

# **AV Clearview Phase I Transmission Project - New Alternative Evaluation**

**August 2, 2013**

## **Introduction**

The purpose of this supplemental study to the 2012-2013 Transmission Plan is to evaluate a new alternative proposed by High Desert Power Authority for the AV Clearview Transmission Project. The new alternative, AV Clearview Phase I Transmission Project (AV Clearview Phase I), was submitted to the CAISO after the 2012-2013 Transmission Plan was finalized. The details of the previously submitted project and CAISO's evaluation are published in Section 3.4 of the 2012-2013 Transmission Plan and that section is attached to this supplemental study.

<http://www.caiso.com/Documents/BoardApproved2012-2013TransmissionPlan.pdf>.

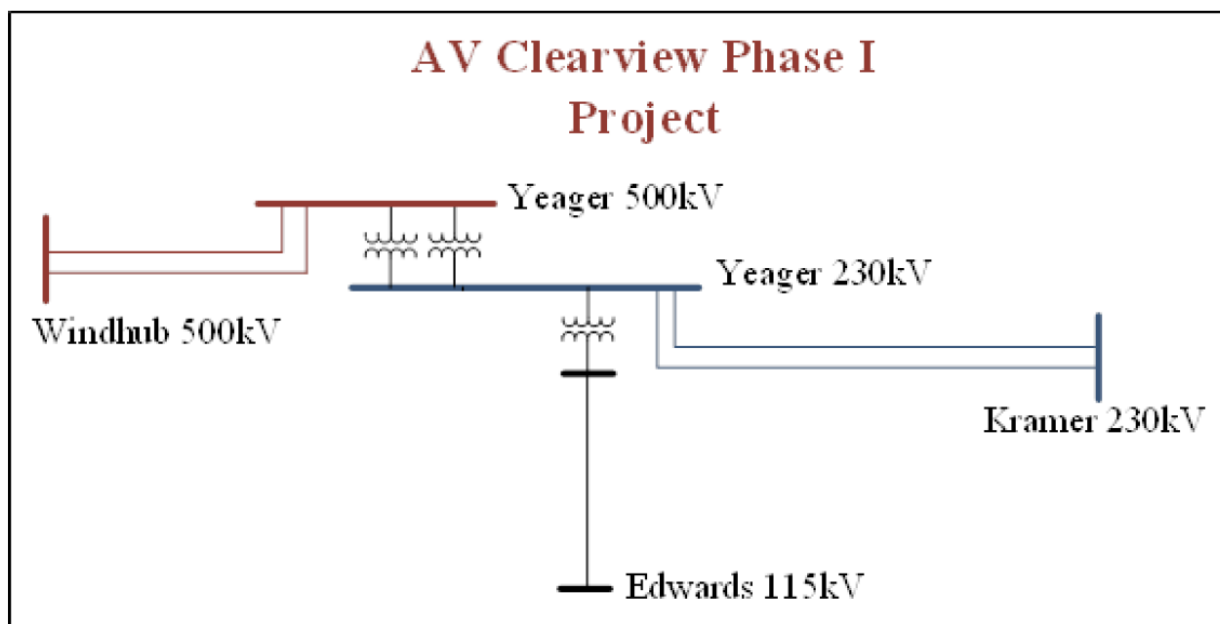
## **AV Clearview Phase I Overview**

The new alternative submitted by High Desert Power Authority consists of the following transmission elements:

- new 500/230/115 kV Yeager Substation (near SCE's Edwards 115 kV substation)
- two New 500/230kV Yeager Transformer Banks
- new double circuit 500 kV from Windhub to Yeager
- new double circuit 230 kV from Yeager to Kramer
- new 230/115 kV step-down transformer bank at Yeager
- new single circuit 115 kV from Yeager to SCE Edwards 115 kV substation (reliability back-up, normally open).

The figure below shows the new alternative's proposed configuration.

Figure 1: AV Clearview Phase I alternative



### Deliverability Assessment Results

A Deliverability Assessment was performed for the new AV Clearview Phase I project alternative. The base cases were updated to include the recently approved Lugo-Eldorado series cap and terminal equipment upgrade project. The following sections discuss the results.

