FINAL APPLICATION FOR LICENSE
OF MAJOR UNCONSTRUCTED PROJECT

APPLICANT PREPARED
ENVIRONMENTAL IMPACT REPORT

CHAPTER 2
Purpose and Need

LAKE ELSINORE
ADVANCED PUMPED STORAGE PROJECT
FEDERAL ENERGY REGULATORY COMMISSION
PROJECT NUMBER 14227

Applicant:

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2.0. Project Purpose and Need

2.1. Introduction

The California Environmental Quality Act (CEQA) defines "project" as "the whole of the action" that may result from either a direct or indirect physical change in the environment (14 CCR 15378[a]). In general, each "project" must be fully analyzed in a single environmental review document. In performing its analysis, an agency should not split a "project" into two or more segments but, in deference to the protection of the environment, examine the totality of the action, even when certain components of that action do not fall within the jurisdiction of the agency.

The Nevada Hydro Company, Inc. (Applicant) can put forth two closely related projects to fill the needs described in this chapter. Each provides its own benefits, both to the functioning of the electric grid and, through operations, to ratepayers. These projects are:

- The **Lake Elsinore Advanced Pumped Storage (LEAPS)** project, a 500 MW generation/600 MW load advanced pumped storage facility. The LEAPS project is being licensed by Federal Energy Regulatory Commission (FERC) in Docket P–14227.
- The **Talega–Escondido/Valley–Serrano 500 kV Interconnect (the TE/VS Interconnect)** project is a 500 kV, 32-mile transmission line that could interconnect LEAPS to the grid in the service territories of both San Diego Gas & Electric Company (SDG&E) and Southern California Edison (SCE).

The Applicant is well aware that it cannot connect LEAPS to the grid other than in conformity with the hydroelectric licensing requirements of Subchapter I of the Federal Power Act, 16 U.S.C. §§ 791–823d ("FPA"), and has engineered the project accordingly. The proposed Project is a major hydro-electric project within the meaning of the Federal Power Act. As such, it cannot be constructed and operated except under such license issued by the FERC. See 16 U.S.C. § 799. Therefore, the LEAPS facility's connection(s) to the grid must be over primary lines as required under the Federal Power Act. In its application to the FERC, Nevada Hydro is not proposing to construct the wires portion of the project to function as a major link of a transmission or distribution, but is proposing to construct the wires to connect the powerhouse to the grid. Thus, the Project is not contemplating combining the transmission lines to carry system load in excess of the power generated by the LEAPS Project.

With regard to the Project's primary connection described in this EIR, under the test described in PG&E, 85 FERC ¶ 61,411 (1998), "the line leading from the project ceases to be a primary line at the point it is no longer used solely to transmit power from the project to the interconnected grid." NYPA, 98 FERC ¶ 61,033 at 61,095 (2002)) (P-2216). Nevada Hydro Notes that, Montana Power Co. v. FPC, 112 F.2d 371 (9th Cir. 1980) refined this test saying that the line transmitting energy from a project's plant to points of junction with the distribution system may be a primary transmission line, even if it also serves other connections, so long as it cannot carry any substantial power from other sources.

Isolating circuit breakers, as well as the proposed use of phase shifting transformers at the Case Springs Substation, will prevent system power flow between the Lake and Case Springs Substations. Isolating circuit breakers will be installed so that the Project can only utilize either the north or south 500 kV line at a time. The circuit breakers and/or phase shifting transformers

will allow the proposed Project to obtain pumping power from either SCE or SDG&E and will restrict the flow of that pumping power to the Santa Rosa Substation only. For example, no power from the Lake Substation used for pumping will be delivered to the Case Springs Substation. The circuit breakers and phase shifting transformers will also allow the Applicant to deliver project power to either the Lake or the Case Springs Substation. When flow is from the proposed Project to these substations, only project power or station power will be transmitted on the 500 kV LEAPS generator tie lines.

In fulfillment of the CEQA requirement to address the "whole of the action", both TE/VS Interconnect and LEAPS are identified, described, and analyzed in this "Applicant Prepared Environmental Impact Report" (PEA).

2.2. Background to Purpose and Need

There are two critical elements in support of the purpose and need for these projects. One focuses on system reliability and the other meeting the aggressive RPS goals of the State.

2.2.1. The Regional Reliability Challenges

History. Going back at least 15 years, officials have been aware of the vulnerability facing the Southern California grid. For example, in a March 2001 letter to the CAISO President, SDG&E said, "We do not believe we can delay the permitting process [for their proposed Valley–Rainbow Project[1]] any longer without potentially jeopardizing reliability in 2004."[2] The CAISO confirmed this need in a filing to the CPUC that it considered Valley Rainbow as a "high priority" project "that is needed by 2004 in order to increase the transfer capability into the San Diego area to serve load".[3] Notwithstanding this need, the Valley-Rainbow project was ultimately unsuccessful. Since that time, only the Applicant has proposed a project that can solve this continuing problem and gained the right-of-way access to complete this critical line.

As system load grew over time in the San Diego and Los Angeles areas, system planners understood the regions' import requirements would increase commensurately because of the difficulty of installing new generation in the area. This difficulty was triggered by strict environmental regulations (especially air quality rules), but also by strenuous public opposition to any new industrial facilities. The Otay Mesa combined cycle plant was one of the few successful new projects, but the value of that project in diminishing the need for imports is substantially reduced by the retirement of the South Bay and other coastal plants. As a result, the ability to use the northern 500 kV path from Palo Verde to Devers, together with the proposed 500 kV TE/VS Interconnect project, is now a new major supply route into the coastal area between the SCE service area and the Southwest Power Link (SWPL) and Sunrise paths, that comes into the SDG&E service area from the east.

1/ The Valley–Rainbow transmission project was proposed by SDG&E as a 500 kV connection that was identical to the TE/VS Interconnect, to be located a few miles down the road from where the TE/VS Interconnect is sited. The project was turned down by the Commission and SDG&E ceased further efforts to advance its approval.

2/ March 22, 2001 Letter from James P. Avery, Senior Vice President Fuel and Power Operations to Terry M. Winter, President and Chief Executive Officer, CAISO.

3/ "Statement of The California Independent System Operator Corporation Regarding Priority Transmission Projects", March 20, 2001, filed in CPUC Proceeding I.00-11-001, "Order Instituting Investigation into implementation of Assembly Bill 970 regarding the identification of electric transmission and distribution constraints, actions to resolve those constraints, and related matters affecting the reliability of electric supply."

More recently, Congress directed, through Section 1221(a) of the Energy Policy Act of 2005, 119 Stat. 594, 946-951 (2005) (16 U.S.C. § 824p) (EPAct), that the Secretary of Energy was to identify "any geographic area experiencing electric energy transmission capacity constraints or congestion that adversely affects consumers" as a National Interest Electric Transmission Corridor (NIETC). On August 6, 2006, the United States Department of Energy (DOE) issued a preliminary National Electric Congestion Study (Congestion Study), designating the southern California region as a "critical congestion area" under Section 1221 of the EPAct. Although this designation was ultimately overturned by the Court of Appeal on unrelated procedural grounds, the underlying reliability challenges to the Southern California grid, as well as DOE's conclusions as to the critical congestion in the region, still describe the on–the–ground reality.

