

## **APPENDIX E: Project Need and Description**

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<b>Name</b>	<b>Moorpark-Pardee 230 kV No. 4 Circuit Project</b>
<b>Brief Description</b>	The project was submitted by SCE and involves stringing a fourth Moorpark-Pardee 230 kV circuit, approximately 26 miles long, on existing structures along with associated substation work at Moorpark and Pardee Substations. SCE anticipates the project will not be subject to a Certificate of Public Convenience and Necessity (CPCN).
<b>Type</b>	Reliability
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1) The project is proposed to address the projected local capacity deficiency in the Moorpark local capacity sub-area due to the announced and expected retirement of more than 2000 MW of gas-fired, mostly once-through-cooled (OTC), local generation.</li> <li>2) Based on the current load forecast, the project will offset the need for approximately 232 MW (NQC) of 318 MW (NQC) of incremental local capacity in the Moorpark sub-area potentially resulting in hundreds of millions in savings. Approximately 86 MW of local capacity need will remain in the Santa Clara sub-area assuming the 43 year old Ellwood Generating Station (54 MW) will be retired.</li> </ol>
<b>Project Need Date</b>	31/12/2020
<b>Expected In-service Date</b>	31/12/2020
<b>Interim Solution</b>	Since the expected in service date meets the need date, interim solutions are not needed.
<b>Project Cost</b>	Approximately \$45 million
<b>Alternatives Considered but Rejected</b>	<p>The following alternatives were considered:</p> <ol style="list-style-type: none"> <li>1) Procuring incremental resources                      This alternative involves procuring approximately 232 MW of incremental local capacity comprised of some combination of preferred resources, storage and renewables based on the results of an RFO. Compared to the proposed project:                     <ul style="list-style-type: none"> <li>• SCE estimates, based on its previous experience, the net cost of this alternative will be \$850 million-\$1 billion higher. The estimate takes into account the benefits (in dollars) of the resources (e.g., energy value, capacity value, etc.).</li> <li>• Due to the highly aggressive schedule, this alternative may require delaying the OTC compliance date for one Ormond Beach unit until the incremental resources are in place</li> <li>• The alternative will not be adequate if additional local generation retires, forecast load increases or the area experiences higher than forecast load.</li> </ul> </li> </ol>

	<ul style="list-style-type: none"> <li>• The alternative increases operational complexity due to the variability, run-time limitation and charging needs associated with a local capacity mix comprised of preferred resources, storage and renewables</li> <li>• The alternative yields poorer resiliency performance for the critical LCR N-1/N-2 contingency due to thermal overloading on the Pardee-Santa Clara 230 kV line but better resiliency performance for other more extreme transmission contingencies such as common corridor outages of all Pardee-Moorepark 230 kV lines or loss of the Pardee Substation due to such events as wildfires, earth quakes, etc.</li> </ul> <p>2) Installing a dynamic reactive power device</p> <p>This alternative involves adding more than 240 MVar of dynamic reactive support. Compared to the proposed project:</p> <ul style="list-style-type: none"> <li>• The cost of the reactive power device is expected to be at least \$30 million higher.</li> <li>• The alternative will not be adequate if additional local generation retires, forecast load increases or the area experiences higher than forecast load.</li> <li>• The alternative yields poorer resiliency performance for the critical LCR N-1/N-2 contingency due to thermal overloading on the Pardee-Santa Clara 230 kV line</li> </ul>
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<b>Name</b>	<b>Otay 69 kV Re-configuration Project</b>
<b>Brief Description</b>	The project was submitted by San Diego Gas & Electric. This project will re-conductor the Otay Tap-San Ysidro and Otay Lake Tap-San Ysidro 69 kV lines.
<b>Type</b>	Reliability
<b>Objectives</b>	This project is designed to address the following thermal overloads. 1) On Otay Tap-San Ysidro 69 kV line under the contingency of Otay Lake Tap-San Ysidro 69 kV line. 2) On Otay Lake Tap-San Ysidro line under the contingency of Otay Tap-San Ysidro 69 kV line.
<b>Project Need Date</b>	01/01/2019
<b>Expected In-service Date</b>	06/01/2020
<b>Interim Solution</b>	Operators can drop up to 5 MW of load at the San Ysidro substation.
<b>Project Cost</b>	\$6.5-8.4 million
<b>Alternatives Considered but Rejected</b>	The following alternatives to the Otay 69 kV Re-configuration Project were considered:  1) Install preferred resources at the San Ysidro 69 kV substation This alternative involves installing two sets of two-hour battery with 5 MW of capacity at the San Ysidro 69 kV substation to mitigate the thermal overloads on the Otay Tap-San Ysidro and Otay Lake Tap-San Ysidro 69 kV lines. The estimated cost is about \$13 million. Since the alternative option of installing preferred resources is more expensive than the re-conductor option, the ISO recommends the re-conductor option to maintain the reliability of the 69 kV network in the San Ysidro area.

