July 17, 1984

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MEMORANDUM FOR: Thomas M. Novak, Assistant Director
for Licensing
Division of Licensing

FROM: R. Wayne Houston, Assistant Director
for Reactor Safety
Division of Systems Integration

SUBJECT: STAFF ASSESSMENT OF AN ALLEGATION RE: THE DIABLO CANYON PLANT AND USE OF THE FLUD COMPUTER CODE (TAC #M54434)

Plant Name: Diablo Canyon
Licensing Stage: OR
Region: V
Docket Nos.: 050-275/323
Responsible Branch: LB #3
Project Manager: H. Schierling
Review Status: Complete

Enclosed is our assessment of the concern raised by a former employee of the BECHTEL Power Corporation regarding the FLUD computer program. The FLUD code was used in several engineering calculations during design of the Diablo Canyon plant.

Based on our assessment, we conclude that the allegation regarding the FLUD code does not involve any degradation of safety margins and that modification of the previously accepted calculations performed with the FLUD code is not required.

Original signed by
R. Wayne Houston

R. Wayne Houston, Assistant Director
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Division of Systems Integration

Enclosure: As stated

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7/13/84	7/ /84	7/16/84	7/17/84

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STAFF ASSESSMENT AND CONCLUSION
REGARDING THE COMPUTER PROGRAM FLUD AND ITS
USE IN SEVERAL DIABLO CANYON DESIGN CALCULATIONS

A former employee of the BECHTEL Power Corporation has filed an allegation regarding the Computer Code FLUD, which was utilized in several engineering calculations for the Diablo Canyon Plant. In his letter, of March 1984, to the NRC (Region V), he stated that, "For the Diablo Canyon Nuclear Plant, several engineering calculations were completed by using the BECHTEL developed computer code "FLUD". This code computes the pressure and temperature rize (sic) in the various compartments of the auxiliary building rupture of one or more high energy pipes. This code had no algorithm to simulate gas diffusion between compartments and has a possible accumulative error in the equation of state under some narrow range of pressure and temperature." He alleges that when the code is used for a reasonably long duration run, it sometimes generates results that are very unreasonable.

On May 9, 1984, members of the NRR staff in Bethesda and the OI staff in Walnut Creek, contacted the former BECHTEL employee to obtain a better understanding of his concern. On May 11, 1984, the staff contacted the BECHTEL Power Corporation to obtain their views concerning their former employee's concern as stated above.

Based on the above discussions, we find that the concern expressed by the former BECHTEL employee is valid only in flow regimes beyond the applicable range of the flow models incorporated into FLUD. FLUD is intended to be used for forced flow conditions while the concerns address situations that are important only for free convective flow conditions. This finding is based on the following rationale.

The use of subcompartment codes such as FLUD is intended to solve problems for which a significant pressure difference can develop between a compartment receiving the mass/energy input and downstream compartments (i.e., forced flow condition). The calculated results of the FLUD code that were questioned by the former BECHTEL employee, appear to be those calculated when the pressure difference between compartments approaches zero (i.e., free convective flow). For these conditions, the maximum differential pressures have already occurred and have been conservatively calculated by a computer code like FLUD. The addition of an algorithm to simulate gas diffusion between compartments, as suggested by the former BECHTEL employee, would represent a misapplication of the code. As stated earlier, the flow regime in question does not produce significant loads on structures and components. Pressure loads, which are important to safety, occur early in the transient where the FLUD code can conservatively be applied. Secondly, if the free convective flow regime were of interest, additional flow models would also be required in addition to such second order effects as gas diffusion.

Based on the above rationale, we conclude that the FLUD code, with respect to the expressed concern, continues to be an acceptable tool for calculating the design pressure differential between compartments. It is no different from codes used by the NRC and the industry since it is based on the current state of the art for forced flow models. We, therefore, conclude that the subject allegation has no safety significance for the Diablo Canyon Plant since it does not affect the calculation of the design pressure loads and does not result in any safety margin degradation.