SDG&E has acknowledged the vulnerability of the area in the long-term resource plan that was submitted as part of its Sunrise Powerlink CPCN application. In that document, SDG&E itself identified a need for a second 500 kV transmission interconnection to meet the grid reliability requirements of the CAISO in 2010. SDG&E officials saw that planned new, renewable generation facilities that would interconnect at the Imperial Valley Substation would be an important new source of energy supply, and that the proposed Sunrise Powerlink Project, with its 500 kV line from Imperial Valley to an injection point nearby to the Miguel Substation (the terminus of the SWPL) would be a valuable, independent 500 kV supply path into the SDG&E system. However, because of the requirement that the Sunrise line have a shared right-of-way for over 30 miles with the SWPL line, the reliability officials at WECC classified the potential outage of both lines in that common corridor as a Category C contingency. That is, if both lines in this common corridor were lost, system operations changes with controlled or planned loss of system load would be permitted, but cascading area failures would not be (per NERC TPL 003-0a). This NERC determination, while providing more import capability under many circumstances, had the effect of rendering the Sunrise Powerlink Project into a transmission line that was functionally and practically much less robust than the needed independent path for importing a growing power requirement into the SDG&E system.

Further, the potential outage of the North Gila-Imperial Valley 500 kV line limits the value of Sunrise. Since system operators must always be prepared for the contingency which would remove the North Gila-Imperial Valley 500 kV line, SDG&E imports from the east would be limited to the operating dispatchable generation in the Imperial Valley area plus the downgraded capability of Path 44. The installed dispatchable generation in the Imperial Valley area is less than the ratings of either of the two 500 kV paths into San Diego: Imperial Valley-Miguel and Imperial Valley-Central.

More recently still, the CAISO itself recognized the need for a new 500 kV connection, as was noted in recent CAISO testimony submitted to the CPUC in a case involving SDG&E's proposed procurement of new gas-fired resources:

> ***Q. Are there any feasible transmission mitigation solutions that can meet the 650MW to 950 MW need?***
>
> *A. As described above, the constraint driving these needs is the transmission system limitations between the SCE and SDG&E systems south of SONGS. During studies of the Sunrise Powerlink, the ISO studied transmission options to*

> *increase the transmission capability between these two systems in order to further reduce local generation needs in San Diego. However, the scope of the upgrades needed to meet a 650 MW to 950 MW need was essentially a new 500 kV line connecting the SDG&E system to the SCE system.*[4]

Notably, this testimony did not address the ramifications of the SONGS being off line. Now that SONGS is to be permanently closed, this need for enhanced transmission between the SCE and SDG&E systems will become a matter of far greater urgency.

Then, on the afternoon of September 8, 2011, an 11-minute "system disturbance" occurred in the Pacific Southwest leading to cascading outages (including the only 500 kV link from the East into the SDG&E system) and leaving approximately 2.7 million customers without power. This outage affected parts of Arizona, Southern California, and Baja California, Mexico. All of the San Diego area lost power, with nearly one-and-a-half million customers losing power, some for up to 12 hours. The disturbance occurred near rush hour, on a business day, snarling traffic for hours. Schools and businesses closed, some flights and public transportation were disrupted, water and sewage pumping stations lost power, and beaches were closed due to sewage spills. Millions went without air conditioning on a hot day.

While the Staff report[5] on the outage prepared by the FERC and the North American Electricity Reliability Corporation (NERC) did not recommend physical changes to the system in order to prevent a recurrence of such an outage, the Applicant has concluded and can demonstrate that had the TE/VS Interconnect been on line that day, it is likely that all of the damage that did occur would have been avoided.

It should be noted that the system collapse of September 2011 was triggered by the loss of the 500 kV of the SWPL east of Imperial Valley. With insufficient generation running in SDG&E to compensate for that loss and the outage of SONGS (now the new normal), the voltage in the area collapsed and the system went black. With the Arizona Corporation Commission unlikely to permit a second North Gila-Imperial Valley 500 kV line, Sunrise should be seen as, ultimately, only a partially successful attempt at solving the import problem, which remains a challenge for the future that will necessarily require additional high voltage transmission feeding the SDG&E service area.

Reliability today. The landscape of electric power supply in Southern California has fundamentally changes with the announced retirement of the already-shut down San Onofre Nuclear Generating Station (SONGS). Compounding this impact is the impending effects of the restrictions of once through cooling for existing and future generating stations along the pacific coastline.

The first of these events, the retirement of both SONGS units, has an immediate impact. This retirement removes 2,150 MW of generation from the Southern California area. Because of its many years of high operating factor, utility reliability and economic planners for the area had developed a system highly dependent on its presence at full

[4]/ Testimony of Robert Sparks on Behalf of The California Independent System Operator Corporation, Application of San Diego Gas & Electric Company (U902 E) for Authority to Enter into Purchase Power Tolling Agreements with Escondido Energy Center, Pio Pico Energy Center and Quail Brush Power, Application 11-05-023, (2012), page. 9.

[5]/ *Arizona–Southern California Outages on September 8, 2011, Causes and Recommendations*. Prepared by the Staffs of the Federal Energy Regulatory Commission and the North American Electric Reliability Corp., April 2012.

output. With its retirement, system reliability in both San Diego and the Los Angeles basins has been significantly diminished. For example, power imports into San Diego from the east were once based on the ability of SONGS to back up such flows in the event of transmission problems to the east by flows over WECC Path 44. A similar situation now exists for flows into the Los Angeles basin over WECC Path 43. While not negating the usefulness of these two transmission corridors, their capability is much reduced because of the absence of SONGS.

In addition, the cost of electricity to customers in this area has recently shown a spike upward. This is due to a combination of both the loss of the low cost of energy from SONGS itself and the loss of SONGS ability to backstop imports of less costly power from external resources rather than using more costly internal generation.

The second event affecting reliability is that the California Water Resource Control Board (CWRCB) performance criteria for mitigating the effects of the use of water for generation cooling that is discharged into the ocean. Compliance with these criteria is scheduled to begin on January 1, 2018. At this point it appears none of the generation plants in southern California that are using this "once-through-cooling" (OTC) process have found a cost-effective way to meet these criteria. Thus, all generation located along the coastline will likely have to retire as of that date, unless the CWRCB develops a revised plan.

Current efforts are under way to build replacement generators on or near these sites. However, under the best of circumstances, there will be less replacement generation built than will be retired. One example of this net impact is the planned retirement of Encina Station with over 925 MW of capacity, with the as-yet uncertain replacement of that capacity by the 550 MW Carlsbad Project. Thus, for SDG&E there is a potential net reduction of internal generation of from 375 MW to 925 MW. The Huntington Beach Station is proposed to be shut down in two stages and to be replaced with equivalent capacity. However, this will leave that site with only half its capability, about 420 MW, until all replacement work in finished in 2022. This process is complicated by the need to continue using the generators of the Huntington Beach Units 3 and 4 as synchronous condensers for area voltage support, which will delay or perhaps negate their replacement as generators. Other sites up the coast are also going to be impacted by as yet undetermined amounts.

An important effect of these two decisions has been to put emphasis on the need for the use of transmission to bring low cost power into the San Diego and Los Angeles basins. Fossil-fueled generation near the high population density coastal area will be both more difficult to permit and more expensive to operate than has been enjoyed from those existing units that had once through cooling. In addition, a review of the proposed renewable generation in the CAISO generation queue shows that much of it is well back from the coast and will put additional stress on a transmission system that must be made more robust to accommodate it. Such areas as the Antelope Valley, Mojave Desert and Imperial Valley show examples of major generation development, with the transmission to actualize it under development. The TE/VS Interconnect is part of that major upgrade in transmission requirements, especially for the San Diego and Los Angeles areas. It is also the first leg of the option to close the 500 kV loop between the Palo Verde-Devers-Valley Serrano path and the SWPL/Sunrise path.

