
Technical Specification Interpretation

230kV System Operability

July 22, 2009



Introduction

The purpose of the meeting is to provide PG&E's perspective on the criteria to be applied for Operability of the 230kV system in accordance with Technical Specifications 3.8.1/3.8.2 as stated in our February 23, 2009 submittal:

“The 230 kV offsite power system is considered operable for normal and offnormal configurations when load flow and dynamic loading analyses demonstrate that the 230 kV system has sufficient capacity and capability to operate the engineered safety features for a design basis accident (or unit trip) on one unit, and those systems required for an orderly shutdown of the second unit. A concurrent trip of the second unit need not be assumed. Operability is based on the ability to transfer to the 230 kV offsite power system without loading the emergency diesel generators, and provide adequate voltage to safety-related loads.”



Agenda

- Background – 230kV System
 - Design
 - Load Flow Analyses
- Design / Licensing History
- LAR 98-01: 230kV System Upgrades
- DCPP Operating History
- Summary

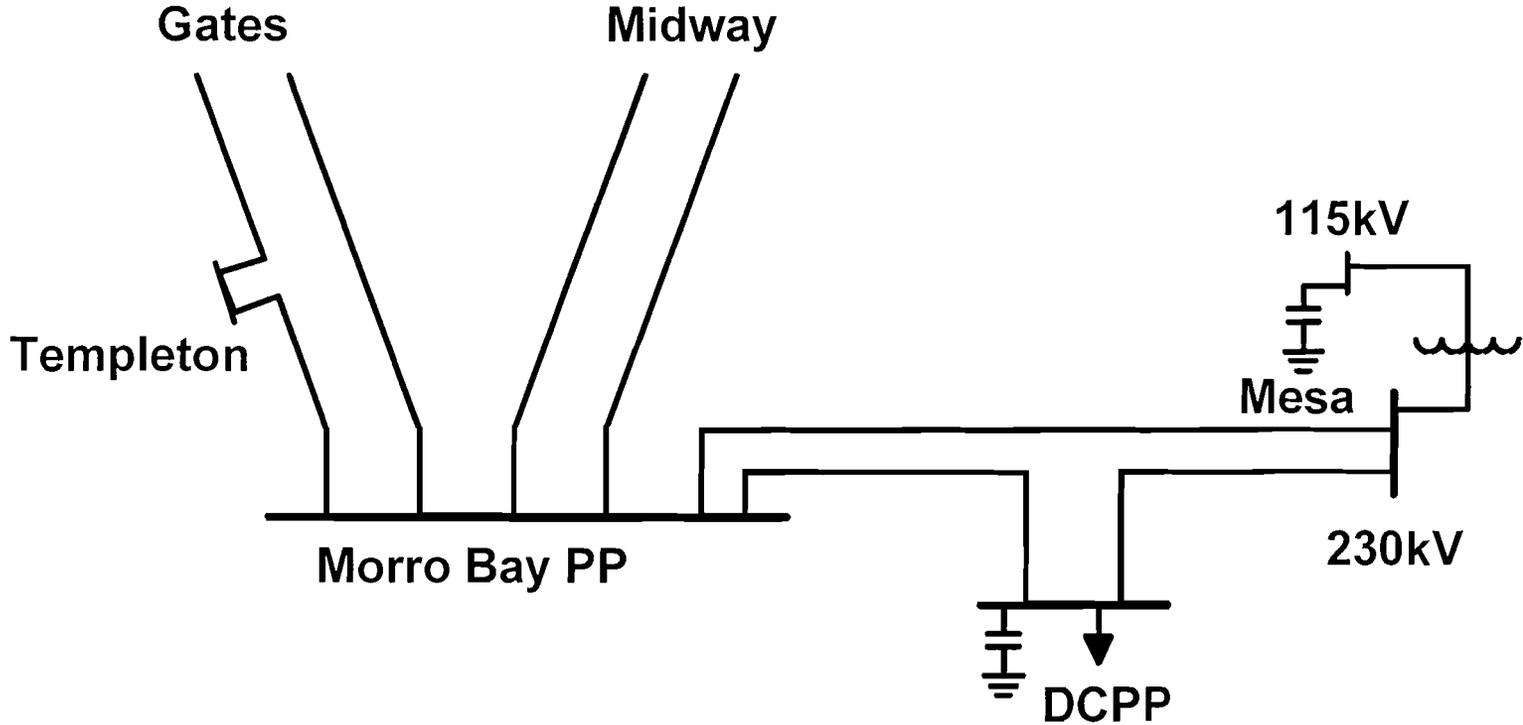


Background – 230kV System Design

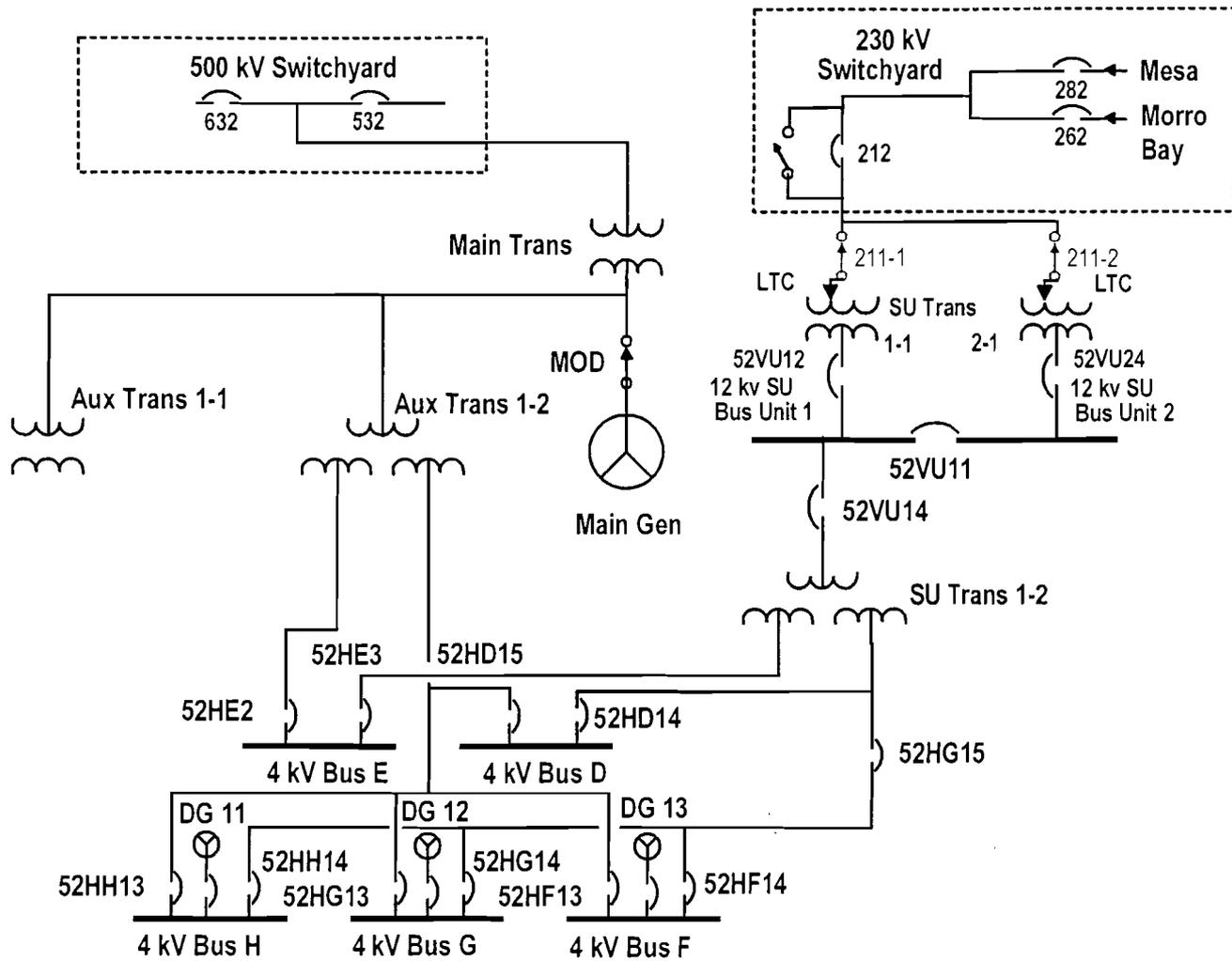
- The design function of the 230kV System is to provide an offsite source of power for the startup of one unit or to be the immediately available offsite source of power for design basis events.
- The important to safety function is for the 4kV safety-related buses to be automatically transferred to the nonsafety-related 230kV source. This will provide offsite power to the safety-related loads and minimize challenges to the safety-related diesel generators.