#### 2012-2013 TPP Commercial Interest Portfolio Deliverability Assessment Results

Using the 2012-2013 TPP Commercial Interest portfolio case, a deliverability assessment was performed for the Coolwater-Lugo 230 kV and AV Clearview Phase I projects. The study confirmed that both the Coolwater-Lugo 230 kV and AV Clearview Phase I projects, are effective alternatives at delivering the modeled Commercial Interest portfolio renewable generation in the Kramer zone.

The steady state analysis concluded that with the AV Clearview Phase I project alternative, the existing Kramer SPS could no longer be required<sup>1</sup>.

#### C3C4 Phase II Deliverability Assessment Results

Using the C3C4 Phase II base cases, a deliverability assessment was performed for the AV Clearview Phase I project. The steady state analysis confirmed that with either the Coolwater-Lugo 230 kV project or with the AV Clearview Phase I project alternatives, a previously proposed Jasper SPS and a previously proposed Pisgah SPS are required. In addition, it was concluded by steady state analysis that the Kramer SPS could no longer be required with the AV Clearview Phase I project alternative<sup>1</sup>.

In addition to the above listed SPS's requirements, the study identified the following constraints with the new AV Clearview Phase I alternative:

- overload on Kramer-Coolwater 230 kV line following an N-1 outage of Kramer-Lockhart 230 kV line
- overload on Kramer-Lockhart 230 kV line following an N-1 outage of Kramer-Coolwater 230 kV line
- overload on Lugo-Jasper 230 kV line under N-0 conditions with all lines in-service.

The N-1 overloads above can be mitigated by installing a new SPS to trip generation at Lockhart.

The N-0 overload on Lugo-Jasper 230 kV line can be mitigated by upgrading that line. An upgrade of this line is part of the scope of work and cost for the Coolwater-Lugo 230 kV project. Therefore, the scope and cost of this upgrade also needs to be added to the scope and cost of the AV Clearview Phase I alternative.

---

<sup>1</sup> Although post-transient and stability analyses were performed on the Coolwater-Lugo 230 kV alternative in the 2012-2013 TPP studies; post-transient and stability analyses were not performed by the ISO on the new AV Clearview Phase I alternative. Performing this additional analysis on the AV Clearview alternative could identify the need for the Kramer SPS with that alternative, and therefore the existing SPS would simply need to be retained for both alternatives.

**Conclusion**

This study determined that the new alternative is not on its own an equivalent substitute for the Coolwater-Lugo 230 kV line in the context of the ISO Generation Interconnection study process. An upgrade of Lugo-Jasper 230 kV line would need to be added to the scope and cost estimate for the AV Clearview Phase I alternative in order for the two alternatives to be equivalent.

The C3C4 Phase II base cases were established pursuant to the Cluster 1-4 Technical Bulletin

[http://www.aiso.com/Documents/RevisedTechnicalBulletin-DeliverabilityRequirements-QueueClusters1-4\\_Determination-NetQualifyingCapacity.pdf](http://www.aiso.com/Documents/RevisedTechnicalBulletin-DeliverabilityRequirements-QueueClusters1-4_Determination-NetQualifyingCapacity.pdf)

which specifies an assumption that the amount of new generating capacity in each study area from the interconnection queue will not exceed the amount that will be deliverable based on the transmission system as reflected in the ISO transmission planning process. Based on the technical bulletin, 500 kV upgrades associated with providing deliverability at Pisgah substation, including a Pisgah-Lugo 500 kV line, were removed from the study assumptions because the viability of the project is highly uncertain. However, as shown in the table below, with the Coolwater-Lugo 230 kV line project looped into the planned Jasper substation approximately 720 MW of the 920 MW of the generation in the queue at Pisgah, Jasper and nearby would still be deliverable. If the AV Clearview alternative were chosen without the upgrades between Jasper and Lugo associated with the Coolwater-Lugo 230 kV line project then only 500 MW out of the 920 MW would be deliverable. The ISO is responsible to provide deliverability for the entire 920 MW if the total amount were to develop. With the Coolwater-Lugo 230 kV line project, the likelihood of needing additional transmission is lower than with the AV Clearview project by itself.