With low probability of completion of a second Palo Verde-Colorado River 500 kV line or a second North Gila-Imperial Valley 500 kV line, the completion of a link between these two major 500 kV paths becomes more important. This would provide the closure of the "open jaw" at the western ends of these two paths that are heavily used for import to coastal California. This closure would offer the ability to move power at 500 kV from either leg to the other under contingency situations, an ability now severely limited. This would allow higher imports of lower cost power from Arizona, New Mexico and eastern California.

2.2.1.1. Loss of SONGS

In a presentation by CAISO for a meeting held by the CPUC and CEC on July 15, 2013[6], a number of possible solution alternatives were presented to address the reliability needs of the southern California electric system because of the retirement of the SONGS nuclear units[7]. These alternatives also addressed the present understanding of the needed response to the requirement of the "once-through-cooling" mitigation and future load growth in the San Diego and Los Angeles basin areas. These alternatives can be summarized as follows:

1. TE/VS-LEAPS in its base configuration or with possible 500 kV extensions.[8]
2. Addition of new generation:

	2018	**2022**
L.A. Basin		3,800 MW
SDG&E	1,120 MW	785-920 MW

3. New Transmission Projects:
   - Alberhill – Suncrest (Central) 500 kV
   - Valley–Alberhill–Viejo–new Cougar 500 kV
   - Imperial Valley – Songs HVDC Line
   - Sycamore – Penasquitos 230 kV line
   - Alamitos (or SONGS) – South Bay area HVDC Submarine Cable

The Applicant is aware that there is no one solution that will be able to resolve the extensive needs identified by the CAISO. However, the selection of project(s) to provide the required solution must consider both timeliness and cost. The timeliness issues will be driven by the ability to get the necessary sites, rights-of-way, air quality studies, permits of various types and construction duration. Cost effectiveness will require the evaluation of the generation types and fuel costs that can be sited and installed versus delivery of resources located outside the area via the transmission system. This process should be directed by the Commission, with their mandate to protect the state's ratepayers.

For its base configuration, the TE/VS Interconnect would provide 1,100 MW of increased import capability under normal conditions and 1,800 MW under contingency situations. If a cooperative effort were undertaken by SCE and SDG&E to use a portion of the Talega – Escondido 230 kV line path at 500 kV (and the Applicant understands the

[6] CEC/CPUC Joint Workshop Electricity Infrastructure Issues Resulting from SONGS Closure, ISO 2013 Transmission Plan Nuclear Generation Backup Plan Studies (SONGS), July 15, 2013 PowerPoint Presentation.

[7]/ The transmission portion of this proposal is also addressed by the Applicant in Chapter 6, Section 6.2.3.2.

[8]/ See Section 2.4.2 of this PEA for a discussion of proposed extensions to the TE/VS Interconnect.

corridor is already permitted for 500 kV), the full capability of the 500 kV line from Alberhill to Case Springs (2,600 to 3,400 MW) could be available to meet the needs of both the utilities.

With the extensions of the 500 kV from Case Springs to Talega and to Rainbow[9], the result would more than replace SONGS as they bring 500 kV service deeper into the Basin than exists today. Also, the 500 kV extension to SDG&E's once proposed Rainbow site (or even Escondido) provides a shorter jumping off point to Suncrest, which would close the 500 kV system between SWPL and Valley-Serrano. The economic benefits are at least as great as the present situation in which both SCE and SDG&E have to forgo lower cost imports and use higher cost internal generation for lack of import capability.

In reviewing the options other than the TE/VS-LEAPS development, there are some herculean efforts required and some of the options appear to be "grasping at straws". The Applicant suggests a more deliberate development of a smaller amount of combined cycle in combination with transmission and pumped storage would enhance both reliability and economics.

See Table 2.2.1-1. SONGS Solution Alternatives from the CAISO for a high level review of the proposals presented by the CAISO.

Table 2.2.1-1. SONGS Solution Alternatives from the CAISO

Proposal	Potential Positives	Potential Negatives
New Generation		The siting of approximately 5,800 MW of generation in the Los Angeles and San Diego basins by 2022 will require an expenditure of approximately $6 billion. If sites were limited to 500 to 600 MW each, that would be 10 sites. The sites will require natural gas supply, air quality permits and electric transmission system capable of supporting this additional generation. The generation would likely be simple cycle combustion turbines with higher heat rates compared to combined cycle units, there would be an economic penalty. This is not green house gas friendly suggestion. This type of unit would incur added expense for startup/shutdown costs, increased maintenance, and even worse heat rates at less than full load operation.
Proposed Alberhill – Suncrest 500 kV line	Provides closure of the 500 kV open jaw, with SWPL as the lower jaw and Palo Verde – Devers – Valley – Serrano as the upper jaw. Provides a 500 kV source into SDG&E in the event of the loss of the Imperial Valley-Miguel and Imperial Valley-Suncrest	This option has yet to be studied for the level of its effectiveness in the wider context of the southern California transmission planning process. Nor does it provide any improvement in the need for resources in the L.A. Basin. Something else must handle that need. Given SDG&E's difficulty with the Valley-Rainbow Project a decade ago, this proposal will require a well-considered development effort when "time is of the essence".

[9]/ id.

Proposal	Potential Positives	Potential Negatives
	500 kV lines. Continues 500 kV supply into SDG&E for the loss of the North Gila – Imperial Valley 500 kV line, the single most difficult contingency limiting SDG&E imports.	
Proposed Valley-Alberhill-Viejo-Cougar 500 kV line		This is an entirely new option, for which there has yet to be shown that it can be built. Given the history of difficulty that SCE has experienced in completing the entire Tehachapi transmission development, especially in the area around Rio Hondo and Mira Loma, this project, while impressive in its concept, is likely to have difficulties with getting its path permitted. It may not be completed, or it may be significantly delayed. Further, there is no assurance that it would offer enough voltage support and real power flow to the area to offset the Imperial Valley area problems. Tests of the additional stress on the South of Lugo path must also be considered.
Proposed projects in SDG&E territory		Both projects suffer from the fact that one of the primary issues for the area lies to the east of Imperial Valley – loss of the North Gila-Imperial Valley 500 kV line. Thus, while the proposals add line transfer capacity west of Imperial Valley, they both are west of the biggest problem line loss contingency when considering G-1/N-1 issues. There is already more than enough line capability with SWPL and Sunrise for normal operations and the possible loss of the Sunrise line. The Sycamore-Penasquitos 230 kV line may relieve some congestion on the Sunrise path if Imperial Valley-Miguel were out, but that seems to be a small advantage. That 230 kV line does nothing for the two major contingencies in the Imperial Valley area. The proposed DC line may provide some advantage for the N-1-1 loss of the two 500 kV lines west of Imperial Valley. But without some specifics to review, this is merely a possibility. Given the right-of-way problems SDG&E encountered in the Sunrise development, there is reduced assurance that the line could be completed when "time is of the essence".
South Bay area HVDC Submarine Cable	The use of DC cables in the ocean is a well understood technology.	By 2022, both ends of either cable option will be connected to weak sources. Once Alamitos is retired that's a weak point. South Bay has no useful source except the 500 kV line coming into Miguel, which is part of the problem. SONGS is now just an any-bus with no special attributes.

