**SDG&E 2/11/10 Response**
**A.09-08-003 East County Substation (ECO) PTC**
**Energy Division Data Request 1 Dated January 22, 2010**
**SDGE-ED-001: Q1-3**

**Question 1:**

Please provide input regarding how the following system alternative may perform. Should such an alternative not meet project objectives please provide an in depth discussion as to why.

- Remove the requirement for the 230kV portion of the ECO substation by requiring energy from the various collector systems to be delivered at either 138 or 500 kV.

- Adjust the 138 kV switchyard and associated transformation (500/138kV) to reflect this new configuration.

**SDGE Response to Q1:**

There is approximately 1120MW of generation that is requesting to connect to the proposed East County Substation (ECO) at 230kV as of April 2008. In addition, there is 361MW of generation requesting connection at the Boulevard 138kV Substation (See Table 1).

**Table 1: CAISO Queue**

| CAISO Queue as of January 8, 2010 | | |
|---|---|---|
| **Imperial Valley*** | **ECO** | **Boulevard** |
| Q78 – 300 MW | Q159A – 400MW | Q32 – 201 MW |
| Q124 – 600 MW | T183 – 300MW | Q106A – 160 MW |
| T429 – 100 MW | T215 – 420MW | |
| T442 – 125 MW | | |
| C510 – 200 MW | | |
| **1325 MW** | **1120 MW** | **361 MW** |

* Generation interconnection requests by substation

If the 230kV switchyard at ECO was eliminated from the plan of service, the generation projects proposed for interconnection at ECO would need to connect at the ECO 500kV or the ECO 138kV busses. Based on studies to date using the appropriate assumptions, when 1120MW of generation is connected directly to the ECO 138kV bus, a substantial amount of voltage support is needed in order to avoid voltage collapse. When 1120 MW of generation is connected to the ECO 500kV bus, the voltage support required for interconnection to the ECO 138kV bus is no longer needed.

In addition, if generators interconnected to the ECO 500kV bus, the cost impacts to the Interconnecting Customers would increase substantially because generator step-up transformers would now be needed at the 500kV system level. Also, the cost of having the generator transmission lines at the 500kV system level would be much more. These increased costs could prove to be fatal to the development of smaller scale projects.

Of further concern, 500 kV class facilities are much larger in size than 230 kV facilities, thus limiting the number of interconnection points for larger projects at ECO Substation. If future large-scale projects are proposed to connect at ECO, there may not be sufficient positions available in the 500 kV switchyard. In addition, the 500kV generator tie-lines will require additional rights of way compared to a 230kV tie-lines. As stated above, connecting large amounts of generation to the 138 kV switchyard will require significant voltage support. For most mid- to large-scale wind generation projects, 230 kV is a logical choice for interconnection voltage, due to both cost and performance characteristics. 500 kV will still be the preferred interconnection option for very large projects. Thus, the current plan of service for 500 kV, 230 kV and 138 kV switchyards is ideal.

In addition to system concerns, the elimination of the 230 kV switchyard at ECO Substation creates equipment concerns in the event of an emergency. SDG&E currently purchases and operates 500/230 kV transformers in its transmission system. Pacific Gas & Electric (PG&E) and Southern California Edison (SCE) utilize similar transformers. SDG&E has in place a mutual assistance agreement with both PG&E and SCE in the event of a transformer failure causing a system emergency. Each utility agrees to supply another with a transformer if it has available spares in such an emergency. Neither PG&E nor SCE utilize 138 kV in their respective transmission systems, which would render them unable to assist SDG&E if a 500/138 kV transformer failure were to remove ECO from service.

SDG&E does not currently have any 500/138 kV transformers in its transmission system and would be required to purchase a spare in the event of a failure. This spare would also be located at ECO, and an event that severely damaged ECO could render the spare inoperable as well. For the 500/230 kV class transformers, SDG&E can either utilize transformers from other stations if feasible, or, as stated above, call upon PG&E and SCE for assistance. The elimination of the 230 kV voltage level from ECO would severely restrict the options available to SDG&E under these exigent circumstances and is undesirable.

