LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
DIABLO CANYON UNIT 1	0 5 0 0 0 2 7 5	1 OF 12

TITLE (4) TECHNICAL SPECIFICATION 6.8.4.E NOT MET DUE TO INADEQUATE REVIEW OF LICENSING REQUIREMENTS

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MON	DAY	YR	YR	SEQUENTIAL NUMBER	REVISION NUMBER	MON	DAY	YR	FACILITY NAMES	DOCKET NUMBER(S)
08	18	92	93	- 0 0 7 -	0 0	05	28	93	DIABLO CANYON UNIT 2	0 5 0 0 0 3 2 3
										0 5 0 0 0

OPERATING MODE (9): 1

POWER LEVEL (10): 1 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)

X 10 CFR 50.73(a)(2)(i)(B)

___ OTHER - ___ (Specify in Abstract below and in text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER: AREA CODE	
DAVID P. SISK, SENIOR REGULATORY COMPLIANCE ENGINEER	805	545-4420

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
A	I P	M O N	W 1 8 5	N					

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
| | YES (if yes, complete EXPECTED SUBMISSION DATE)	| X | NO				

ABSTRACT (16)

On August 18, 1992, Technical Specification (TS) 6.8.4.e, "Post-Accident Sampling," was not met when PG&E discontinued the qualified remote grab sample gas chromatograph method as a backup for monitoring reactor coolant dissolved hydrogen. NUREG-0737 Item II.B.3 requires a backup method that meets the 10 CFR 50 General Design Criterion (GDC) 19 dose limit criteria. TS 6.8.4.e establishes the program that meets these regulatory requirements. In addition, the Unit 2 in-line monitor (primary method) was unavailable for a period of time.

The root cause was determined to be personnel error (cognitive) in that non-licensed plant personnel did not adequately review NUREG-0737 requirements.

As a corrective action, a backup method for monitoring dissolved hydrogen that met GDC 19 criteria was implemented. The procedures for reactor coolant dissolved hydrogen analysis were revised. Formal training of assigned shift chemistry and radiation protection technicians was provided.

In addition, pursuant to Item 19 of Supplement 1 to NUREG 1022, PG&E is submitting information regarding post-accident plant vent effluent radioiodine and particulate sampling and analysis during the installation of a new digital radiation monitoring system.

I. Plant Conditions

Event 1: Dissolved Hydrogen Monitor

Units 1 and 2 have been in various modes and at various power levels with the conditions described below.

Event 2: Plant Vent Sampling

Unit 1 was in Mode 1 (Power Operation) at 100 percent power.

II. Description of Event

A. Summary:

Event 1

In December 1989 and January 1990, PG&E installed in-line dissolved hydrogen monitors (IP)(MON) to the Units 1 and 2 post-accident sampling system (PASS) (IP) as primary monitors to improve the reliability of reactor coolant system (RCS) (AB) dissolved hydrogen measurement. Previously, a Sentry remote grab sample gas chromatograph (GC method) was used as the primary method. The GC method had met the 10 CFR 50, Appendix A, General Design Criterion (GDC) 19 dose requirements in accordance with NUREG-0737, Item II.B.3, "Post-Accident Sampling System." After installation of the in-line hydrogen monitors, the GC method was considered to be an alternate method. On August 18, 1992, the GC method was discontinued. Subsequent to discontinuing the GC method, problems with the new Unit 2 in-line monitor cell (CEL-1109) (IP)(MON) resulted in the in-line system being out of service for extended periods of time, and reliance was placed on other methods as a backup to the in-line monitor. An NRC inspection report dated May 13, 1993 identified that these other methods did not meet the GDC 19 dose limit.

Event 2

This information is submitted voluntarily pursuant to Item 19 of Supplement 1 to NUREG 1022. On February 26, 1993, at 0437 PST, the high range radioiodine and particulate sampler (IL)(MON), RX-40, was declared inoperable for 12 days to support installation of the digital radiation monitoring system (DRMS) (IL). During the time RX-40 was inoperable, the normal iodine monitor sample lines for RE-24, with a portable pump (IL)(P) connected, were relied upon. Technical Specifications (TS) 6.8.4.e, "Administrative Controls, Post-Accident Sampling," NUREG-0737, and Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," do not specify any allowed outage time limits for this equipment. Although there was no

specific time limitation designated for RX-40, PG&E's administrative control guidelines allow a 30-day out-of-service time for similar kinds of equipment. Thus, the 12-day period of time when this sampler was removed from service was determined to be acceptable and consistent with NRC requirements.

B. Background:

Event 1

1. NUREG-0737, Item II.B.3 requirements include:

   a. The capability to promptly sample and analyze reactor coolant under accident conditions without incurring a radiation exposure to any individual in excess of 5 rem to the whole body and 75 rem to the extremities (GDC 19).

   b. The combined time for sampling and analysis should be 3 hours or less from the time a decision is made to take a sample for:

      (1) Dissolved gases (i.e., hydrogen);

      (2) Alternatively, have in-line monitoring capabilities to perform all or part of the above analysis.

   c. If in-line monitoring is used for any sampling and analytical capability specified, the licensee shall provide backup sampling through grab samples, and shall demonstrate the capability of analyzing the samples.