Additional detailed information on how the Applicant's projects substitute for the generation once provided by SONGS may be found in PEA Attachment 8 (The Talega–Escondido/Valley–Serrano 500 kV Interconnect and Lake Elsinore Advanced Pumped Storage Projects Provide the Solution to Replace SONGS).

2.2.2. The State's RPS Goals

California has among the most aggressive clean energy policies in the world. California law requires that 33% of all energy used in the state be derived from renewable energy sources by 2020, as well as that the emission of greenhouse gases (GHG) be reduced to 1990 levels by 2020. Beyond that, California policies call for an overall 80% reduction of 1990 GHG emission levels by 2050. This will, in turn demand that over time, California will necessarily rely on an ever-greater percentage of renewable energy resources (i.e., well beyond the currently mandated renewable portfolio standard of 33%) to meet its electric power needs. On top of this, the State has projected transition to a transportation fleet that increasingly uses electricity rather than gasoline or diesel as its motive power means that California's electric power needs will continue to grow, even with the expected implementation of state-of-the-art energy efficiency programs throughout the state.

However, most renewable energy resources are intermittent. The sun rises in the morning and sets in the evening; the state's ample wind resources are often at their most productive during off-peak hours; and geothermal power operates 24/7, meaning that there are numerous hours during the year when the power from geothermal facilities is or will be surplus. California therefore faces a major challenge on its path to a clean and renewable energy future: it must start developing advanced technologies that can reliably and effectively buffer the intermittency of renewable generation with the variable demands of electricity customers over the course of a day.

There are only three available technologies that can effectively address this lack of fit between the times during the day when renewable resources are available and the times when electric power is demanded by society. The first of these is demand response, which can help buffer the demands on the system during periods of peak load. However, in a largely post-industrial California, demand response cannot be reasonably expected to meet much more than 5% of the power system's needs for resources that can balance the discrepancy between when renewable energy is generated and when it is consumed. Moreover, demand response inevitably runs up against consumer resistance. People may be willing to cycle their air conditioners off for up to 10 or 15 minutes an hour on a hot day, but they will not be willing to shift their air conditioning load to the nighttime when it is over 100 degrees outside at 3 p.m.

The second available buffering technology would be to install a fleet of gas-fired turbines (essentially, stationary jet engines). However, the combustion of fossil fuel creates GHGs, which will ultimately limit the ability of the State to deploy this technology broadly. Moreover, although the price of gas is currently low, there is always a risk of significant gas price volatility: prices were as high as $12/MMBTu as recently as 7-8 years ago. Finally, gas turbines can operate and produce power when the system has insufficient renewable generation to meet power needs, but gas turbines simply cannot absorb excess power during those hours when there is an overabundance of renewable generation (which will be increasingly the case as California deploys more and more renewable resources over the next 5 to 10 years).

However, the third available buffering technology – advanced storage – has none of the limitations of demand response or the drawbacks of an increased reliance on gas

generation. Storage is clean, green and cost-effective. Moreover, storage can easily absorb excess renewable generation at night when the wind blows and during the height of the day when solar generation will often exceed demand. Finally, the potential of storage is virtually limitless. California will be able to build as much electricity storage capacity as it needs with minimal environmental restrictions. Some of that storage, mostly in the form of batteries, will necessarily be located on the distribution grid to help buffer local distributed generation from rooftop photovoltaic systems.

Storage has been a subject of much discussion in California over the past 5+ years. Assemblywoman Nancy Skinner led the fight to enact Assembly Bill 2514 in 2010. The California Public Utilities Commission (Commission) has initiated a proceeding to evaluate the long-term role for storage[10], and the California Energy Commission (CEC) and the California Independent System Operator (CAISO) have all held extended workshops looking into the long-term value of storage for California. Utility executives have characterized storage as the "Holy Grail" of the clean energy future.

On February 26, 2013, all three of the State's energy–related agencies held a Summit on the future of resource adequacy in California. This event was attended by most of the agencies' Commissioners and Board Members, as well as by a critical mass of the State's key stakeholders on major energy policy issues. A number of the speakers at the Summit acknowledged the high value that electricity storage, as a clean, highly flexible and reliable resource, would bring to the grid of the future. Indeed, there was general consensus on the part of the active participants at the Summit that California will need a dramatically greater amount of highly flexible new energy resources as soon as three years from now.

The Applicant's projects bring to the State, not only all of the benefits pumped storage provides in the Southern California load pocket, but also provide the first high voltage connection between San Diego and the State's grid backbone. Further, the Projects are located geographically near to the now retired SONGS facility, and can be configured to make up for the loss of these important grid assets as well as the future reduction of internal resources dependent on "once-through-cooling". Finally, the grid and ratepayer benefits each project provides individually and together more that make up for the cost of each project.

2.3. Summary of Project Objectives

A pumped storage facility requires a number of specific component parts. Among those, there must exist, or there must exist the ability to construct, both an upper (forebay) and lower (afterbay) reservoir in close proximity and separated by sufficient height differential (head) to effectively operate. In describing pumped storage facilities, the FERC notes that this type of facility is particularly effective at sites having high heads (i.e., large differences in elevation between the upper and lower reservoir).

In 1990, the Tudor Engineering Company (TEC) published a reconnaissance level investigation that identified the potential to construct a pumped storage hydropower project in the Elsinore Mountains, in proximity to Lake Elsinore. As indicated therein, "[p]umped storage units are

[10]/ Order Instituting Rulemaking Pursuant to Assembly Bill 2514 to Consider the Adoption of Procurement Targets for Viable and Cost-Effective Energy Storage Systems. Rulemaking 10–12–007, filed December 16, 2010.

used by various utilities to mitigate the effects of daily peaking problems. The southwest region of California, however, has few sites that can be utilized for pumped storage, either because of insufficient or varying water supplies or an unacceptable elevation between the upper and lower reservoirs."[11]

The area identified in the TEC study represents the only suitable location in the general project area possessing an existing water body of sufficient size to serve as a project facility, substantial elevation differences (delta) over a relative short horizontal distance to allow for the operation of a large scale pumped storage project, and proximity to large metropolitan areas with identified energy needs. Since those physiographic and locational conditions are not readily reproducible, the Lake Elsinore area represents the only known locale in southern California that can accommodate a pumped storage facility sufficient to accommodate large power levels and long discharge times. Unlike an idea or a product that can be taken from its source, exported, and then produced in distant areas, pumped storage is dependent upon the existence of definable variables that impose real world restrictions on its location and duplication.

As such, the primary goals of the Project are to:

1. Take advantage of the unique combination of an existing water body, sufficient topographic variation (high head), and proximity to the southern California high voltage electrical grid to allow for the construction and operation of a modern and efficient pumped storage facility;
2. Connect the pumped storage facility to the CAISO controlled grid in a manner which allows the stored power to serve the power needs of both the San Diego and Los Angeles metropolitan areas;
3. Link the San Diego area to the California grid "backbone" at 500 kV;
4. Provide system control management to the CAISO system operators; and,
5. Utilize these assets to substitute for the loss of the SONGS facility.

Based on those primary goals, the Applicant has developed the following Project objectives.

2.3.1. The objectives of the "pumped storage component" of the Project:

1. **Store off-peak power.** Store excess off-peak energy production in the CAISO region, including off-peak production by wind generation facilities in the Tehachapi region and/or elsewhere, geothermal generation, and other existing baseload generation and release such energy by operation of the LEAPS hydropower generators as needed during peak demand hours.