Background – 230kV System Design



Background – 230kV System Design



Background – 230kV System Design

- DCPP is committed to IEEE 308-1971 for the 230kV offsite power source.
- IEEE 308-1971, Section 8.1.1, Multi-Unit Station Considerations, states:

“A multi-unit station may share preferred power supply capacity between units. In such a case, as a minimum the total preferred capacity must be sufficient to operate the engineering safety features for a design basis accident on one unit and those systems required for concurrent safe shutdown on the remaining units. The type of accident and shutdown and the unit assumed to have the accident, shall be those which give the largest total preferred capacity requirements.”



Background – 230kV System Analyses

- DCPP load flow analyses are based on a postulated design basis event on one unit and an orderly shutdown on the other unit. For an orderly shutdown, the buses of the other unit are assumed to be manually transferred.
- The DCPP load flow analyses of record assume the house loads for one DCPP unit are supplied by the 230kV system as an initial condition. This assumption ensures that the loading for shutdown of the non-accident unit is factored into the total capacity (steady state) of the 230kV system. This assumption also appropriately models the ability of plant operators to minimize the impact of the shutdown of the second unit on the vital bus transients associated with the ESF response of the accident unit.



Background – 230kV System Analyses

- PG&E performs load flow analyses for various normal and offnormal configurations to determine the response of the plant electrical systems and to determine whether grid separation would occur.
- The acceptance criteria applied to the load flow analyses is the ability to transfer DCPP loads to the 230kV system without loading the emergency diesel generators and provide adequate voltage to the safety-related loads.
- In those cases (grid configuration/loading) where it is calculated that grid separation may occur, either compensatory measures (eg., blocking transfer/restart of loads) are implemented to preclude separation from the grid or the 230kV system is considered inoperable.
- PG&E continues to work closely with the Transmission System Operator (TSO) to optimize the capacity/capability of the 230kV system in support of DCPP operation.



Background – 230kV System Design

- PG&E has interpreted the reference to “concurrent safe shutdown on the remaining units” as an “orderly” shutdown (vice a unit trip) :
 - General Design Criterion 5 (1971) *Sharing of structures, systems, and components* states: “Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.”
 - While the scope is limited to onsite AC power systems, the “Discussion” section of RG 1.81 states “The staff has determined that, because of the low probability of a major reactor accident, a suitable design basis for multi-unit nuclear power plants is the assumption that an accident occurs in only one of the units at a time, with all remaining units proceeding to an orderly shutdown and a maintained cooldown condition.”
 - The NRC has differentiated unit trips from unit shutdowns in similar guidance relative to offsite power evaluations (ref. Generic Letter 79-36, Branch Technical Position PSB-1 1981)



Design / Licensing History

- SER 0, issued October 15, 1974, documents the NRC's conclusion that the 230kV and 500kV systems provide sufficient assurance that redundant and independent sources of offsite power are provided to meet GDC 17, IEEE 308-1971, and Regulatory Guide 1.32.
- Second level undervoltage relays (SLURs) were installed in 1978.
- In the mid-1990s, DCPP upgraded its load flow analysis tool from a static loading software package to the ETAP dynamic loading software. The modeling assumptions regarding input loads remained unchanged. The initial ETAP runs identified transient voltage issues during 230kV loading which were reported to the NRC as an outside design basis condition in LER 1-95-007-01.