NO	BUS	NAME	Type	Nameplate Capacity	Deliverable Capacity with Coolwater-Lugo 230 kV line project	Deliverable Capacity with AV Clearview project
1	Jasper 230 kV	Q135	Wind	60	60	60
2	Jasper 230 kV	Q552	Solar	60	60	60
3	Pisgah 230 kV	Q240	Solar	400	400	380
4	Pisgah 230 kV	Q241	Solar	400	200	0
Total				920	720	500

# **Attachment 1**

## **Section 3.4 of 2012-2013 Transmission Plan dated March 20, 2013**

### **3.4 Alternatives considered to the Coolwater-Lugo Project: AV Clearview Transmission Project**

The Coolwater-Lugo 230 kV transmission line was triggered by an LGIA with ISO generation project #125 in the serial group, executed in 2010. The Coolwater-Lugo 230 kV transmission line was identified in the LGIA as a delivery network upgrade needed to mitigate the overloads on the Kramer-Lugo #1 & #2 230 kV Lines.

SCE's application to the CPUC for a Certificate of Public Convenience and Necessity (CPCN), for the Coolwater-Lugo project is expected in 2013. In anticipation of that filing, the CPUC has indicated that alternatives to Coolwater-Lugo supporting west Mohave renewable generation will need to be considered in the upcoming CPCN proceedings. The AV Clearview Transmission Project was suggested in comments submitted during the planning process as an alternative to the Coolwater-Lugo 230 kV transmission line. Thus, in light of the of the CPUC's stated need to meaningfully discuss alternatives in the CPCN process, the ISO decided to study AV Clearview as an alternative in preparation for the CPCN proceeding. Conducting this analysis as part of the transmission planning process provides a consistent study framework for the analysis and greater transparency to stakeholders about an alternative that might be considered in the CPCN proceeding.

The Coolwater-Lugo 230 kV transmission project consists of the following transmission elements:

- Coolwater-Lugo 220kV Transmission Line:
  - Install a new 59 mile 220kV transmission line including the following elements:
    - approximately 16 circuit miles of 2B-2156 KCMIL ACSR conductor
    - approximately 43 circuit miles of 2B-1590KCMIL ACSR conductor
    - ½ inch steel overhead ground wire as needed
    - approximately 59 miles of OPGW (315,000 linear feet)
- Coolwater Generating Station 220kV Switchyard:
  - Install necessary equipment to terminate the new Lugo 220kV transmission line in a breaker-and-a-half configuration.
- Lugo Substation:
  - Install the necessary equipment to terminate the Coolwater 220kV transmission line in a new double breaker line position arranged in a breaker-and-a-half configuration.

## Section 3.4 of 2012-2013 Transmission Plan

**North of Lugo Area Description**

The Coolwater-Lugo 230 kV transmission line and the AV Clearview Transmission Project alternative are located in the North of Lugo transmission system. The North of Lugo transmission system serves San Bernardino, Kern, Inyo and Mono counties. The area extends more than 270 miles north from Lugo.

The North of Lugo electric transmission system is composed of 55 kV, 115 kV and 230 kV transmission facilities. In the north, it has interties with LADWP and Sierra Pacific Power. In the south, it connects to the Eldorado substation through the Eldorado-Baker-Cool Water–Dunnside-Mountain Pass 115 kV line. It also connects to the Pisgah substation through the Lugo-Pisgah #1 and #2 230 kV lines. Two 500 and 230 kV transformer banks at the Lugo substation provide access to SCE’s main system. The North of Lugo area can be divided into the following sub-areas: North of Control; South of Control to Inyokern; South of Inyokern to Kramer; South of Kramer; and Victor.

The ISO studied the North of Lugo area under four renewable development scenarios. Table 3.4-1 shows the relevant renewable generation amounts in each of those scenarios. More information about the renewable scenarios and the North of Lugo area studies are in Chapter 4. This section describes the alternative mitigation that was considered to mitigate identified transmission deficiencies.