2. **Integrate intermittent renewable resources.** Provide 500 MW of regulation, fast responding spin, and load following capability in the immediate area of need

[11]/ Tudor Engineering Company, Report on Reconnaissance Level Investigation of Lake Elsinore Pumped Storage Project, June 1990, p. 1-2.

to integrate intermittent renewable resources procured by southern California Load Serving Entities (LSEs).

3. **Facilitate the development of workable competitive wholesale markets.** Provide 500 MW of regulation, fast responding spin, and load following capability to facilitate the development of workable competitive wholesale markets.
4. **Provide black start capability.** Provide 500 MW of black start capability, allowing for the restoration of network operations, to the CAISO southern California transmission system.
5. **Provide voltage support and other ancillary services.** Provide voltage support and other "ancillaries" for the eastern SCE service area and wind energy integration in the southern California electrical region.

2.3.2. The objectives of the "transmission component" of the Project:

1. **Reduce congestion.** Provide additional high voltage transmission capacity to reduce congestion on the CAISO grid and thus reduce energy costs for CAISO consumers.
2. **Provide at least 1,100 MW of incremental transmission import capability to San Diego.** Provide at least 1,100 MW of additional import capacity to SDG&E system at all times (and without SONGS operating) to enhance San Diego load area's access to renewable resources available through the WECC/CAISO transmission grid.
3. **Provide at least 1,800 MW of incremental transmission import capability to San Diego under contingency conditions.** Provide at least 1,800 MW incremental transmission import capability for SDG&E under G-1/N-1 conditions (and without SONGS operating) and other major reliability challenges to satisfy reliability criteria and to reduce the cost to SDG&E ratepayers of capacity for CPUC Resource Adequacy requirements.
4. **Provide a high voltage interconnection between SDG&E and the State's backbone transmission system.** Provide SDG&E with the first 500 kV interconnection with the CAISO 500 kV network and thereby enhance the integration and operational reliability of the CAISO transmission grid.
5. **Further long-term infrastructure planning efforts.** Provide a potential future option for further expansion of the CAISO grid by contributing to the creation of a 500 kV link from Arizona-Imperial Valley-San Diego 500 kV facilities to the 500 kV network in the Los Angeles basin.
6. **Provide access to the planned pumped storage facility.** Provide the CAISO grid with access to the planned LEAPS pumped storage hydropower generation plant, a location constrained facility.

2.4. Analysis of Project Objectives

This section will provide the Commission with a brief analysis of the reasons why attainment of these objectives is necessary or desirable to meet the goals and objectives of the Commission and State.

For each of these objectives, there are potentially a variety of ways each can be achieved. These alternatives have been analyzed fully in Chapter 6.2. Of these potential alternatives, some have been eliminated from further consideration for the reasons discussed in Chapter 6.2.3. Other alternatives remain under consideration and are analyzed fully in Chapter 6.2.4. Because of the synergies among the Project components, the Applicant believes that, on balance, the Project can provide for the attainment of these objectives with minimal impact and cost effectively.

2.4.1. LEAPS Objectives

With regards to LEAPS, the following additional information provides an explanation and further elaboration of the Project's objectives.

- **Store off peak power**. As indicated in the "National Energy Policy," the "nation's most pressing long term electricity challenge is to build enough new generation and transmission capacity to meet projected growth in demand."[12] The Nation's and the State's electric generation system must have sufficient operating generating capacity to supply the peak demand for electricity by consumers (including the transmission and distribution losses associated with power delivery). An additional amount of reserve power plant capacity must be operational to act as instantaneous back up supplies should some power plants or transmission lines unexpectedly fail. According to the Western Electricity Coordinating Council (WECC), to reliably deliver power, control area operators should maintain operating reserves of seven percent of their peak demand (including losses). If operating reserves decline below that level, customers that have agreed to be interrupted in exchange for reduced rates may be disconnected. If operating reserves get as low as one and one-half percent, firm load will likely be shed locally, resulting in rotating blackouts, in order to avoid system wide blackouts.[13]

  As noted by the CEC: "It is the long term planning application usage of resource adequacy requirements that ultimately drives construction of new generating facilities – or 'new steel in the ground.' Peak loads are gradually increasing throughout the West because of economic expansion and population growth. As loads increase over time, the existing installed base of 'steel in the ground' electric generation is gradually becoming inadequate for reliably meeting future loads, on a planned basis."[14]

  As reported by SDG&E: "Beginning in 2010, overlapping transmission and generation contingencies, as defined by the CAISO, on peak days could result in a situation

[12]/ National Energy Policy Development Group, National Energy Policy, Reliable, Affordable, and Environmentally Sound Energy for America's Future, May 2001, p. 1-5.

[13]/ When major outages occur, there is an increased risk of significant public health and safety impacts. Shortages of electricity can impose risk of very serious impacts on the public, potentially increasing the risk of deaths due to heat waves (Source: California Energy Commission, CalPeak Enterprise #7 Escondido [01-EP-10] Staff Assessment for Emergency Permit, June 1, 2001, pp. 3-4).

[14]/ California Energy Commission, Revised California and Western Electricity Supply Outlook Report, Prepared for the 2005 Integrated Energy Policy Report Proceedings Docket #04-IEP-1, CEC-700-2005-019-ED2, July 2005, p. 51.

where the sum of available in-area generation and existing import capability could not meet load in the SDG&E service area, potentially resulting in involuntary load shedding."[15]

Although disagreement exists among experts as to the timing when the demand for new generation facilities will arise, there is consensus that future demand exists. As reported by the San Diego Association of Governments (SANDAG): "Current trends indicate that electricity peak demand will nearly double, increasing by more than 4,000 MW by 2020. This increase in demand is the equivalent to the output of about six to seven moderate generation plants."[16] In its presentation to the CEC/CPUC Joint Workshop of July 15, 2013, CAISO indicated an incremental annual load growth 80 to 90 MW for SDG&E and 200 to 300 MW for the Los Angeles basin. This would be an annual total change of 280 to 390 MW for the area[17]. A decade of such load growth, even uncompounded, will move the need for resources for the area well beyond the need to solve the present presenting issues of retirement of SONGS and "once-through-cooling" distress. The North American Electric Reliability Council (NERC) indicates that "[t]he siting of new generators, whether utility or merchant built, can clearly have an impact on the reliability of the interconnected electric systems. For example, locating new generators electrically close to demand centers will cause less of a burden on the transmission systems than generators built in remote locations. In some instances, constructing new generators near demand centers may actually reduce transmission system loading."[18]

As indicated by the CEC: "Electricity use varies widely over the time of day and time of year. On a typical day, demand increases 60 percent from the midnight low to the afternoon high. Because air conditioning loads drive peak demand, California sees its greatest demand spikes during the summer months (June, July, August, and September). This variable load requires a generation system that is extremely flexible. The full available capacity of the system needs to be dispatched only to meet a few hours of peak demand."[19]

Although A/C electricity cannot be directly stored, it can be converted to other forms of energy and then reconverted back to electricity when it is needed. Large scale storage systems, such as pumped storage, provide the ability to utilize low cost, baseload power, generated during periods of low demand, during peak load periods. Without storage, the electrical industry must develop and maintain a delivery network capable of meeting the highest demand of the year. With storage, however, the electricity delivery system can be designed to accommodate a normal load and the stored energy can be used to respond to peak demands.