<b>Name</b>	<b>Suncrest 500/230 kV Transformers Rating Increase</b>
<b>Brief Description</b>	SDG&E confirmed that new 30-minute emergency ratings on the two banks could be developed by upgrading the size of the conductors connecting the transformers to the bus facilities.
<b>Type</b>	Reliability
<b>Objectives</b>	In this planning cycle, the ISO confirmed previously identified thermal overload concerns on the Suncrest banks for category P6 contingencies. The purpose of this project is to mitigate those concerns.
<b>Project Need Date</b>	06/01/2018
<b>Expected In-service Date</b>	06/01/2018
<b>Interim Solution</b>	N/A
<b>Project Cost</b>	Approximately \$1 million
<b>Alternatives Considered but Rejected</b>	A remedial action scheme was considered, but given the low cost of increasing the facility rating, the facility rating increase is the recommended project.

<b>Name</b>	<b>IID's S-line 230 kV double circuit steel tower construction project</b>
<b>Brief Description</b>	The ISO and IID examined upgrades to IID's existing S-line as a mitigation to existing S-Line thermal constraints. The project would consist of the ISO - through a participating transmission owner – funding the upgrade of the existing wood pole line to 230 kV double circuit steel tower construction, and the necessary upgrades to termination equipment.
<b>Type</b>	Economic-driven
<b>Objectives</b>	<p>The project is proposed to providing economic benefits to the ISO by alleviating limitations on the use of the ISO system caused by parallel flows (loop flows) identified in previous planning study results, reducing local capacity needs materially in the combined San Diego - Imperial Valley areas as well as reducing market congestion on the ISO system - which totaled \$6 million in 2015 and 2016.</p> <p>Summing the production simulation benefits of \$40 million to the low end of the capacity benefits \$111.3 million yields total benefits of \$151.3 million. The conservatively high cost estimate is approximately \$50 million, which translates to revenue requirement of \$72.5 million. The benefit to cost ratio is approximately 2.08</p>
<b>Project Need Date</b>	The economic benefits of the project will accrue as soon as the project goes into service.
<b>Expected In-service Date</b>	12/31/2021
<b>Interim Solution</b>	An operating procedure and nomogram will continue to be used to limit flows on the North Gila-Imperial Valley 500 kV line and the S-line.
<b>Project Cost</b>	Approximately \$50 million
<b>Alternatives Considered but Rejected</b>	<p>The ISO has qualitatively considered other alternatives to this upgrade in the past. These have included flow controllers such as back-to-back HVDC converters, or phase shifting transformers, as well as the much broader-scoped Renewable Energy Express project proposed in this planning cycle.</p> <p>The upgrade to the 230 kV S-Line is considered to be the lowest cost and least complex solution. It also provides a basis for future opportunities for cost savings and access to potential renewable resources in the near term with the least dependence on continuous coordination of operation and control with neighboring systems, and the least risk of under-sizing the project for future needs.</p> <p>Accordingly, the S-Line upgrade has been found to be needed as an economic-driven project.</p>

