



California ISO

2015-2016 Conceptual
Statewide Transmission
Plan Update

California ISO 2016-
2017 Regional
Transmission Planning
Process

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1. Introduction

The development of the Conceptual Statewide Transmission Plan (Plan) is pursuant to section 24.4.4 of the California ISO tariff and its purpose is to ensure that the California ISO's regional plan complements transmission plans of other CTPG members. The 2015-2016 Plan is an update to the 2014-2015 Plan and will be used as an input into the California ISO's 2016-2017 regional planning process which is currently under way. The information that is presented in this Plan has drawn from past efforts of the California Transmission Planning Group (CTPG) in which the California ISO participated in as well as information provided in 2015 WestConnect (Order 890) Annual Ten-Year Transmission Plan¹. The Plan takes a California statewide perspective rather than focusing only on the California ISO Planning Region. As such, it includes potential high level transmission solutions across the state that are needed to address identified reliability needs and to meet California's 33 percent renewable energy goal by 2020.

As originally envisioned by the CTPG, this Plan tabulates proposed transmission facilities of the California transmission planning entities as they are documented in the California ISO's 2015-2016 regional transmission plan and the 2015 WestConnect (Order 890) Annual Ten-Year Transmission Plan. However, since 2012 the need for CTPG activities have largely been minimal due to the organization and implementation of the Western Planning Regions on June 1, 2015 to address FERC Order 1000 regional and interregional requirements. While CTPG fulfilled a significant coordination role among its members during the earlier years of its activity, going forward coordination with those members involved in CTPG is now being accomplished through WestConnect as an Order 1000 planning region. Given the interregional coordination efforts in place and that coordination with the annual transmission plan itself, the California ISO considers that the purpose originally served by the Conceptual Statewide Plan will be met through other forums, and anticipates bringing the annual development of this Conceptual Statewide Plan to an end in early 2017 or earlier.

2. Development of the California ISO Conceptual Statewide Plan

Importantly, the transmission projects proposed by all California transmission planning entities will ultimately be approved through their own transmission planning processes. Accordingly, the California ISO is not seeking stakeholder comment regarding those entities who are members of the WestConnect Planning Region as they will coordinate comments through their own processes.

In addition to the information provided in this Plan, general documentation of the California ISO's regional vision regarding the solutions that have been identified and approved through the California ISO's own regional planning process are presented. These solutions are based on, among other things, the California ISO's base case

¹ <https://doc.westconnect.com/Documents.aspx?NID=17179>

assumptions, studies of several sensitivity scenarios, other studies and analyses that the California ISO has previously discussed with stakeholders in the 2015-2016 regional planning process, as well as input from other planning regions such as WestConnect.

Finally, with the release of this Plan the California ISO is providing an opportunity for interested stakeholders to submit comments and recommend modifications to the Plan as it pertains to the information presented in this Plan. This may include information that is documented within the California ISO’s 2015-2016 regional plan, including alternative transmission and non-transmission solutions, potential interstate transmission lines and proposals for access to resources located in areas not identified in the plan. This information will be considered in the California ISO’s 2016-2017 regional planning process. Stakeholder comments and recommended modifications to the Plan that may be associated with WestConnect members will be provided to WestConnect for consideration in their process.

3. Projects Comprising the California ISO Conceptual Statewide Plan

All projects which comprise the Plan are listed in Table 1. When considered together, they provide a foundational plan for achieving all requirements that have been identified by the California ISO’s regional planning process and those planning processes of the other California transmission planning entities that are members of WestConnect. All California ISO projects listed in Table 1 have been considered and approved through the California ISO’s 2015-2016 regional planning process. Projects listed for other CTPG members and documented in the 2015 WestConnect (Order 890) Annual Ten-Year Transmission Plan or other designated document locations are proposed through the individual CTPG member’s transmission plans and only establish a determination of need. The actual status of these individual projects may be included in the individual transmission plans through which their need was determined and as such, should be consulted if further information about these individual projects is required.