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[15]/ Avery, James P., Sunrise Powerlink, Chapter 1, Application No. A.05-12-014, San Diego Gas & Electric Company, August 4, 2006, p. I-16.

[16]/ San Diego Regional Energy Office, Energy 2020 – The San Diego Regional Energy Strategy, Creating a More Secure Energy Future for the San Diego Region, San Diego Association of Governments, May 2003, p. 16.

[17] CAISO, CEC/CPUC Joint Workshop, "Electricity Infrastructure Issues Resulting from SONGS Closure",July 15, 2013, p.36

[18]/ North American Electric Reliability Council, Reliability Assessment: 2002-2011, The Reliability of Bulk Electric System in North America, Final Draft for BOT Approval, October 2002, p. 28.

[19]/ California Energy Commission, Revised California and Western Electricity Supply Outlook Report, Prepared for the 2005 Integrated Energy Policy Report Proceedings Docket #04-IEP-1, CEC-700-2005-019-ED2, July 2005, p. 13.

"Pumped storage plants are primarily peak generating facilities. During off peak periods, water is pumped from a lower reservoir or body of water to an upper one. The water is then released for power generation during periods of peak power demand. Although a net consumer of energy, pumped storage can be economically viable because it uses baseload capacity during off peak periods to create additional peak capacity. Pumped storage can also be used to provide emergency reserve generating capacity."[20] LEAPS can respond to a CAISO dispatch signal to provide up to 500 MW in 15 seconds.

- **Integrate intermittent renewable resources**. Adding significant quantities of wind capacity to the grid will create integration challenges for the CAISO that, if not properly planned for, may lead to unnecessarily high integration costs. For example, the unpredictable and intermittent nature of wind will increasingly place the CAISO operators in the position of having to adjust up or down other generating resources. Without the additional regulation and quick responding spin capacity that LEAPS provides, the most optimistic scenario would have CAISO operators adjusting up or down the output of slow responding, fossil fuel thermal generation to integrate the additional wind capacity. This increased reliance on fossil fuel thermal generation for purposes of integrating wind resources would be contrary to California's RPS and GHG emission reduction objectives.

  It would be more likely that CAISO operators would simply curtail wind resources because it was the most economic choice, given all considerations, such as unit start-up costs, etc. The least optimistic scenario would have CAISO operators' blackout certain sections of the grid because of insufficient regulation capacity and fast responding spin required to level out any sudden, unexpected decrease in wind output.

  The CAISO has acknowledged the difficulty in planning for and integrating wind resources. In its November 2007 "Integration of Renewable Resources," the CAISO noted: "Additional storage capability would be of considerable benefit with the integration of large amounts of renewables, especially intermittent resources."[21] "A proven and deployed storage technology is hydro pump storage."[22]

- **Facilitate the development of workable competitive wholesale markets**. LEAPS will facilitate the implementation of California's MRTU energy and ancillary services market design by providing significant energy storage, regulation up and down, load following, and spin services. For example, LEAPS will be a "shock absorber" in the physical and economic systems by easily accommodating frequency deviations, large energy ramps, and significant mismatches between day-ahead schedules and real time supply and demand. To the extent CAISO operators have the necessary tools to meet real time deviations from schedules, LEAPS will minimize their need for out of market calls that end up harming workable wholesale competition.

- **Provide black start capability**. Because there is always the possibility of natural disasters, malfunctions, and other events causing all or a portion of the southern

[20]/ Upper Mississippi River Basin Association, Nonfederal Hydroelectric Development and Licensing – A Perspective from the Upper Mississippi River Basin, May 1991, p. 4.
[21]/ California Independent System Operator, Integration of Renewable Resources, November 2007, p. 10
[22]/ Op. Cit., p.11.

California grid to go down, it is particularly vital to provide for the restoration of network interconnections to the CAISO and the southern California transmission system in the event of such grid-wide emergencies, especially contingencies involving SONGS and other nuclear units. Having this capability is a critical feature to grid management.

LEAPS will be equipped to provide 500 MW of black start capability and can routinely produce 6,000 megawatt hours (MWh), and, in an emergency, 8,000 MWh, of stored energy. In addition, LEAPS can synchronize to and bring up a segment of the 500 kV interstate loop between Valley, Talega, and Case Springs substations. LEAPS can, independently of all other power facilities, fuel sources and transmission, from a cold start, be on line and ready to supply energy into the grid in 10 minutes. It can then, through its control room and associated substations, isolate the local segments of the 500 kV transmission system and resynchronize at 500 kV. Once these critical transmission segments are re-powered, the facility can expand outward to other grid segments and synchronize them as well. This will allow other power facilities to come on line and provide additional power supplies as the grid becomes re-established and re-interconnected.

All facility control rooms and substations have state of the art emergency power facilities and will provide long term power supply to all critical equipment, communications, and telemetry systems. The LEAPS control room will be equipped to function as an emergency command center, and will be able to communicate, not only with the CAISO, but with federal, State, and military facilities as well.

- **Provide voltage support**. All high voltage AC transmission lines provide positive voltage support (that is, provide VARs to the grid) when they are loaded below the "surge impedance loading" level (normally about 1,600 MWs for a 500 kV line) through line charging effect.

  All generators with excitation systems, which provide a range of lead and lag power factor (CAISO required +0.95 - 0.9 power factor capability for all generators), can help regulate transmission voltage. When in leading power factor, a generator supplies VARs to the system (increase voltage). When in lagging power factor, a generator consumes VARs from the system, thus reducing the transmission line voltage (when system is lightly loaded, transmission voltage tend to be too high, or above operating voltage limit). Further, VARs do not travel far. Local voltage support is, therefore, important to local areas. Because the location of the Project is central to SCE and SDG&E systems, LEAPS can provide voltage support to both the SCE and SDG&E systems.

  In addition, SONGS in the past has provided a much needed active voltage control to maintain voltage in the area. LEAPS can at least partially provide this voltage support[23]. For the SDG&E system, even today, after losing the SWPL line, the system continues to have a low voltage issue, particularly near the Miguel and South Bay areas, since these are located at the end of the radial system from SONGS. The Project can provide voltage support not only by supplying VARs directly but also

[23]/ It will be necessary to evaluate the extent of support LEAPS can provide, perhaps in concert with an SVC at the SONGS 230 kV bus.

indirectly by unloading the existing South of SONGS transmission lines by flow through Escondido.

In terms of renewable resources, most forms of solar and wind energy conversion devices provide limited reactive voltage support to the grid. In fact, these devices are likely to have a negative voltage support. With the increase of renewable energy requirements in California, voltage support will become a critical element (this will continue to become a more critical issue as the State moves toward the required 33 percent RPS level).

By their nature, modern advanced pumped storage facilities provide large amounts of reactive support and can provide this support in all modes of operation. For example, pumped storage facilities can run dry, synchronized to the 500 kV system. In this mode of operation, the units produce no real power, but provide reactive power support services to the grid as synchronous condensers. In the wet mode of operation, the units provide energy simultaneously with all ancillary services, particularly voltage support.

Most importantly, LEAPS can provide, as required, large amounts of voltage support for the CAISO controlled grid. This additional capacity will offset the local amounts of reactive support consumed by the wind and solar resources as they come on line.

2.4.2. TE/VS Interconnect Objectives

With regards to the TE/VS Interconnect, the following additional information provides an explanation and further elaboration of the Project's objectives.