Table 3.4-1 Renewable generation in the SCE system modeled to meet the 33 percent RPS net short

<b>Zone</b>	<b>High DG (MW)</b>	<b>Environmentally Constrained (MW)</b>	<b>Commercial Interest (MW)</b>	<b>Cost Constrained (MW)</b>
Kramer	62	64	765	62
DG	95	2	0	2
San Bernardino – Lucerne	187	108	106	271

**3.4.1 Overview of AV Clearview Transmission Project Alternative**

The High Desert Power Authority suggested that the AV Clearview Transmission Project could serve as an alternative to the Coolwater-Lugo 230 kV Transmission Project. The stated purpose of the facility is to connect eastern transmission and resources around the Kramer/Coolwater area to the Tehachapi area. Upon request, High Desert Power Authority provided the ISO with additional information to the ISO; namely, more details about two options, which include a Baseline Case and an Expanded Case.

The Baseline Case consists of the following transmission elements:

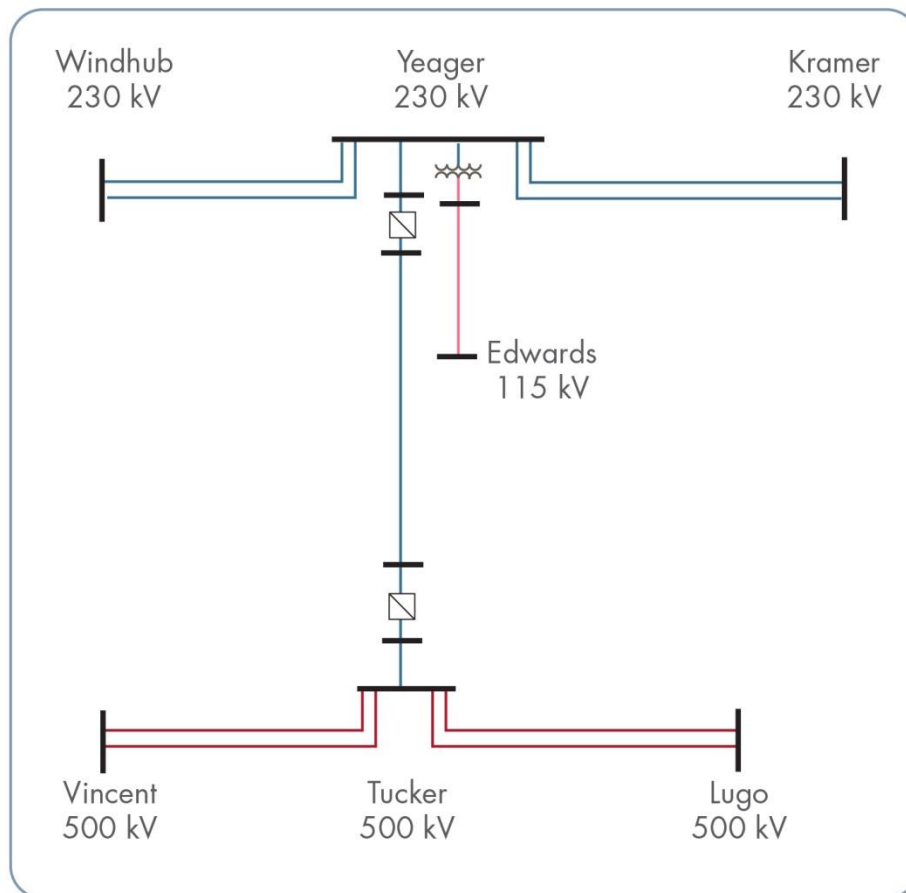
- new 230 kV Yeager Substation;
- new double circuit 230 kV from Windhub to Yeager;

## Section 3.4 of 2012-2013 Transmission Plan

- new double circuit 230 kV from Yeager to Kramer;
- new 230/115kV step down transformer bank at Yeager;
- new single circuit 115kV from Yeager to SCE Edwards 115 kV substation;
- new 500 kV Tucker Substation;
- new 1000 MW capacity underground DC line between Yeager and Tucker Substations;
- and
- loop Lugo-Vincent #1 and #2 Lines through Tucker Substation.