Table 1 – Projects Comprising the 2014-2015 Conceptual Statewide Plan

Balancing Authority	Area	Transmission	Included in 2014-2015 Conceptual Statewide Plan	Reported in Current Regional Transmission Plan
CAISO	PG&E	Panoche – Ora Loma 115 kV Line Reconductoring	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	PG&E	Bellota 230 kV Substation Shunt Reactor	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	PG&E	Cottonwood 115 kV Substation Shunt Reactor	No	CAISO 2015-2016 Plan - Table 7.2-1

CAISO	PG&E	Delevan 230 kV Substation Shunt Reactor	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	PG&E	Ignacio 230 kV Reactor	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	PG&E	Los Esteros 230 kV Substation Shunt Reactor	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	PG&E	Wilson 115 kV SVC	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	SDG&E	15 Mvar Capacitor at Basilone Substation	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	SDG&E	30 Mvar Capacitor at Pendleton Substation	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	SDG&E	Reconductor TL 605 Silvergate – Urban	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	SDG&E	Second Miguel – Bay Boulevard 230 kV Transmission Circuit	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	SDG&E	TL600: “Mesa Heights Loop-in + Reconductor	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	SCE	Eagle Mountain Shunt Reactors	No	CAISO 2015-2016 Plan - Table 7.2-1
CAISO	SCE	Lugo – Victorville 500 kV Upgrade (SCE portion)	No	CAISO 2015-2016 Plan - Table 7.2-1
LADWP²	Tehachapi area	Barren Ridge Renewable Transmission Project Barren Ridge-Haskell 230kV Lines and Barren Ridge-Rinaldi 230kV Line (upgrade)	Yes	Exhibit 6 2015 WestConnect Transmission Plan
IID³	Imperial County	Niland Substation Transformer Replacement	Yes	Exhibit 6 2015 WestConnect Transmission Plan
IID	Imperial County	Hoover 230 kV Switching Station	Yes	Exhibit 6 – Planned 2015 WestConnect Transmission Plan
WASN⁴	Northern California	Keswick-Airport-Cottonwood 230kV reconductoring	No	Exhibit 6 – Planned 2015 WestConnect Transmission Plan
WASN	Northern California	Olinda-Cottonwood #1 & #2 230 kV Reconductoring	No	Exhibit 6 – Planned 2015 WestConnect Transmission Plan
WASN	Northern California	Olinda 230 kV Reactive Voltage Control	No	WASN OASIS Website

² Los Angeles Department of Water Power

³ Imperial Irrigation District

⁴ Western Area Southern Nevada

Section 4 of this report provides an overview of the California ISO Planning Region including solutions and transmission upgrades that have been identified in the California ISO 2015-2016 transmission plan. Background and details on the transmission plans of other CTPG members can be found in the 2015 WestConnect (Order 890) Annual Ten Year Transmission Plan.

4. Details of the California ISO Conceptual Statewide Plan

Since the first California ISO Conceptual Statewide Plan was prepared, the California ISO and WestConnect Planning Regions have performed and documented, respectively, the results of their regional planning assessments to address reliability and RPS needs, among others, across a ten year planning horizon. This portion of the report provides an overview of the California ISO's 2015-2016 planning effort which covers a broad range of needs throughout the California ISO's Planning Region. A detailed discussion of the California ISO's planning assessment is documented in the California ISO's 2015-2016 Transmission Plan⁵. Likewise, other California transmission planning entities participate in and have documented their transmission assessments through the WestConnect Planning Region's planning process. As such, details on their transmission plans are documented in the 2015 WestConnect (Order 890) Annual Ten Year Transmission Plan.

5. California ISO Balancing Authority Area

The California ISO Balancing Authority's 2015-2016 Transmission Plan provides a comprehensive evaluation of the California ISO transmission grid to identify upgrades needed to successfully meet California's policy goals, in addition to examining conventional grid reliability requirements and projects that can bring economic benefits to consumers. This plan is updated annually, and is prepared in the larger context of supporting important energy and environmental policies while maintaining reliability through a resilient electric system.

5.1 California ISO 2015-2016 Transmission Plan Summary

Needs which have historically been driven by customer load growth, are now driven predominantly by the policy-driven transitions in the electricity industry to renewable energy and decarbonizing the grid. As such, the transmission plan is a bellwether of the industry infrastructure transitions, both in the evolving demands placed on the transmission system and the issues that need to be managed in meeting those new demands.

