconnection to accommodate the interconnection of the Generating Facility to the CAISO Controlled Grid. Network Upgrades shall consist of Delivery Network Upgrades and Reliability Network Upgrades.