The figure below shows the Baseline Case configuration.

Figure 3.4-1: AV Clearview alternative: baseline case configuration





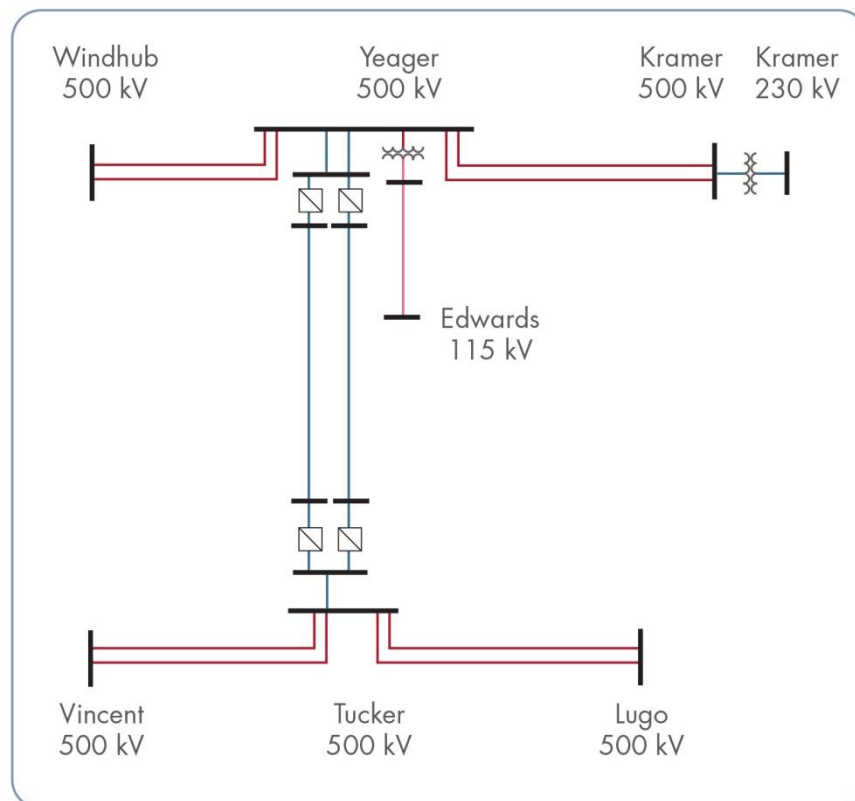
## Section 3.4 of 2012-2013 Transmission Plan

The Expanded Case consists of the following transmission elements:

- new 500 kV Yeager Substation;
- new double circuit 500 kV from Windhub to Yeager;
- new double circuit 500 kV from Yeager to Kramer;
- new 500/115kV step down transformer bank at Yeager;
- new single circuit 115kV from Yeager to SCE Edwards 115 kV substation;
- new 500 kV Tucker Substation;
- new 2000 MW capacity underground DC line between Yeager and Tucker Substation;
- and
- loop Lugo-Vincent #1 and #2 Lines through Tucker Substation.

The figure below shows the expanded case configuration.

Figure 3.4-2: AV Clearview alternative: expanded case configuration



## Section 3.4 of 2012-2013 Transmission Plan

It should be noted that the Expanded Case has been identified as a separate alternative, not as a future expansion to the Baseline Case, referencing in particular the 230 kV construction in the Yeager area. The costs set out below have similarly been provided on a “two alternative” basis.

The figure below shows the geographical location of the AV Clearview Transmission Project alternative.

Figure 3.4-3: AV Clearview alternative: geographical map



### 3.4.2 Cost Comparison of AV Clearview Transmission Project Alternative and Coolwater-Lugo 203 kV Transmission Line

Table 3.4-2 shows the cost estimates of the three projects. The cost estimate for the Coolwater-Lugo project was provided by SCE, and the cost estimates for the two AV Clearview alternatives were provided by the High Desert Power Authority. The ISO has taken each cost estimate at face value. Because the ISO conducted this study for the purposes of providing information to the upcoming CPUC proceeding, the ISO expects that the cost estimates will be considered at that time.