<b>Name</b>	<b>Bob SS – Mead S 230 kV line rating upgrade project</b>
<b>Brief Description</b>	The Bob SS to Mead S 230 kV line is an inter-tie between ISO's VEA system and the WAPA system. The proposed project is to reconnector the line to increase the rating of Bob SS to Mead S 230 kV line to 700 MVA~800 MVA.
<b>Type</b>	Economic-driven
<b>Objectives</b>	<p>The project is proposed to providing economic benefits to the ISO by alleviating congestion on Bob SS – Mead S 230 kV line identified in the current and previous planning study results, and reducing potential renewable curtailment.</p> <p>The ISO's economic planning study in the 2017~2018 planning cycle showed that the upgrade can result in an annual production benefit of approximately \$13.10 million. The present value of this savings over the 40 year life of the project at a 7% discount rate is approximately \$180 million. The capital cost of the upgrade is approximately \$25 million as estimated in the study request submitted by GridLiance. The present value of the annualized revenue requirement is approximately \$37 million. The benefit to cost ratio is approximately 4.86.</p>
<b>Project Need Date</b>	12/31/2020
<b>Expected In-service Date</b>	12/31/2020
<b>Interim Solution</b>	An interim solution is not needed.
<b>Project Cost</b>	Approximately \$25 million
<b>Alternatives Considered but Rejected</b>	<p>No other alternatives were proposed or considered.</p> <p>The proposed project provides a low risk of under-sizing the line for future need and has a high benefit to cost ratio.</p>



<b>Name</b>	<b>South Bay – Moss Landing enhancements</b>
<b>Brief Description</b>	The South Bay-Moss Landing enhancements comprising of the San Jose-Trimble 115 kV series reactor and the Moss Landing–Panoche 230 kV Path Upgrade.
<b>Type</b>	Economic-driven
<b>Objectives</b>	The project is proposed to providing economic benefit of reducing LCR requirement for the South Bay-Moss Lannding sub-area, which is a part of the Greater Bay Area. The two economic-driven projects comprising the South Bay-Moss Landing enhancements, having a combined capital cost of \$14 million and local capacity reduction benefit of over 400 MW for the South Bay-Moss Landing sub-area, which is a part of the Greater Bay Area local capacity requirement (LCR) area.
<b>Project Need Date</b>	1/1/2018
<b>Expected In-service Date</b>	5/31/2019
<b>Interim Solution</b>	In the event that the project is not in-service by the expected in-service date, operational action plans during abnormal operating conditions can be implemented as a temporary mitigation plan to mitigate the overloads in the interim until the series reactor is in-service
<b>Project Cost</b>	Approximately \$14 million
<b>Alternatives Considered but Rejected</b>	No other alternatives were proposed or considered.  The proposed project provides low risk of under-sizing the line for future need and has high benefit to cost ratio.

<b>Name</b>	<b>Lakeville 60 kV Area Reinforcement</b>
<b>Brief Description</b>	<ul style="list-style-type: none"> <li>• Reconductor the line sections on the Lakeville #2 60 kV Line between Petaluma A to Lakeville Junction (tower 4/100) and Cotati to tower 11/236 (approx. 3.39 miles) with 397.5 AAC</li> <li>• Upgrade the capacity of the Petaluma A bus conductor with at least a summer emergency (SE) rating of 490 amps (currently, the bus consists of 250 Cu)</li> <li>• Upgrade limiting equipment, including terminal equipment and disconnect switches, on the line and buses so that the full capacity of the line can be used.</li> <li>• Open 60 kV line between Cotati and Petaluma</li> </ul>
<b>Type</b>	Reliability
<b>Objectives</b>	For category P6 contingency of both the Fulton #1 & #2 115/60 kV transformer banks in the 2019, 2022 and 2027 summer peak and winter peak conditions resulted in the case diverging.
<b>Project Need Date</b>	2019
<b>Expected In-service Date</b>	2021
<b>Interim Solution</b>	Operational action plan
<b>Project Cost</b>	\$7 million
<b>Alternatives Considered but Rejected</b>	An SPS was considered to drop load to mitigate the reliability constraint.