⁵ <http://www.caiso.com/Documents/Board-Approved2015-2016TransmissionPlan.pdf>

The California ISO 2015-2016 Transmission Plan reflects the continuation of the trends established through the past number of previous plans:

- new reliability requirements have consistently declined in a period of relatively low load growth, after experiencing a spike in development activity to address the transition away from coastal once-through cooling gas-fired generation and the early retirement of the San Onofre Nuclear Generating Station;
- transmission needs to access renewable generation development to achieve the state's 33 percent by 2020, renewable generation goals have largely been identified and are moving forward;
- economic-driven development has been explored through a number of California ISO planning cycles where a number of major projects have been initiated and where new projects have been identified as needed in this cycle; and
- while new policy-driven goals have been established in California, considerable analysis is necessary to choose among technologically and geographically diverse resources before transmission decisions can be made to access those renewables and pursue other transmission opportunities that may be needed to access those renewables. This has been especially challenging given the need to consider the growing benefits of regionalism where considering needs and options on a more west-wide basis and the increasing benefits of resource and geographic diversity are needed to move to yet higher renewable energy goals.

The California ISO 2015-2016 Transmission Plan shows a continued trend demonstrated in past transmission plans of a declining amount of new capital transmission projects being identified and expanding the analysis of the issues that will need to be managed as the grid continues its transition from conventional resources to renewable resources and other preferred resources in meeting those needs. This trend has been partially offset by the need to address replacing aging infrastructure and the management of new concerns such as increasing demands on voltage control, which has driven much of the reinforcement projects identified in the California ISO 2015-2016 Transmission Plan.

In preparation for the next wave of development to achieve higher renewable energy goals, additional special studies were conducted within the planning cycle to inform resource discussions and to proactively manage emerging system performance issues resulting from the transitions on the supply side, e.g. resources, and the demand side, e.g. customer needs.

Key analytic components of the plan included:

- continuing to refine the plans for transmission needed to support meeting the 33 percent RPS goals, which are based on renewable resource portfolios produced through a process established by the California Public Utilities Commission (CPUC) and California Energy Commission (CEC) of the type and location of renewable

resources most likely to be developed to meet the 33 percent renewables portfolio standard (RPS) goal by 2020⁶;

- supporting advancement of preferred resources in meeting needs overall, and in particular in southern California;
- identifying transmission upgrades and additions needed to reliably operate the network and comply with applicable planning standards and reliability requirements; and
- performing economic analysis that considered whether transmission upgrades or additions could provide additional ratepayer benefits.

Increased opportunity for non-transmission alternatives, particularly preferred resources and storage, continued to be a key focus of the transmission planning analysis. In this regard, the ISO's transmission planning efforts focused on not only meeting the state's policy objectives through advancing policy-driven transmission, but also to help transform the electric grid in an environmentally responsible way. The focus on a cleaner lower emission future governs not only policy-driven transmission, but our path on meeting other electric system needs as well.

The California ISO's evaluation of the areas listed above resulted in the following key findings:

- Identification of 14 transmission projects as needed to maintain transmission system reliability. The California ISO recommended and received approval of those 14 projects with an estimated cost of approximately \$288 million. Further coordination with a neighboring planning region will be undertaken for the remaining project with approval being deferred to next year's planning cycle;
- As a part of the 2015-2016 planning efforts, the California ISO conducted a separate and standalone review of a large number of local area low voltage transmission projects in the PG&E service territory that were predominantly load forecast driven and whose approvals dated back a number of years. In reviewing the continued need for those projects in light of materially lower load forecast levels since those projects were approved, the California ISO took into account existing planning standards, California local capacity requirements, and deliverability requirements for generators with executed interconnection agreements. As a result of the review, 13 predominantly lower-voltage transmission projects that were found to be no longer required and were

⁶ SB 350, The Clean Energy and Pollution Reduction Act of 2015 (Chapter 547, Statutes of 2015) was signed into law by Governor Jerry Brown on October 7, 2015. The new law establishes targets to increase retail sales of qualified renewable electricity to at least 50 percent by 2030. Future planning cycles will focus on moving beyond the 33 percent framework when renewable generation portfolios become available through the process established with the California Public Utilities Commission and California Energy Commission.

recommended to be cancelled. Only one of the 13, a 230 kV to 60 kV transformer addition, had a regional (e.g. greater than 200 kV) component.

