SDG&E September 27, 2012 Response
A. 10-06-007 South Bay Substation Relocation Project PTC
Energy Division Data Request 17 Dated September 18, 2012
SDGE-ED-017: Question 1

In the CPUC's data request # 16, the CPUC requested:

> (a) The "base case" power flow – or power flows – that demonstrates the loading problems listed above.
>
> (b) For the Old Town, South Bay, and Silvergate transformers, please provide the loadings at the time of the SDG&E system peak for the last five years. Please include loadings on both the 230 kV (and/or 138 kV) and 69 kV sides of these transformers, including both MW and MVARs.
>
> (c) The outage history of the Old Town transformers. Please include the time of the outage, the duration of the outage, and the cause. If data is available, please also provide the loading on the Old Town transformer that remained in service during the outage.

These questions were based on the following SDG&E statements/responses:

> **"The following lines exceed their normal ratings for loss of a single transmission element (N-1, NERC category B) in the absence of the Bay Boulevard 230 kV project:**
>
> **1) Penasquitos-Old Town 230 kV line**
>
> **2) Miguel-Miguel Tap 69 kV**
>
> **3) Paradise-Miguel 69 kV line (beginning in 2015)**
>
> **4) San Ysidro-Otay Lake Tap 69 kV line (beginning in 2016)"**

In addition, SDG&E went on to state that:

> **"If a critical contingency occurs and one of the above lines exceeds its normal rating, it would be necessary to rely on a short-term emergency rating and to redispatch generation to bring the line flow to within its normal rating. However, in the absence of South Bay generation there is little or no generation available to redispatch in the vicinity of the downtown load center. It would be necessary to either shed load or curtail load pre-contingency, neither of which are acceptable mitigations for a Category B contingency.**
>
> **Additionally, the following transformers exceed their normal ratings for loss of one of the parallel banks:**
>
> **1. Mission 138/69 kV banks 50/51/52**

2. **Old Town 230/69 kV banks 70/71**

As with the transmission lines listed above, if a critical contingency occurs it would be necessary to rely on the banks' short-term emergency ratings. However, transformer banks are generally limited on the number of days per year they are permitted to exceed their normal ratings, in order to prevent loss of service life. Generally that limit is five days per year. Note that in the response to Energy Division Data Request 12 Q1, SDG&E determined that the Old Town banks were at a risk of exceeding their normal rating for up to nine days per year in 2014, in the absence of the Bay Boulevard project.

Finally, the addition of the Bay Blvd project significantly improves the voltage profile of the San Diego transmission system in the absence of the South Bay generation, reduces reactive power demand, and reduces system losses. Powerflow studies indicate that the risk of voltage collapse in the San Diego load pocket is significantly reduced with the Bay Boulevard substation.

SDG&E would also have to implement the following projects if a "No Project Alternative" was selected as the Environmentally Superior Alternative:

1. **Reconfigure Penasquitos-Old Town and Silvergate-Old Town Tap 230 kV lines to create a new Penasquitos-SIlvergate 230 kV line**
2. **Reconductor Miguel-Miguel Tap 69 kV**
3. **Reconductor Paradise-Miguel 69 kV line**
4. **Reconductor San Ysidro-Otay Lake Tap 69 kV line**
5. **Upgrade 138/69 kV banks at Mission Sub or add a 2nd 230/69 kV at Mission Sub**
6. **Add a 3rd 230/69 kV bank at Silvergate**
7. **Install a +/-240 MVAR 230 kV synchronous condenser at Mission substation**
8. **Rebuild the existing 138/69 kV South Bay substation to replace aging and obsolete substation equipment**
9. **Find additional land for a new distribution substation needed to provide for future load growth in the South Bay region."**

In SDG&E's September 18, 2012 response to the CPUC's data request # 16, specifically question number 1, SDG&E provided and stated that:

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Attached are spread sheets which provide summary and detailed tabular power flow results as to the reliability risks if the in-service-date for Bay Blvd is delayed beyond summer 2013 out to 2015. The load and resource tables provide load and resource assumptions for years 2013 and 2015 for two scenarios each year.

The analysis was performed using primarily VSAT (Voltage Stability Analysis Tool) to perform 600 MW power transfers. The starting point was 4700 MW of load [not including losses] and correlates closely to our 2010 all-time peak system load of 4684 MW. The transfer was performed out to a total of 5300 MW of SDGE load. Only single contingencies were simulated, including G-1/N-1 simulations.

The 2013 scenarios portray pre-project assumptions. The 2015 scenarios portray post Bay Blvd assumptions.

Three scenarios were modeled for each of the 2013 and 2015 years. However the L&R numbers were not included in that spread sheet. The scenarios portrayed starting point cut plane flows of 2000/3000/4000 MWs. The 4000 MW cut plane flow cases succumbed to voltage collapse at the initial transfer point of 4700 MW of SDGE load. The 2013 3000 MW cut plane flow model succumbed to voltage collapse at the 4800 MW of load point, the 2015 3000 MW case failed at the 5150 MW SDGE load point. This alone is an indicator, all assumptions being the same, of the benefit of the 230 kV loop-in to the proposed Bay Blvd substation.

The "sum_load_1" and "sum_load_2" worksheets list loading performance in PU and referenced against the continuous ratings. "Sum_load_1" list results based on ascending SDGE MW load from 4700 to 5300 MW. The "sum_load_2" worksheet lists performance in ascending contingency/affected facility and range of ascending SDGE load level for excursions beyond 0.95 PU of the continuous facility rating. Loading beyond the 0.99 PU level are highlighted in dark pink.

General comment: The facility post contingency loading performance, using the continuous rating as reference, does indicate either potential for reliability risk in the local area of the project [south of a line through Silvergate and Miguel substations. In addition, loading on certain few facilities north of the downtown area indicate post contingency loading above continuous ratings.

<u>Question 1</u>:

Please provide the actual power flow data in GE PSLF format. The GE PSLF cases should model, for example, but not limited to, the existing South Bay Substation and Old

Town power flows. That is, the "base case" power flow – or power flows – that demonstrates the loading problems listed above.

<u>SDG&E Response to Question 1:</u>

Attached is a compressed file folder (*.zip format) with nine (9) power flow cases, compatible with the General Electric PSLF load-flow program, version 18. A matrix of the case names and descriptions follows:

Case Name	**Description**
2013_AR3	2013 Base Case
2014_A5	2014 Base Case
2015_A4	2015 Base Case
bb_2013_2k_r1	2013 pre-project case w/2000 MW import
bb_2013_3k_r1	2013 pre-project case w/3000 MW import
bb_2013_4k_r1	2013 pre-project case w/4000 MW import
bb_2015_2k_r1	2015 post-project case w/2000 MW import
bb_2015_3k_r1	2015 post-project case w/3000 MW import
bb_2015_4k_r1	2015 post-project case w/4000 MW import

The 2013/14/15 A* cases were used for conventional power flow analysis for the Old Town transformer issue. The various "bb" cases were imported into a different program (Powertech Labs Voltage Stability Analysis Tool) and the load varied to identify thermal violations described above. The various indications of 2k/3k/4k/ refer to having set the model to 2000/3000/4000 MW of cut-plane import power into the San Diego load center. To replicate each overload it is necessary to adjust the load and import level in the PSLF case to conditions where each overload occurs. See the second spreadsheet in SDG&E's response to SDGE-ED-016, Q1(b) for the system conditions associated with each thermal overload.

bb_2013_3k_r1.zip

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working version has been obtained.