<b>Name</b>	<b>Vaca Dixon-Lakeville 230 kV Corridor Series Compensation</b>
<b>Brief Description</b>	The project is to add reactive series compensation to the Vaca Dixon-Lakville 230 kV and Vaca Dixon-Tulacay 230 kV lines.
<b>Type</b>	Reliability
<b>Objectives</b>	To redirect flows on to other lines under contingency conditions to avoid overloading the 230 kV lines under P2 and P6 contingencies.
<b>Project Need Date</b>	2019
<b>Expected In-service Date</b>	October 2019
<b>Interim Solution</b>	Operational action plan
<b>Project Cost</b>	\$11 million
<b>Alternatives Considered but Rejected</b>	The installation of an SPS to drop load was considered.

<b>Name</b>	<b>Newark-Lawrence 115 kV Line Upgrade</b>
<b>Brief Description</b>	Upgrade the limiting equipment (circuit breaker) at Newark substation on the Newark-Lawrence 115 kV line.
<b>Type</b>	Reliability
<b>Objectives</b>	The reliability assessment identified Category P6 and P7 contingencies resulting in overloads on the Newark-Lawrence 115 kV line. The project addresses the reliability constraints.
<b>Project Need Date</b>	Identified in the 2019 study year
<b>Expected In-service Date</b>	December 2018
<b>Interim Solution</b>	Operational action plan
<b>Project Cost</b>	\$1.5 - \$2.0 million
<b>Alternatives Considered but Rejected</b>	No other alternatives were considered due to the cost of the project to bring the line up to its full capability .

<b>Name</b>	<b>Newark-Milpitas #1 115 kV Line Upgrade</b>
<b>Brief Description</b>	Upgrade the limiting equipment on the Newark-Milpitas #1 115 kV line.
<b>Type</b>	Reliability
<b>Objectives</b>	A Category P6 contingency overload was identified on the Newark-Milpitas #1 115 kV Line in the reliability assessment. The project addresses the reliability constraining
<b>Project Need Date</b>	Identified in the 2019 study year
<b>Expected In-service Date</b>	June 2019
<b>Interim Solution</b>	Operational action plan
<b>Project Cost</b>	\$1.5 – \$2.0 million
<b>Alternatives Considered but Rejected</b>	No other alternatives were considered due to the cost of the project to bring the line up to its full capability .

<b>Name</b>	<b>Trimble-San Jose B 115 kV Line Upgrade</b>
<b>Brief Description</b>	Upgrade the limiting equipment on the Trimble-San Jose B 115 kV Line.
<b>Type</b>	Reliability
<b>Objectives</b>	A Category P6 contingency overload was identified on the San Jose-Trimble 115 kV line.
<b>Project Need Date</b>	Identified in the 2019 study year
<b>Expected In-service Date</b>	December 2018
<b>Interim Solution</b>	Operational action plan
<b>Project Cost</b>	\$0.25 million
<b>Alternatives Considered but Rejected</b>	No other alternatives were considered due to the cost of the project to bring the line up to its full capability .

<b>Name</b>	<b>Cooley Landing-Palo Alto and Ravenswood-Cooley Landing 115 kV Rerate</b>
<b>Brief Description</b>	The Cooley Landing-Palo Alto and Ravenswood-Cooley Landing 115 kV Lines have thermal ratings based on two feet per second wind speed assumptions. The rerate project will increase the thermal capacity of the lines by rerating of these lines based on four feet per second wind speeds.
<b>Type</b>	Reliability
<b>Objectives</b>	Category P2, P6 and P7 contingency overloads were identified on the Cooley Landing-Palo Alto and Ravenswood-Cooley Landing 115 kV Lines.
<b>Project Need Date</b>	Identified in the 2019 study year
<b>Expected In-service Date</b>	2019
<b>Interim Solution</b>	Operational action plan
<b>Project Cost</b>	\$1 million
<b>Alternatives Considered but Rejected</b>	No other alternatives were considered due to the cost of the project to bring the line up to its full capability