- The California ISO's analysis also indicated that the authorized resources, forecast load, and previously-approved transmission projects working together continued to meet the forecast reliability needs in the LA Basin and San Diego areas. However, due to the inherent uncertainty in the significant volume of preferred resources and other conventional mitigations, the situation is being continually monitored in case additional measures are needed;
- Consistent with recent transmission plans, no new major transmission projects were identified as needed to support achievement of California's 33 percent renewables portfolio standard given the transmission projects already approved or progressing through the CPUC approval process;
- No economic-driven transmission projects were recommended for approval; and
- None of the transmission projects in this transmission plan include facilities eligible for competitive solicitation.

Special studies focusing on emerging grid transition and renewable integration issues expanded on similar studies performed in previous years, including the following:

- a preliminary effort studying gas pipeline and electricity coordination given the evolving role of gas fired generation in southern California;
- a preliminary study of the capabilities of the California ISO grid to accommodate renewable generation resources on an energy-only basis in moving beyond 33 percent renewables to a 50 percent renewables goal. Note that this is informational only to assist industry in considering options in moving beyond 33 percent; and,
- a preliminary study of the benefits of large energy storage in managing oversupply periods in moving beyond 33 percent; this study explored a 40 percent renewables condition.

A number of interregional projects were raised by stakeholders during the planning cycle. The California ISO conducted some analysis of several of these projects reflecting a more limited California ISO view of those projects. The California ISO will be participating in the interregional Federal Energy Regulatory Commission (FERC) Order No. 1000 interregional planning process with the neighboring western planning regions as that process commences for the first time in the first quarter of 2016, which will allow for a broader consideration of the potential benefits of these projects.

5.2 The Transmission Planning Process

The California ISO's transmission planning process is defined by three distinct phases of activity that are completed in consecutive order across a time frame called a planning cycle. The planning cycle is identified by a beginning year and a concluding

year with the beginning year starting in January but extends beyond a single calendar year. The California ISO 2015-2016 planning cycle, for example, began in January 2015 and concluded in March 2016. The distinct phases of the planning cycle are defined below:

- Phase 1 - Develop and finalize a study plan that documents the assumptions, models and public policy mandates that will be followed throughout the planning cycle;
- Phase 2 - Performance of all technical assessment where solutions, transmission or otherwise, are identified to as required for the California ISO controlled grid or that may be needed to support other state or industry informational requirements. Document the results, conclusions, and recommendations in a transmission plan, which is considered by the Board for approval; and,
- Phase 3 - If required, engagement in a competitive solicitation for prospective developers to build and own new transmission facilities identified in the Board-approved plan.

5.3 State Agency Coordination in Planning

State agency coordination in planning continued to build on the core strengths offered by the CPUC, CEC, and California ISO towards building further improvements into the development of unified planning assumptions and other considerations that are a crucial component of the California ISO's transmission plan. While the coordination effort not only enhanced the importance of the transmission plan it continued to establish a firm foundation over which enhancements in future transmission planning cycles can be successfully achieved.

The 2015-2016 planning assumptions and scenarios were developed through the annual process the California ISO, CEC and CPUC have in place and performed in the fall of each year to be used in infrastructure planning activities in the coming year. This alignment effort continued to improve infrastructure planning coordination within the three core processes:

- long-term forecasts of energy demand produced by the CEC as part of its biennial Integrated Energy Policy Report (IEPR),
- biennial long term procurement plan proceedings (LTPP) conducted by the CPUC, and
- annual transmission planning process performed by the California ISO.

In this coordination effort, the agencies considered assumptions such as demand, supply and system infrastructure elements, and the 33 percent RPS generation portfolios proposed by the CPUC. The results of the CPUC's annual process feeding into this 2015-2016 transmission planning process were communicated via an

assigned commissioner's ruling in the 2014 LTPP.⁷ These assumptions were further vetted by stakeholders through the California ISO's stakeholder process which resulted in this year's study plan.⁸ The California ISO considers the agencies' successful effort coordinating the development of the common planning assumptions to be a key factor in promoting the California ISO's transmission plan as a valuable resource in identifying grid expansion necessary to maintain reliability, lower costs for California consumers, or meet future infrastructure needs based on public policies. This coordination is expected to continue and grow, as demonstrated in the Renewable Energy Transmission Initiative, and will aid in the development of renewable generation portfolios moving beyond 33 percent to the higher goals now in effect in California.