## Section 3.4 of 2012-2013 Transmission Plan

Table 3.4-2 Cost estimates of AV Clearview Transmission Project Alternative and Coolwater-Lugo 203 kV Transmission Project

Project	Estimated Cost
AV Clearview Transmission Project Alternative – Baseline Case	\$670 million
AV Clearview Transmission Project Alternative – Expanded Case	\$1,190 million
Coolwater-Lugo 230 kV Transmission Project <i>(Note 1)</i>	\$436 million

Note 1: The cost presented here does not include the following elements that were originally included in the scope of work for the South of Kramer Transmission Project which included the Coolwater-Lugo 230 kV line: (1) Lugo 500/230 kV #3 transformer (this transformer is not needed for the portfolio scenarios studied) and (2) Jasper Substation.

### 3.4.3 Policy-Driven Powerflow and Stability Study Results

Chapter 4 of this report describes the study assumptions and study methodology of the policy-driven powerflow and stability study analysis performed by the ISO. Using the assumptions and study methodology described therein, the AV Clearview Transmission Project alternative was found to be a potential mitigation for the following constraints that were identified in the policy-driven powerflow study for the SCE area.

- Commercial Interest portfolio — peak scenario: case divergence following an N-2 contingency of Kramer-Lugo 230 kV lines
- Commercial Interest portfolio — off-peak scenario: case divergence following an N-2 contingency of Kramer-Lugo 230 kV lines

As described in chapter 4, both the Coolwater-Lugo 230 kV Transmission Line and the AV Clearview Transmission Project alternative were found to be effective at mitigating the above constraints.

### 3.4.4 Deliverability Assessment Results

Chapter 4 of this report describes the study assumptions and study methodology of the policy-driven deliverability assessment study analysis performed by the ISO. Using the assumptions and study methodology described therein, a deliverability assessment was performed using the Commercial Interest portfolio. This portfolio has approximately 750 MW of renewable generation modeled in the Kramer zone. As described in chapter 4, the Coolwater-Lugo 230 kV project ensures the deliverability of the 750 MW of renewable generation in the Kramer zone and the 106 MW in the Lucerne zone, in the Commercial Interest portfolio.

## Section 3.4 of 2012-2013 Transmission Plan

In the ISO's assessment, replacing the Coolwater-Lugo project with the AV Clearview Transmission Project alternative caused overloads on the following transmission lines:

- Yeager-Edwards 115 kV;
- Edwards-Holgate 115 kV; and
- Holgate-Kramer 115 kV.

The proposed mitigation for these overloads is to keep the Yeager-Edwards 115 kV line open. With these overloads mitigated by this operating solution, the results of the deliverability study for the AV Clearview Project show the following:

- Baseline Case — approximately 250 MW of additional generation in the Kramer zone can be deliverable above the 750 MW already included in the Commercial Interest Portfolio.
- Expanded Case — approximately 1,250 MW of additional generation in the Kramer and Coolwater areas can be deliverable above the 750 MW already included in the Commercial Interest portfolio.
- The 106 MW in the Lucerne zone are also deliverable. The Jasper substation is assumed to be built to connect this generation to the system, but the cost for Jasper substation is not included in the cost for either project alternative since it is needed to connect renewable generation in the studied portfolios regardless of which alternative is selected.

Depending on the specific location of the additional generation, some level of additional deliverability beyond the amounts identified above may be achievable. As the incremental generation is beyond the amounts identified in the CPUC portfolios used for transmission planning purposes, the ISO has not attempted further refinement to these values.

In the ISO's planning process, the ISO does not assess a financial benefit with accessing additional renewable generation outside of the portfolio development process led by the CPUC. If there is new information that leads the CPUC to identify additional resources that should be considered in subsequent renewable portfolio development cycles, the CPUC would take that into account in its adoption of renewable portfolios.