- **Reduce Congestion**. Section 1221(a) of the EPAct 2005 (Siting of Interstate Electric Transmission Facilities) requires the Secretary of Energy to identify "any geographic area experiencing electric energy transmission capacity constraints or congestion that adversely affects consumers" as a National Interest Electric Transmission Corridor (NIETC). On August 6, 2006, the United States Department of Energy (DOE) issued a preliminary "National Electric Congestion Study" (Congestion Study), designating the southern California region as a "critical congestion area" under Section 1221 of the EPAct 2005. The Congestion Study defined "critical congestion area" as those "areas of the country where it is critically important to remedy existing or growing congestion problems because the current and/or projected effects of the congestion are severe."[24]

  As further indicated in the Congestion Study: "San Diego is the Nation's seventh largest city, that demand in this area is served by a combination of internal capacity and imported power, and that virtually all of the imports are delivered through two points of interconnect. Neither of these points of interconnection is capable of meeting the peak load import requirements of the area if the other is out of service."[25] This problem is further compounded by the retirement of SONGS and the future reductions of resources because of "once-through-cooling" impacts.

[24]/ United States Department of Energy, National Electric Transmission Congestion Study, Energy, August 2006.
[25]/ Ibid., pp. 45-46.

In an October 10, 2006 letter to the DOE, the CEC expressed its support for DOE's identification of southern California as one of two critical congestion areas.[26]

Not only is the Project located in roughly the middle of this NIETC, but by providing 1,800 MW (base plan) to 2,600 MW (extended plan) of additional extra high voltage transfer capacity available to the San Diego and Los Angeles basins, the TE/VS Interconnect will reduce congestion in this critical congested area of the CAISO controlled grid and, thereby, reduce the energy costs to CAISO consumers.

As discussed in Chapter 6.2 (Description of Project Alternatives and Impact Analysis), there are potentially a variety of means to reduce congestion, including adding new local generation, reducing or managing demand, and using alternative routings for transmission interconnections. Most of these strategies are, however, beyond the ability of the Applicant to bring to fruition. By proposing both a new transmission interconnection and new generation (pumped storage) within a critically congested area, the Applicant's Project will help reduce congestion and enhance reliability.

- **Provide at least 1,100 MW of incremental transmission import capability to San Diego and the L.A. Basin**. The Project will provide incremental transmission import capability for SDG&E under G-1/N-1 conditions to satisfy reliability criteria and to reduce the cost of meeting reliability criteria. The CPUC's resource adequacy (RA) policy requires its jurisdictional load serving entities (LSEs) to procure the bulk of their wholesale electric needs through forward procurement mechanisms. The Commission has established a capacity-based RA obligation. This RA procurement obligation includes a CAISO-determined Local Capacity Requirement (LCR). The CAISO determines the LCR by identifying specific areas within the CAISO Balancing Authority Area that have limited import capability and determines the generation capacity necessary to mitigate the local reliability problems in those areas to meet FERC approved reliability criteria. In general, the procurement cost of LCR capacity has been greater than the procurement cost of RA capacity.

  Currently, there are only two U.S.-based power import paths to the SDG&E service area. The first is the Southwest Powerlink (SWPL) 500 kV line from Imperial Valley to Miguel Substations together with the Imperial Valley-Central 500 kV line (Sunrise Project). The Sunrise line has been built on a 30+ mile common corridor right-of-way with SWPL before veering by a separate path to Central. The second is the South of SONGS path (WECC Path 44).

  The reliable import capability into the San Diego Basin is determined by analyzing many factors. However, in this area there are two important reliability tests: One is taking the worst single generation contingency (likely to be the loss of the Otay Mesa combined cycle plant) followed by the worst single transmission contingency. The transmission contingency is likely to be the North Gila to Imperial Valley 500 kV line. This is known as the "G-1/N-1" test required by CAISO in its reliability analyses. It is interesting and important to note that the system failure of September 2011 was very similar to this test. The second major test is the corridor failure of the SWPL line and

[26]/ California Energy Commission, Letter to United States Department of Energy, Response to U.S. Department of Energy's August 2006 National Electric Transmission Corridor Study: Comments of the California Energy Commission, October 10, 2006.

Sunrise line, either both at the same time (N-2) or one after the other (N-1-1) while making sure the SDG&E system still meets the WECC/NERC reliability criteria. After these "G-1/N-1" (as defined by CAISO reliability criteria) contingencies, all power flow originally on SWPL will have to flow through the South of SONGS path, as South of SONGS is the only remaining import path from the rest of WECC. Currently, the official South of SONGS limit is 2,500 MW for a limited period of time, and lower thereafter. However, with SONGS actually retired, the South of SONGS path rating has not been officially reset, but is highly likely to be far lower.

The TE/VS Interconnect provides a third and distinct import path to the SDG&E service area. For reliability analysis, after the loss of the most critical path (SWPL + Sunrise, with Special Protection Scheme exercised), the original flow on SWPL and Sunrise will now flow, divided between South of SONGS and the TE/VS Interconnect (part to Path 44 and part through Escondido).

Without the TE/VS Interconnect and with SONGS retired, before the loss of the SWPL+Sunrise corridor, the total flow on South of SONGS and SWPL/Sunrise must be kept to a maximum of 700 MW. In order to keep the flow below this much-reduced threshold and meet reliability requirements, SDG&E has to limit imports and replace that power with generation originating inside the SDG&E load service area (i.e., not including the Imperial Valley area). With the TE/VS Interconnect and phase shifters operating to schedule flow of at least 1,100 MW into SDG&E under normal condition and 1,800 MW under contingency conditions, the same system condition and contingency would allow the flow on South of SONGS and Case Springs-Escondido of 2,500 MW.

Since the TE/VS Interconnect will provide at least 1,800 MW of additional transmission to the San Diego load area under this contingency condition, it will reduce SDG&E's LCR by the same amount while satisfying the CAISO's reliability criteria. As such, the TE/VS Interconnect will reduce the cost of reliability to CAISO ratepayers.

Additionally, California has adopted an aggressive Renewable Portfolio Standard (RPS). Under the State's RPS policy, LSEs are required to procure 33 percent of their energy needs from renewable resources. In a significant number of cases, renewable resources are located in areas that are remote to the State's load centers. As such, additional transmission infrastructure will be required for the State's LSEs to access the pool of available renewable resources in as cost efficient manner as possible.

As indicated in California's "2007 Integrated Energy Policy Report," the CEC "has expressed concern that SDG&E's margin of safety is not large enough to ensure that it meets the 20 percent by 2010 goal and has encouraged SDG&E to procure, through contracts or development of utility-owned facilities, RPS energy equivalent to 20 percent by 2010 plus a 20 to 30 percent margin of error."[27]

By providing at least 1,000 MW of additional import capacity to SDG&E, the TE/VS Interconnect will provide access to a larger and more diversified pool of renewable resources, including developing wind energy resources in the Tehachapi area, solar

[27]/ California Energy Commission, 2007 Integrated Energy Policy Report, CEC-100-2007-008-CMF, 2007, p. 120.

energy from the Mohave area, geothermal energy from the Imperial Valley, and other renewable resources from Nevada, the Pacific Northwest, the western United States, and Canada.

Imperial Valley geothermal resources can be delivered more reliably to the San Diego area by means of the TE/VS Interconnect. TE/VS provides backup to the SWPL/Sunrise in the event it were lost. Plus, it makes possible delivery over the existing SCE and Imperial Valley Irrigation District (IID) networks.