5.4 Renewables Portfolio Standard Policy-driven Transmission Assessment

The transition to greater reliance on renewable generation has created significant transmission challenges because renewable resource areas tend to be located in places distant from population centers. The California ISO's transmission planning process has balanced the need for certainty by generation developers as to where this transmission will be developed with the planning uncertainty of where resources are likely to develop by creating a structure for considering a range of plausible generation development scenarios and identifying transmission elements needed to meet the state's renewables portfolio standard. Commonly known as a "least regrets methodology", the portfolio approach allowed the California ISO to consider resource areas (both in-state and out-of-state) where generation build-out is most likely to occur, evaluate the need for transmission to deliver energy to the grid from these areas, and identify any additional transmission upgrades that are needed under one or more of the portfolios considered in the planning process. These transmission upgrades were identified as policy-driven requirements and considered in the transmission plan's 33 percent RPS assessment.

Public policy requirements and directives are an element of transmission planning that was added to the planning process in 2010. Planning transmission to meet public policy directives is a national requirement under FERC Order No. 1000 and it enables the California ISO to identify and approve transmission facilities that system users need to comply with state and federal requirements or directives. The primary policy directive across the last five transmission plans as well as the current transmission plan was California's renewables portfolio standard that calls for 33 percent of the electric retail sales in the state in 2020 to be provided from eligible renewable resources. California's Clean Energy and Pollution Reduction Act of 2015, SB 350 was

⁷ Rulemaking 13-12-010 "Assigned Commissioner's Ruling on updates to the Planning Assumptions and Scenarios for use in the 2014 Long-Term Procurement Plan and the California Independent System Operator's 2015-2016 Transmission Planning Process" on March 4, 2015 with an update adopted on October 28, 2015.

⁸ <http://www.caiso.com/Documents/2015-2016FinalStudyPlan.pdf>

signed into law on October 7, 2015 establishing targets to increase retail sales of qualified renewable electricity to at least 50 percent by 2030. Future planning cycles will focus on moving beyond the 33 percent framework when renewable generation portfolios become available through the process established with the CPUC and CEC. The California ISO's study work and resource requirements determination for reliably integrating renewable resources has continued on a parallel track outside of the transmission planning process, but steps were taken to incorporate those requirements into the California ISO's 2015-2016 Transmission Plan and in future transmission plans developed by the California ISO.

The California ISO assessment of the CPUC portfolios did not identify a need for new transmission projects to support achievement of California's 33 percent renewables portfolio standard. As such, the transmission plan concluded that the transmission projects already approved or progressing through the California Public Utilities Commission approval process provided sufficient transmission capacity to meet the need of the current renewable portfolios.

Table 2 provides a summary of the various transmission elements of the 2015-2016 Transmission Plan for supporting California's renewables portfolio standard in addition to providing other reliability benefits. These elements are composed of the following categories:

- major transmission projects that have been previously approved by the California ISO and are fully permitted by the CPUC for construction;
- additional transmission projects that the California ISO interconnection studies have shown are needed for access to new renewable resources but are still progressing through the approval process; and
- major transmission projects that have been previously approved by the California ISO but are not yet permitted.

Table 2: Elements of 2015-2016 California ISO Transmission Plan Supporting Renewable Energy Goals

