MEMORANDUM

R·W·BECK

To: Susan Lee

From: Chuck Williams

Subject: **Sunrise Powerlink Project – ALT-23**

Date: December 12, 2006

I have reviewed the package you forwarded containing information provided by SDG&E regarding the subject project alternative and provide below my comments and observations.

1.0 Underground Design – The information from SDG&E included a number of potential Cross-Sections for underground transmission. While they indicate a preference for a typical 60 foot easement they do illustrate a number of other potential configurations.

In an effort to identify a minimum required cross-section I note the following:

The minimum distance of 6 feet from the center of a ductbank to the edge of slopes as shown in several of the cross-sections (A2, B1) appears reasonable. For the portion of ALT-23 with 2-230 kV circuits, using this minimum distance of 6 feet combined with a ductbank spacing of 8 feet, results in a total minimum width of 20 feet. At vault locations a minimum of 30 feet would be necessary. I also note that SDG&E's discussion is framed in regard to easement width and there seems to be some opportunity for the construction area to be slightly smaller than the easement, however, this may only reduce the width required by 3 feet. Based on these minimums I do not agree with SDG&E's statement in item "1.2 Space Limitations" that the required width through ABDSP is significantly larger than the width of the existing road. The design challenge is those areas where the road narrows to 23 feet. A ductbank segment will fit in this space; however, if there are narrow road sections over 1,600 feet in length vaults would not be able to fit in the existing roadway.

For the portion of ALT-23 with 2-230 kV circuits and the 69/92 kV circuits a similar evaluation results in a total minimum width of 28 feet for ductbanks as shown in Detail B1, and 38 feet in vault areas.

Reviewing the aerial mapping it appears that there are segments of narrow roadway that are in excess of 1,600 feet long presenting a potential fatal flaw for the construction to be entirely contained within the existing roadway.

1.1 Capacity Limitations – In an effort to reduce the width of easement and construction, SDG&E used a minimum spacing between ductbanks of 8 feet. They then comment that due to mutual heating the underground cables would be de-rated thereby reducing the transfer capacity of the transmission link.

I note that in addition to the close spacing of the 230 kV cables, the nature of the soils in this area compounds this issue since rock is a very poor conductor of heat. A solution using an engineered/thermal backfill is questionable as this could require excavating a trench as wide as the entire roadway. The use of even larger cables is also questionable since their analysis is

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based on 3,500 kcmil copper cable. Based on the results of their preliminary capacity studies it appears that 2-230 kV underground lines in this area would have a transfer capacity of approximately 1,500 – 1,600 MVA which is substantially short of the 2,000 MVA need stated in the PEA for the proposed 500 kV line.

Based on the above it appears that transfer capacity limitations make ALT-23 infeasible.

1.2 Space Limitations – As commented above I do not agree with SDG&E's statement that the required width through ABDSP is significantly larger than the width of the existing road. However, I do agree that even with the reduced width requirements I describe above, there are areas where construction would be necessary outside of the existing roadway. From a review of the aerials only some of this would be where the terrain is sufficiently flat, resulting in areas that would require slope grading. Accomplishing this grading without blasting is questionable.

1.3 Construction Constraints – I concur with SDG&E's statement that ALT-23 is feasible from a construction perspective. Of the several constraints noted by SDG&E the significant issue is that even trenching below the existing roadway may encounter materials (rock) that would need to be blasted in order to excavate the ductbank trenches. This is consistent with my limited field observations.

In general the other construction constraints appear to be difficulties which can be overcome although they could substantially increase the construction costs and schedule.

1.4 Traffic Constraints – There are some areas where construction could result in total closure of the road. The number of these areas and duration of closures is difficult to judge but it does appear this would only be for a small portion of the overall length of ALT-23. The degree of impact this represents is better left for determination by other members of the team with appropriate background and experience.

1.5 Maintenance Constraints – There will be operation and maintenance challenges associated with ALT-23. How "great" these challenges will be is somewhat subjective, but I do note that the types of challenges identified by SDG&E are successfully overcome by operating utilities.

1.6 Environmental Constraints – This in an area where I defer to other members of the team with appropriate background and experience.

If the discussions above do not adequately address the questions noted in your December 5, 2006 transmittal memo or if you have other questions please contact me.