As a result, by providing San Diego consumers more economical access to the Imperial Valley and other areas rich in renewable resource potential, the Project is an essential element in the State's efforts consistent with Senate Bill 1078 and California's "Energy Action Plan" (EAP). By providing access to the San Diego marketplace, the TE/VS Interconnect will encourage the development of such resources, thereby diversifying the State's resource mix and reducing its reliance on fossil fueled generation.

Enhanced access to renewable resources will promote the attainment of California's RPS and greenhouse gas (GHG) emission reduction objectives and will do so in an economically efficient manner, by reducing SDG&E's renewable resource portfolio risk.

- **Provide an interconnection between SDG&E and SCE transmission systems**. The State's existing 500 kV bulk transmission "backbone" runs from the Oregon border through the SCE service territory but does not connect with the Los Angeles and San Diego basins. San Diego's system currently connects to the rest of California via 230 kV lines running north through the San Onofre Nuclear Generating Station (SONGS) and 500 kV lines running east to Imperial Valley. The CEC confirms that a new "northern 500 kV interconnection would improve the reliability of California's transmission system and increase the state's overall ability to import lower cost power from Arizona, Mexico, and the Desert Southwest. In 2004, the California ISO noted that 'The transmission line proposed in association with the Lake Elsinore Pumped Storage Project would allow the San Diego area to import substantially more power from surrounding areas and would greatly enhance electric system reliability.'"[28]

  San Diego is the nation's seventh largest city and the nation's sixth largest county with an economy producing in excess of $70 billion of goods and services per year. Yet it depends on this single set of 230 kV lines from the north and a pair of contingency-relayed 500 kV lines to tie it into the transmission network outside the San Diego area to obtain the electricity imports needed to support its economy. Among the electric service areas in the State, only the San Diego region is so underserved.

  The TE/VS Interconnect will provide SDG&E with the first 500 kV connection directly to the robust network of SCE and thus to the CAISO 500 kV network backbone. By doing so, the facility will enhance the integration and operational reliability of the CAISO transmission grid.

- **Further long term infrastructure planning efforts**. The California Independent System Operator has noted that the "CAISO has begun developing a vision of an

[28]/ Op. Cit., Strategic Transmission Investment Plan, Final Joint Committees Report, CEC-700-2007-018-CMF, p. 106.

adequate 500 kV backbone transmission system for the state."[29] According to the CAISO, it is the lack of this type of backbone transmission that gives rise to the exercise of market power and the need for broad market-wide mitigation measures. Correcting this deficiency through transmission upgrades would, according to the CAISO, be more prudent than relying on ongoing regulatory intervention.[30]

In addition to providing for the first 500 kV connection directly into San Diego, and tying it with the CAISO- controlled grid, in the future, the TE/VS Interconnect would serve as the northern leg of a 500 kV full loop around San Diego that would tie TE/VS and Sunrise. This option would not be exercised by the Applicant but might be considered by the Commission as part of its long term planning efforts.

- **Provide access to the planned pumped storage facility**. With the State increasingly focusing on how to integrate the mandated renewable resources into the grid, LEAPS is the only large project on the horizon which is able to provide 500 MW of renewable storage and firming while also providing increased grid reliability and enhanced access paths to renewable basins.

  By providing the CAISO grid access to LEAPS, the TE/VS Interconnect will allow the grid the full benefit of the flexibility that facility can provide. This includes storage and firming of renewable resources and particularly intermittent renewable resources, like wind. In addition, LEAPS will provide 500 MW of dispatchable power, regulation and fast responding spin to integrate intermittent renewable resources generation procured by southern California's LSEs and 500 MW of storage regulation and load following capability to facilitate the development of workable competitive wholesale markets. This, combined with the ability to provide voltage support, will help the grid integrate wind and other renewable energy resources in the southern California electrical region.

  Sites for pumped storage facility hydro are relatively rare, particularly so in southern California. The location identified for LEAPS is likely the only site capable of efficiently supporting a large scale facility. If the State is to utilize the benefits of pumped storage, LEAPS must be connected to the CAISO controlled grid.

2.5. Proposed Extension to the TE/VS Interconnect

Because of the retirement of SONGS and the impending reduction of generation in the coastal area of the both Los Angeles and San Diego as a result of once-through-cooling restrictions, it will be important to use transmission resources as effectively as possible. This is both an immediate need (tied to the retirement of SONGS) as well as long-term. In addition, the use of 500 kV transmission for large-scale power delivery has been seen as an important replacement for 230 kV transmission.

The TE/VS Interconnect was originally proposed as a supplement to the capability of SONGS. However, with SONGS gone, the TE/VS Interconnect, with a normal capability of 2,598 MVA (and optionally higher under emergency conditions), may be easily modified to be a full

[29]/ California Independent System Operator, Testimony of Armando J. Perez, Stephen Thomas Greenleaf and Keith Casey on behalf of the California Independent System Operator, Application 01-04-012, September 25, 2001, p. 19.

[30]/ California Public Utilities Commission, Proposed Alternative Decision of Commissioner Peevey, A. 01.04-012, mailed May 1, 2003, p. 14.

replacement for SONGS. As proposed, the 500kV capacity of the TE/VS Interconnect is stifled by limiting the use to only supplying the Talega–Escondido 230 kV systems at Case Springs. By extending the 500 kV line beyond Case Springs to at least Talega and (perhaps also to the once proposed Rainbow site), the full potential of this project may be more fully realized. The modification will move 500 kV transmission as deep into the existing 230 kV system in Southern California as reasonably possible.

The prospect of extending TE/VS Interconnect to Talega at 500 kV puts the 500 kV terminus within a half mile of the four high-capacity 230 kV lines coming out of the SONGS substation and heading north into the Los Angeles basin. By looping these lines into a newly upgraded 500/230 kV substation at Talega, the ability to replace SONGS would be largely realized. Both the SCE and SDG&E systems would benefit. This would restore much of the value of Path 44 in backstopping SDG&E's imports from the east over SWPL.

In addition to the prospect of extending TE/VS to Talega, with its benefits, there are options in extending the 500 kV easterly from Case Springs. Following the existing Talega-Escondido line east from Case Springs to the corner where the right-of-way turns south to Escondido, one comes to the previously proposed Rainbow Substation site. At this point, a substation could be installed stepping down from 500 kV to 230 kV, using two transformer/phase shifter strings. Then the 230 kV line from there to Escondido could be upgraded to double circuit, double bundled 230 kV. This would provide about 900 MVA of flow capability into SDG&E through Escondido. This 500 kV substation would also provide a jumping-off point for a continuation of the 500 kV line south for about 60 miles to Central Substation. This latter extension would then effectively close the gap between the 500 kV SWPL system to the south and the Palo Verde-Devers-Valley 500 kV path to the north, thus integrating the 500 kV system in the area.

A variant on the extension of the TE/VS 500 kV line to the east from Case Springs to Rainbow would be to continue down the 230 kV right-of-way at 500 kV to Escondido. Again, the 500/230 kV stepdown would be used, and the extension to Central would be about 35 miles rather than 60 miles from Rainbow to Central.

These two prospective extensions of TE/VS are not mutually exclusive, and indeed provide complimentary benefits. Together they move the 500 kV system further into the two basins and offer mutual support to each other and the system in general. But, the 500 kV TE/VS Interconnect is the key link in this important integration process much needed in the southern California area.