Transmission Facility	Online
Transmission Facilities Approved, Permitted and Under Construction	
Tehachapi Transmission Project	2016
Path 42 and Devers-Mirage 230 kV Upgrades	2016
Additional Network Transmission Identified as Needed in California ISO Interconnection Agreements but not Permitted	
Borden Gregg Reconductoring	2018
South of Contra Costa Reconductoring	2016
West of Devers Reconductoring	2021
Coolwater-Lugo 230 kV line ⁹	cancelled
Policy-Driven Transmission Elements Approved but not Permitted	
Sycamore – Penasquitos 230kV Line	2017
Imperial Valley Area Collector Station ¹⁰	cancelled
Eldorado-Mohave and Eldorado-Moenkopi 500 kV Line Swap	2017
Lugo – Eldorado series cap and terminal equipment upgrade	2019
Warnerville-Bellota 230 kV line reconductoring	2017
Wilson-Le Grand 115 kV line reconductoring	2020
Suncrest 300 Mvar SVC	2017
Lugo-Mohave series capacitors	2019
Additional Policy-Driven Transmission Elements Recommend for Approval	
None identified in 2015-2016 Transmission Plan	

⁹ The project was cancelled after conventional generation in the area retired and the project was no longer required in order to provide requested generation interconnection service.

¹⁰ The ISO received notice from the Imperial Irrigation District on November 24, 2015 exercising its right to terminate the Approved Project Sponsor Agreement. As the project was dependent on IID’s participation, the project has been cancelled.

5.5 Key Economic Study Findings

While reliability analysis provides essential information about the electrical characteristics and performance of the California ISO controlled grid, an economic analysis provides essential information about transmission congestion. Generally speaking, transmission congestion increases consumer costs because it prevents lower priced electricity from serving load. It follows then that minimizing or resolving transmission congestion can be cost effective to the ratepayer if solutions can be implemented to generate savings that are greater than the cost of the solution. For a proposed solution to qualify as an economic project, the benefit has to be greater than the cost. If there are multiple alternatives, the solution that has the largest net benefit is considered the most economical solution. Note that other benefits and risks must also be taken into account – which cannot always be quantified – in the ultimate decision to proceed with an economic-driven project.

An economic planning analysis was performed as part of the 2015-2016 transmission planning cycle in accordance with the unified planning assumptions and study plan. All approved reliability and policy network upgrades were modeled in the economic planning database to ensure that the results of the analysis would be based on a transmission configuration consistent with the reliability and public policy results documented in this transmission plan. The economic planning analysis was performed in two steps: 1) congestion identification; and 2) congestion mitigation. Using production cost simulation and traditional power flow software, grid congestion was identified for the 5th and 10th planning years (2020 and 2025). Congestion results were aggregated across specific branch groups and local capacity areas and then ranked by severity in terms of congestion hours and congestion costs. From this “ranked” information, as well the consideration of nine economic study requests that had been submitted to the California ISO as possible economic projects, five high priority congestion areas or projects were selected for further assessment.

Once the five high priority congestion areas or projects were selected, further economic planning analysis was performed on these high priority congestion areas to identify possible solutions to mitigate the congestion in these areas and to assess the economic benefits the possible solutions could bring to ratepayers. Based on the results of the economic planning analysis the California ISO determined that there were no economic upgrade recommendations needed in this plan.

5.6 Policies and Initiatives that Influenced the 2015-2016 Transmission Plan

The transmission planning process is influenced by a number of other evolving processes and initiatives in which the California ISO has varying degrees of influence, input and control. As part of the California ISO’s overall planning assessment, attention to the relationship these processes and initiatives might have to the current transmission planning cycle was considered.

Interregional Transmission Coordination per FERC Order No. 1000

The reforms FERC Order No. 1000 required transmission utility providers to implement affected the California ISO's existing regional transmission planning process and directed the California ISO to collaborate with neighboring transmission utility providers and planning regions across the Western Interconnection to develop a coordinated process for considering interregional projects. These regional and interregional reforms were designed to work together to ensure an opportunity for more transmission projects to be considered in transmission planning processes on an open and non-discriminatory basis both within planning regions and across multiple planning regions.

The California ISO's tariff is compliant with the regional and interregional requirements of FERC Order No. 1000. While the California ISO's prior tariff was largely compliant with the new regional requirements, tariff adjustments were necessary to fully align with the order in a number of areas including the establishment of the California ISO as one of four western planning regions established within the Western Interconnection¹¹.