### 3.4.5 Production Simulation Study Results

Chapter 5 of this report describes the study assumptions and study methodology of the economically-driven production simulation assessment study analysis performed by the ISO. Using the assumptions and study methodology described therein, the ISO performed a production simulation analysis of the AV Clearview project economic benefits. The addition of the AV Clearview Transmission Project alternative resulted in the following transmission lines being congested in the Commercial Interest portfolio:

- Yeager-Edwards 115 kV;
- Edwards-Holgate 115 kV; and

## Section 3.4 of 2012-2013 Transmission Plan

- Holgate-Kramer 115 kV.

The proposed mitigation for these overloads is to keep the Yeager-Edwards 115 kV line open.

With either the Coolwater-Lugo 230 kV transmission line or the AV Clearview Transmission Project, there was no congestion identified in the study area. Because both proposed network upgrades deliver renewable congestion in the study area, the addition of AV Clearview Transmission Project alternative, in lieu of the Coolwater-Lugo 230 kV line, did not produce any economic benefits that would compensate for the higher costs of the project relative to the Coolwater-Lugo 230 kV project costs.

### 3.4.6 Access to Windhub Substation

Comments received from stakeholders have provided conflicting opinions on the viability of additional 230 kV interconnections into the Windhub substation. As the ISO focus in the development of this study is in preparation of material intended for the CPUC process, where these issues can be explored, the ISO has not pursued this matter further at this time.

### 3.4.7 Review of Report provided by Critical Path Transmission

On February 12, 2013, Critical Path Transmission, LLC (Critical Path) submitted a report commissioned by Critical Path comparing the benefits of the AV Clearview project to the South of Kramer (sic) project with preliminary stakeholder comments responding to the draft 2012/2013 transmission plan.

The ISO reviewed the report, and has provided the results of its review with our response to stakeholder comments.

In summary, the ISO concluded that due to assumptions restricting the use of special protections systems in interconnecting renewable generation and other methodology differences, the bulk of the benefits quantified in the report are higher than what the project is likely to produce. As well, a number of transmission capital additions are assumed to be required in the event of the Coolwater-Lugo project, which could be eliminated by the AV Clearview project; the ISO does not agree with the assumptions that those transmission capital additions would in fact be necessary.

Further, the report quantifies benefits post 2020 associated with additional renewable generation the AV Clearview project may make deliverable beyond the CPUC-identified portfolios that the Coolwater-Lugo project can also accommodate. The ISO notes that while some additional renewable capacity benefit is likely for the AV Clearview project, the quantification is higher than ISO projections, and there is a concern of potential double-counting of several of the benefits.

## Section 3.4 of 2012-2013 Transmission Plan

**3.4.8 Conclusion**

The Coolwater-Lugo 230 kV transmission line was triggered by ISO generation project #125 with an executed LGIA in the serial group as a delivery network upgrade to mitigate the overloads on the Kramer-Lugo #1 & #2 230 kV Lines. SCE's application for the CPCN for the project is anticipated in 2013. The CPUC has indicated that alternatives that support west Mohave renewable generation will need to be considered in the upcoming CPCN proceedings.

Both the Coolwater-Lugo 230 kV Transmission Line and the AV Clearview Transmission Project alternative are effective at delivering the renewable generation in the Kramer zone identified in the table above from the 2012-2013 transmission planning process renewable portfolios.

The cost estimate provided for both AV Clearview alternatives are higher than the estimate provided for the Coolwater-Lugo Project. The AV Clearview project has the potential to allow the deliverability of some level of additional generation beyond the portfolio amounts identified by the CPUC for transmission planning purposes. However, the ISO found that the AV Clearview project did not produce economic transmission benefits that would offset the higher costs of the project relative to the Coolwater-Lugo 230 kV project costs.

The ISO further notes that comments have been received raising concerns with cost and siting issues that the ISO considers are best addressed at the anticipated CPUC proceeding addressing the CPCN for the Coolwater-Lugo project.

In response to the feedback provided by the ISO, Critical Path provided a revised project proposal on February 25, 2013. Having just received this proposal, the ISO did not have adequate time to comprehensively review it prior to finalizing its 2012/2013 Transmission Plan for the March Board meeting. However, we intend to review the latest proposal after the March Board meeting, and will make our conclusions and supporting analysis publicly available for consideration by interested parties.