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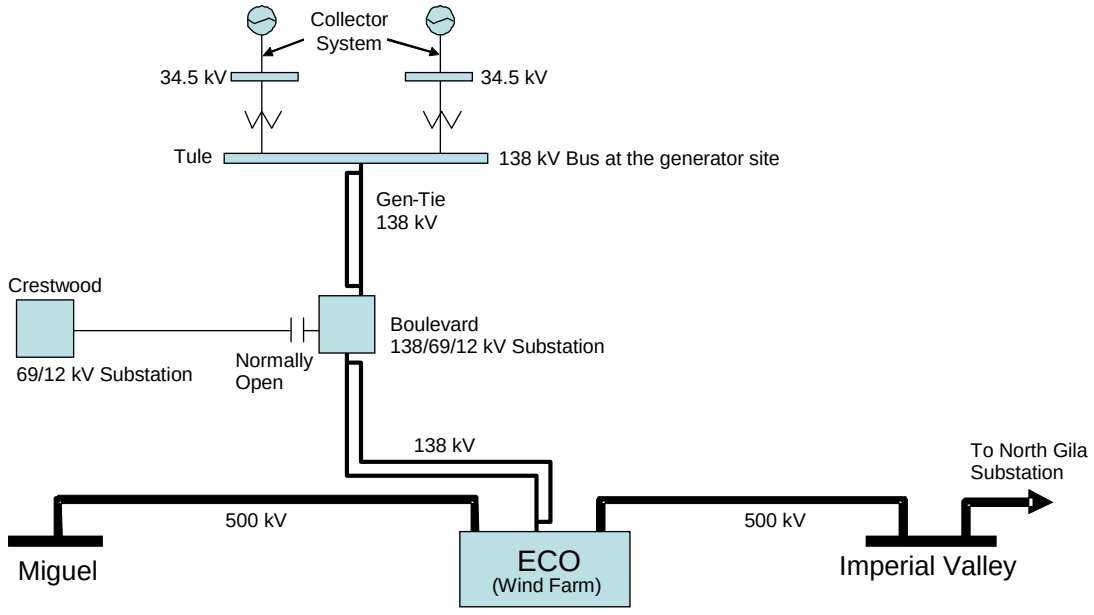
**Question 2:**

While the proposed upgrades to the Boulevard substation may make sense, the benefits from such upgrades could be short lived if the addition of the new wind generation results in the need for upgrades to the existing 69kV circuit back to Crestwood and Boulevard Tap. Please, provide studies (either internal or CAISO studies) that indicate the impact of the proposed ECO - Boulevard 138kV line and the new generation will have on the 69kV system in the area. If such studies are not available please provide a time frame in which they can be made available.

**SDGE Response to Q2:**




Additional studies are not needed to determine the impact of the proposed ECO - Boulevard 138kV line and the new generation will have on the 69kV system in the area.

Above is a one line diagram showing a wind generation plant connecting to the Boulevard Substation. Under normal operating conditions, the 69kV line from Boulevard to Crestwood would be normally open (Crestwood and Boulevard will not be electrically connected under normal operating conditions).

Under the rare circumstance that there is an outage (forced or planned) on the transmission line that connects Boulevard and ECO Substations, the generation will be tripped off and the connection between Crestwood and Boulevard will be closed to retsore the power to the Boulevard area through Crestwood Substation. Considering this operating configuration there will be no impact on the existing 69kV system between Boulevard and Crestwood Substations, or to Crestwood Substation by the addition of generation to Boulevard Substation.

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**Question 3:**

The submitted "Detailed Magnetic Field Management Plan" (Attac~~lu~~h~~n~~ment 3-D of the Proponent's Environmental Assessment) for the 138-kV transmission line part of the ECO Substation Project meets CPUC requirements. The absence of a field management plan for the ECO and Boulevard substations does not meet CPUC requirements.

The submitted Magnetic Field Management Plan (FMP) treats phasing of the new construction of a 138 kV twin-circuit 6O-Hz transmission line that will be sited on its own 100 foot wide ROW and on a shared ROW abutting the Southwest Powerlink (SWPL) 500kV transmission line. Segment 1,~~.~~ which is aligned along a north-south axis, involves only the 138-kV line, whereas Segments 2 and 3 are aligned along an east-west axis on a shared ROW 0000 foot total width. The 138-kV line placement changes from north of the SWPL to south of the SWPL at the point where Segments 2 and 3 meet.

A reduction in edge of the ROW magnetic fields of 32.1% was achieved on Segment 2 at no-cost by changing from the initial phasing (A-B-C, top-to-bottom in a vertical I-type configuration for both of the twin circuits) to CAB (top-to-bottom). This reduction in magnetic field strength is greater than the CPUC significance guideline of 15%. Consequently, Segment I also will be phased as BAC for both of the twin circuits without, of course, affecting costs or magnetic fields on Segment 1. Phasing on Segment 3 of the 138-kV line will change to SAC (top-~~te~~to-bottom) at the point where the 138-kV line makes a transition to placement on ROW to the south side of the SWPL. A reduction of slightly more than 15% was achieved by the SAC phasing compared to the initial design. These no cost changes satisfy CPUC requirement for the three segments of the 138-kV line that constitute its entire length.

The submitted magnetic FMP for the ECO Substation Project considers only the 138 kV transmission line between Boulevard and ECO substations. The CPUC (2006 b) indicated that all new transmission lines over 50 kV must include a FMP and new substations over 50 kV a checklist-style FMP, unless exempt under terms listed in Section 3.4. The potentially applicable exemption criterion therein is for undeveloped land:

“Projects located exclusively adjacent to undeveloped land-including land under the jurisdiction of the National Park Service, the State Department of Parks and Recreation, U.S. Forest Service, or Bureau of Land Management (BLM):”

CPUC guidance on FMP preparation for undeveloped land eliminates the requirement for low-cost mitigation, but does not eliminate the requirement for an FMP. Land use adjacent to the project includes undeveloped land (the majority use), planned residential and commercial development, and 25 existing residences within 1000 feet. The FMP submitted for this project considers only no-cost mitigation, which is consistent for CPUC requirements for undeveloped land.