The California ISO received FERC's final order on interregional transmission coordination on June 1, 2015. During 2015 the California ISO and its neighboring western planning regions considered approaches to develop certain business practices that would provide stakeholders visibility and clarity on how the western planning regions would implement interregional coordination requirements into their respective regional planning processes. Ultimately the California ISO, NTTG, and WestConnect collaborated in developing a set of business practices that would be beneficial to stakeholders and to facilitate successful interregional transmission coordination engagement among the western planning regions. NTTG and WestConnect will each determine how these business practices will be incorporated into their regional processes. The California ISO will incorporate the procedures into its transmission planning business practice manual.

While ColumbiaGrid chose to pursue a different approach to business practices, the western planning regions are committed to proactively engage in interregional transmission coordination activities across all four regional planning processes.

Generator Interconnection and Deliverability Allocation Procedures (GIDAP)

The principal objective of the GIDAP is to ensure that going forward all major transmission additions and upgrades to be paid for by ratepayers would be identified and approved under the transmission planning process. The most significant implication for the 2015-2016 transmission planning process relates to the planning of policy-driven transmission focused on achieving the state's 33 percent renewables portfolio standard. In that context and commensurate with the base renewables

¹¹ Western planning regions are the California ISO, ColumbiaGrid, Northern Tier Transmission Group (NTTG), and WestConnect.

portfolio scenario provided by the CPUC and the California ISO's generator interconnection queue up to and including queue cluster 8, the California ISO planned transmission solutions that provided deliverability for new renewable energy projects unless specifically noted otherwise.¹²

Renewable Integration

The California ISO currently conducts a range of studies to support the integration of renewable generation into the California ISO controlled grid. However, given the further increase in renewable generation being achieved and forecast further analysis on a programmatic basis was considered in the transmission planning process to address additional emerging issues including the implications of significant displacement of conventional generation with renewable resources that do not have the same inherent fundamental operating characteristics; the exploration of system frequency response performance; transient and dynamic system performance; voltage control performance; and flexible needs throughout the system ramping spectrum.

The additional renewable integration studies that were undertaken in 2015 either as part of the 2015-2016 planning cycle or coordinated with it, included further analysis of expected frequency response performance at higher renewable generation levels, which built on preliminary studies conducted in the 2014-2015 cycle, and a preliminary analysis of the benefits of large scale energy storage in addressing ramping and potential oversupply challenges – e.g., the “duck curve.”¹³ At this time, voltage control issues tend to be more localized, and are being considered throughout existing reliability analysis.

Non-Transmission Alternatives and Preferred Resources

Building on efforts in past planning cycles, the California ISO is continuing to make material strides in facilitating the use of preferred resources to meet local transmission system needs. Continuing to build on the California ISO's proposed methodology¹⁴ to support California's policy emphasis on the use of preferred resources,¹⁵ the California ISO explored opportunities to:

- identify areas where reinforcement may be necessary in the future but the reasonable timelines to develop conventional alternatives do not require immediate action. The California ISO believes that has provided developers

¹² Every RPS Calculator portfolio submitted by the Commission into the ISO's transmission planning process for purposes of identifying policy-driven transmission to achieve 33 percent RPS has assumed deliverability for new renewable energy projects.

¹³ http://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf

¹⁴ <http://www.caiso.com/Documents/Paper-Non-ConventionalAlternatives-2013-2014TransmissionPlanningProcess.pdf>

¹⁵ To be precise, “preferred resources” as defined in CPUC proceedings applies more specifically to demand response and energy efficiency, with renewable generation and combined heat and power being next in the loading order. The term is used more generally here consistent with the more general use of the resources sought ahead of conventional generation.

opportunity to develop preferred resource proposals in their submissions into utilities' procurement processes;

- consider energy storage as part of the overall preferred resource umbrella in transmission planning, in particular opportunities for large scale energy storage to help address flexible capacity needs; and,
- integrate demand response whether they be supply side resources or load-modifying resources. These activities, such as participating in the CPUC's demand response related proceedings, have supported identification of the necessary operating characteristics so that the demand response role in meeting transmission system increases as design and implementation issues are addressed.

Southern California Reliability Assessment and Renewable Generation in Imperial area

The reliability needs in southern California and the complex interrelationship with deliverability of generation from the Imperial and Riverside areas have received considerable emphasis in past planning cycles. As in the 2014-2015 transmission planning cycle, efforts were made in this 2015-2016 planning cycle to monitor the progress of the basket of forecast procurement of conventional and preferred resources and California ISO-approved transmission upgrades, and test the collective effectiveness of those solutions to meet the area's reliability needs.