Design / Licensing History

- The solution to the voltage issues involved additional load flow analyses that resulted in the identification of additional inoperable conditions and compensatory measures for various 230kV grid conditions. However, the input assumptions regarding the loading associated with the combination of an accident in one unit and an orderly shutdown of the other unit did not change.
- A meeting was held with NRC staff on December 22, 1997 to discuss planned improvements to 230kV system. The addition of automatic load tap changing startup transformers and switchyard capacitors were planned in order to make operability of the 230kV system independent of operation of Morro Bay Power Plant in anticipation of its sale. The 230kV licensing basis regarding the assumption of an accident in one unit and an orderly shutdown of the other unit was specifically noted and discussed during this meeting.



LAR 98-01: 230kV System Upgrades

- LAR 98-01 was submitted to the NRC in on January 14, 1998, requesting NRC approval of the 230kV system improvements. The LAR specifically noted the intent of the changes to ensure adequate voltage on the vital 4kV buses when supplied from the 230kV system under conditions involving transfer of plant auxiliary loads for a design basis accident in one unit and loads required for concurrent orderly safe shutdown on the remaining unit.
- Request for Additional Information (RAI), Question 1 asked for PG&E's confirmation that the DCPP licensing basis for the 230kV system included a contingency for providing sufficient capacity and capability to take a trip of one unit following a LOCA and a trip of the second unit 30 seconds later.



LAR 98-01: 230kV System Upgrades

- PG&E's initial response provided a clarification that this contingency was simply a trip of one unit following a LOCA; a trip of the other unit was not postulated.
- A series of four phonecalls between PG&E and the NRR staff were conducted between October 16 and November 20, 1998, discussing this licensing basis for the 230 kV system.
- As requested by the NRC, the response to RAI Question 1 was revised to further clarify the DCPP licensing basis for the offsite power system. This response dated February 5, 1999, again cited the 230kV system licensing basis as providing sufficient capacity and capability to operate the ESF loads for a design basis accident on one unit and those systems required for an orderly shutdown of the second unit.



LAR 98-01: 230kV System Upgrades

- The NRC issued License Amendments 132 (Unit 1) and 130 (Unit 2) on April 29, 1999.
- The cover letter of the amendment authorized changes to the FSARU to incorporate the specified modifications to the 230kV offsite power system, including revisions to the licensing basis as reflected in the proposed FSARU changes submitted on February 5, 1999.
- The associated NRC Safety Evaluation acknowledged:
 - the basis for operability of the 230kV system (i.e., minimum voltage requirements are met on the safety buses following a unit trip to a design basis event).
 - the clarification to the basis for operability as provided in PG&E's response to RAI Question 1.
 - the applicability of the same criteria for 230 kV system operability for off-normal system configurations as for normal system configurations



DCPP Operating History

- The following are potential initiators for a DCPP dual unit trip:
 - Offsite grid disturbances
 - Ocean debris loading of intake travelling screens
 - Major seismic event
- Three dual unit trips have occurred in DCPP's operating history:
 - a 500kV grid disturbance originating in Idaho (12/14/94)
 - a major 500kV grid disturbance originating in Oregon (8/10/96)
 - Sequential manual trips of both units due to heavy debris loading (10/28/99)
- In each case, both units successfully transferred to startup (230kV) without loading the emergency diesel generators – although the loads transferred were different in each event.



DCPP Seismic Trip Design

- The DCPP design incorporates an automatic reactor trip in event of a major earthquake. Each reactor has its own seismic trip instrumentation.
- The 230kV grid components are commercial grade and are not designed to withstand a major seismic event.
- Therefore, it is expected that the 230kV grid would **not** be available as a preferred source of power in the event of an earthquake of the magnitude that would result in an automatic reactor trip.



Summary

- In conclusion, PG&E believes:
 - The design/licensing basis for the 230kV system is to provide sufficient capacity and capability to operate the ESF loads for a design basis accident on one unit and those systems required for an orderly shutdown of the second unit.
 - The load flow analyses of record, performed to demonstrate the adequacy of the 230kV system, reflect both the loads associated with an accident in one unit and the shutdown loads of the other unit in meeting the total preferred capacity requirement of the 230kV system as required by IEEE 308-1971.
 - The NRC validated the design/licensing basis for the 230kV system, as clarified by PG&E in response to RAI Question 1, with its approval of LAs 132/130.