The 138-kV transmission line route largely traverses undeveloped land, but Table 4.9.2 lists 25 residences that are within 1000 feet of the line and a smaller number within a few hundred feet.

The presence of these residences shows that the project does not meet the test for exclusively undeveloped land adjacent to the project.

The proposed 138 kV transmission line would traverse a potential development (Ketchum Ranch) that, if built, could include 2,125 residential units, schools and recreational areas intended for use by residents. There also is a planned project approximately 0.25 mile from the Boulevard substation. CPUC explicitly considered such situations with the decision that in view of the changeable nature of development, low-cost mitigation would not be required, but a detailed FMP citing no-cost mitigations should be prepared (CPUC 2006b, TabIe3-l and CPUC 20060).

The absence of FMPs for the ECO Substation and upgraded Boulevard Substation appears to be an omission that deviates from CPUC requirements even though land adjacent to the substations is undeveloped.

**SDGE Response to Q3:**

Generally, magnetic field values along substation perimeters are low compared to the substation interiors because of the distance from the energized equipment. Normally, the highest values of magnetic fields around the perimeter of a substation are caused by overhead power lines and underground duct banks entering and leaving the substation, and not by equipment within the substation. Therefore, the magnetic field reduction measures generally applicable to a substation project are as follows:

- Site selection for a new substation;
- Setback of substation structures and major substation equipment (such as bus, transformers, and underground cable duct banks, etc.) from perimeter;
- Lines entering and exiting the substation (this will be a part of a transmission line FMP).

The Substation Checklist FMP evaluates the no-cost and low-cost measures considered for the substation project, the measures adopted, and reasons that certain measures were not adopted. The Substation Checklist FMP for East County and Boulevard Substations are located below in Table 2 and Table 3.

**Table 2: Boulevard Substation FMP Checklist**

| No. | No-Cost and Low-Cost Magnetic Field Reduction Measures Evaluated for a Substation Project | Measures Adopted? (Yes/No) | Reason(s) if not Adopted |
|---|---|---|---|
| 1 | Keep high-current devices, transformers, capacitors, and reactors away from the substation property lines. | ☒ | |
| 2 | For underground duct banks, the minimum distance should be 12 feet from the adjacent property lines or as close to 12 feet as practical. | ☒ | |
| 3 | Locate new substations close to existing power lines to the extent practical. | ☒ | |
| 4 | Increase the substation property boundary to the extent practical. | ☒ | |
| 5 | Other: | ☐ | |

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**Table 3: East County Substation FMP Checklist**

| No. | No-Cost and Low-Cost Magnetic Field Reduction Measures Evaluated for a Substation Project | Measures Adopted? (Yes/No) | Reason(s) if not Adopted |
|---|---|---|---|
| 1 | Keep high-current devices, transformers, capacitors, and reactors away from the substation property lines. | ☒ | |
| 2 | For underground duct banks, the minimum distance should be 12 feet from the adjacent property lines or as close to 12 feet as practical. | ☒ | |
| 3 | Locate new substations close to existing power lines to the extent practical. | ☒ | |
| 4 | Increase the substation property boundary to the extent practical. | ☒ | |
| 5 | Other: | ☐ | |

Regarding EMF mitigation measures for transmission lines, SDG&E looks at the following alternatives to determine if they can be done at a "low-cost":

1. Install taller poles to increase the height of the conductors.
2. Move the alignment of the poles away from residences, if it can still fall within the 100' ROW.
3. Move the proposed ROW further away from the residence.
4. Underground the 138kV in those areas.

Option 4 can easily be ruled out as a "low-cost" mitigation measure. The cost to build an underground transmission line is typically 3-4 times the cost to build it overhead and is not a routine field-reduction technique, per CPUC policy.

Option 2 is not feasible, because of potential for blowout. Initially, SDG&E was looking at a much narrower right-of-way, but needed 100' to ensure conductor blowout stayed within the right-of-way.

In creating the optimum line design with the least amount of impact to residences, SDG&E took Option 3 into account. One iteration of the design resulted in the line being located much closer to residences at the south end of Jewel Valley road. The alignment was shifted further away from residences to mitigate other potential impacts on the residents.

Option 1 is the most feasible way to achieve a "low-cost" EMF reduction. By raising the structures, and conductor height 10' in the portions of Segment 1 where there are residences and 5' in portions of Segments 2 & 3 where there are residences, calculated magnetic fields are reduced by at least 15% at the edges of the project right-of-way nearest to residences. The costs associated with this reduction technique are in the range of 4% of the total project costs, per CPUC policy. The height increase could necessitate the installation of marker balls and lights, it could have an impact on aesthetics, and may not be able to be done in some cases (i.e. SWPL

crossing, east end of the private air strip, etc.). It is feasible, and could be considered "low-cost" from an overall project perspective, if some of the structure heights were increased at the locations where residences are in close proximity.