Clean Energy and Pollution Reduction Act of 2015

On October 7, 2015 Governor Jerry Brown signed into law SB 350, the Clean Energy and Pollution Reduction Act of 2015. The bill established, among other goals, a 50 percent renewables portfolio standard (RPS) by 2030. In summary, the bill requires:

- existing RPS counting rules remain unchanged;
- load serving entities to increase purchases of renewable energy to 50 percent by December 31, 2030; and
- setting steadily higher interim targets for compliance periods ending in 2024 and in 2027.

The bill also set the stage for the California ISO to transform into a regional organization and empowered the California ISO to proceed to complete a series of analytic and legislative requirements that consider structural changes to the California ISO's governance.

SB 350 has created a pathway to higher levels of renewable generation and lower greenhouse gas emissions. The California ISO looks forward to helping make these goals achievable and working with the Legislature and interested parties to move forward with structural changes to California ISO governance in order to increase benefits to California and the region.

Renewable Energy Transmission Initiative (RETI) 2.0

Another outcome of SB 350 is that new investments in the state's electric transmission system will be required to achieve the renewable energy goals, which will necessarily

require planning and coordination across California and the West. To this end, the California ISO has partnered with the CEC and the CPUC to conduct the Renewable Energy Transmission Initiative (RETI) 2.0. This initiative is an open, transparent, and science-based process that will explore the viability of renewable generation resources in California and throughout the West, consider critical land use and environmental constraints, and identify potential transmission opportunities that could access and integrate renewable energy with the most environmental, economic, and community benefits.

While RETI 2.0 is not a regulatory proceeding in itself, the insights, scenarios, and recommendations it will generate will frame and inform future transmission planning processes and proceedings with stakeholder-supported strategies to help reach the state's 2030 renewable energy goals. RETI 2.0 will enable input from stakeholders and is expected to feed into the 2017-2018 transmission planning process.

Distributed Energy Resources Growth Scenarios

Through the Energy Storage and Distributed Energy Resources (ESDER) stakeholder initiative, the California ISO has been actively engaged in enhancing the ability of distributed energy resources (DERs) to participate in the California ISO markets. At the same time the CPUC has placed an increased emphasis on incorporating DERs into its planning and procurement framework for jurisdictional utilities. Based on the expected growth in DERs in upcoming years, the ISO believes that a collaborative effort of the CPUC, CEC, ISO and interested stakeholders should be initiated to consider possible growth scenarios that may be crucial foundational elements to be used in future transmission planning and state procurement activities for achieving the state's energy goals. Depending on how the process is designed, development of DER growth scenarios may involve different activities performed by different parties in different venues, the results of which must be integrated into the set of scenarios that are formally adopted for use in procurement and planning.

The ISO believes that 2016 would be the right time to focus on the specific activities and methodologies that would comprise an effective DER growth scenario development process. The CEC will have just completed the 2015 Integrated Energy Policy Report (IEPR), with the next full IEPR demand forecast due at the end of 2017 and as such, these methods could be applied during 2017 in developing the next full IEPR demand forecast.

5.7 Conclusions and Recommendations

The 2015-2016 Transmission Plan provides a comprehensive evaluation of the ISO transmission grid to identify upgrades needed to adequately meet California's policy goals, address grid reliability requirements and bring economic benefits to consumers. This year's plan identified 14 transmission projects, estimated to cost a total of approximately \$288 million, as needed to maintain the reliability of the ISO transmission system, meet the state's renewable energy mandate, and deliver

material economic benefits. As well, the ISO has identified the need to continue study in future cycles focusing on the following:

- continuing the coordinated and iterative process of assessing southern California (LA Basin and San Diego area) needs with an emphasis on preferred resources, and in particular, assessing the progress made on the planned mitigations;
- continuing to explore and refine methodologies to ensure the maximum opportunity for preferred resources to meet transmission system needs; and
- exploring the range of system impacts and challenges associated with steadily increasing levels of renewable generation, and developing proactive plans to manage those issues reliably and economically.