<b>Name</b>	Oakland Clean Energy Initiative Project
<b>Brief Description</b>	<ol style="list-style-type: none"> <li>1. Upgrades to Moraga 230/115 kV Transformer Bank 3 to remove limiting elements, as well as upgrades at Moraga 115 kV and Oakland X 115 kV substation buses;</li> <li>2. Transmission line re-rates on Moraga-Claremont 115 kV Lines #1 and #2, currently underway and scheduled for completion in Q1 2018;</li> <li>3. A minimum of 10MW / 4 hour of in-front-of-the-meter Utility Owned Energy Storage at the Oakland C and Oakland L 115 kV substations;</li> <li>4. Competitive procurement of an additional 10 MW-24 MW of preferred resources sited within the Oakland C and Oakland L 115 kV substation pocket, of which at least 19.2 MW (measured at 4 pm in September) must be load modifying in nature; and,</li> <li>5. Continued reliance on transferring Alameda Municipal Power load from Cartwright (North) to Jenny (South) during peak loading conditions and after an N-1, in preparation for an N-1-1.</li> </ol> <p>The ISO is recommending the approval of the transmission regulated assets of the Oakland Clean Energy Initiative project for the substation upgrades at Moraga and Oakland X, rerating of Moraga-Claremont 115 kV Lines #1 and #2 and the installation of the battery storage at the Oakland C and Oakland L 115 kV substations that are estimated to cost \$56 to \$73 million with an in-service date of 2022. The ISO is recommending PG&amp;E to seek approval through the CPUC procurement process the additional identified preferred resources for the Oakland Clean Energy Initiative.</p>
<b>Type</b>	Reliability
<b>Objectives</b>	To address thermal overloads without aging local generation that is currently under RMR contracts.
<b>Project Need Date</b>	Area needs currently served by local RMR generation.
<b>Expected In-service Date</b>	2022
<b>Interim Solution</b>	Local generation
<b>Project Cost</b>	\$56 to \$73 million
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>• New local gas generation</li> <li>• New 115 kV supply to the area</li> <li>• New 230 kV supply to the area</li> </ul>



<b>Name</b>	<b>Oil Fields 60 kV Capacitor Bank</b>
<b>Brief Description</b>	Install a 10 Mvar (2x5 Mvar) capacitor bank at Oil Fields 60 kV substation
<b>Type</b>	Reliability
<b>Objectives</b>	Category P3 post contingency low voltage issues were identified in the Coburn-Oil Fields 60 kV system. With the Sargent Canyon Cogen retired, and a G-1/L-1 loss of Salinas River Cogen and one Coburn-Oil Fields 60 kV line could result in low voltage issues within the area.
<b>Project Need Date</b>	Identified in the 2019 study year
<b>Expected In-service Date</b>	May 2022
<b>Interim Solution</b>	Local generation
<b>Project Cost</b>	\$7 – 10 million
<b>Alternatives Considered but Rejected</b>	No other alternative considered due to cost to address the voltage constraining

<b>Name</b>	<b>Herndon-Bullard 115 kV Reconductoring project</b>
<b>Brief Description</b>	<ul style="list-style-type: none"> <li>• Reconductor ~6 circuit miles (3 miles of double circuit transmission lines) between Pinedale Junction and Bullard Substation on the Herndon-Bullard #1 and #2 115kV Lines.</li> <li>• Reconductor the two circuits with larger conductor whose emergency rating is at least 1300 Amps.</li> </ul>
<b>Type</b>	Reliability
<b>Objectives</b>	Category P2 overloads identified on sections of the Herndon-Bullard # 1 & # 2 lines. The P2 overloads are due to loss of either of the two parallel circuits from Herndon to Pinedale Junction resulting in one of the feeds serving the entire load at Bullard and Pinedale substation.
<b>Project Need Date</b>	Identified in the 2019 study year
<b>Expected In-service Date</b>	January 2021
<b>Interim Solution</b>	Operational action plan
<b>Project Cost</b>	\$6 – 8 million
<b>Alternatives Considered but Rejected</b>	The installation of an SPS to drop load was considered.