2. TS 6.8.4.e requires the following:

   A program which will ensure the capability to obtain and analyze reactor coolant, radioactive iodines and particulates in plant gaseous effluents, and containment (NH) atmosphere samples under accident conditions. The program shall include the following:

   (1) Training of personnel,

   (2) Procedures for sampling and analysis, and

   (3) Provisions for maintenance of sampling and analysis equipment.

Event 2

1. TS 6.8.4.e, discussed above, is also applicable. It should be noted that TS 6.8.4.e does not specify any equipment allowed

outage time.

2. NUREG-0737 Item II.F.1.2 requires continuous sampling of plant gaseous effluents during post-accident releases of radioactive iodines and particulates. The sampling system design is required to be such that plant personnel could remove samples, replace sampling media, and transport the samples to the onsite analysis facility (LQ) and not receive radiation exposures in excess of GDC 19 dose criteria. The shielding design basis is 10^2 μCi/cc of gaseous radioiodines and particulates, deposited on the sampling media, 30 minutes sampling time, and an average gamma energy of 0.5 MeV. NUREG-0737 does not contain any requirements regarding equipment allowed outage time.

3. PG&E Equipment Control Guideline (ECG) 11.1, "Post-Accident Sampling System," states that RE-32 is the principal method for monitoring the plant vent (VF) mid and high range radioiodines and particulates. ECG 11.1 states that an alternate method is to collect a sample from RX-40 or RE-24. ECG 11.1 requires restoration of RE-32 within 30 days and also requires verification that an alternate method to RE-32 is available within 7 days.

C. Event Description:

Event 1

Following the implementation of the requirements of NUREG-0737 Item II.B.3, the primary method for measuring and analyzing reactor coolant dissolved hydrogen concentration was the GC method. This method was accepted in Supplemental Safety Evaluation Reports (SSERs) 31 and 32 dated April and July 1985, respectively. As clarified in PG&E letters to the NRC dated July 24, 1984, and March 1, 1985, the GC method was the primary method for obtaining samples, but alternate methods were available in the event this portion of the system became unavailable.

The alternates were not required by NUREG-0737 Item II.B.3, but were implemented as prudent measures. The alternate methods to obtain dissolved hydrogen grab samples from the RCS used the PASS panels (IP)(PNL) or primary sample system.

The original method of analysis, the GC method, for dissolved hydrogen required substantial maintenance support. Moisture carryover to the gas chromatograph detector was causing failures of the cell. The gas chromatograph was also used to measure hydrogen and oxygen in the containment atmosphere, and this capability was impacted by the cell failures caused by the moisture problem associated with the dissolved hydrogen analysis. To improve the reliability of the reactor coolant dissolved hydrogen analysis and to ensure better reliability of the

gas chromatograph for containment hydrogen and oxygen atmosphere analysis, PG&E installed an in-line dissolved hydrogen monitor in December 1989 and January 1990 for Units 2 and 1, respectively. The original GC method was discontinued on August 18, 1992, to minimize maintenance requirements and to simplify personnel training requirements. At this point in time, the gas chromatograph was used only for containment hydrogen and oxygen. A safety analysis screen was performed, indicating no 10 CFR 50.59 written safety evaluation was required, prior to the GC method being discontinued.

Subsequent to discontinuing the GC method and continuing until April 1993, PG&E experienced recurrent failures of the in-line cell, which periodically left the Unit 2 in-line hydrogen monitor unavailable due to replacement and calibration activities associated with the in-line cell (CEL-1109). These recurrent failures have not been experienced in Unit 1. Actions taken to address this problem included initiation of a plant problem report, cell replacements, initiation of a quality evaluation, and discussions between PG&E and the vendor.

During this period, numerous maintenance activities were conducted including vendor consultation, meetings with engineering, and in-line monitor cell replacements. On April 12, 1993, the vendor visited Diablo Canyon to investigate the cause of the failures and to assist with the installation of a new cell and sensor sample probe. The vendor identified that the in-line sensor inlet and the sample inlet probe were out of alignment. The sensor sample inlet probe was also slightly bent. The cell failures are believed to have been caused by misalignment of the sample probe tip which stressed the cell and caused leakage of electrolyte and eventually caused the cells to fail.

A coalescing filter (IP)(FLT) was added to the GC method on April 15, 1993, in order to reduce moisture carryover and to extend the thermal conductivity detector life. The GC method was reinstated by means of procedure revisions and interim training on April 21, 1993.

Event 2

This information is submitted voluntarily pursuant to Item 19 of Supplement 1 to NUREG 1022. During February 1993, activities were in progress to install a DRMS. As part of this upgrade, the midrange monitor and sampler, RM-32/RE-32, and the normal range sampler, RE-24, were to be replaced by a new digital RE-24 monitor with filters RF-24 and RF-24R (IL)(FLT). A new high range noble gas monitor, RE-87, with high range radioiodine and particulate filters RF-87A and RF-87B, was also to be installed. Completion of this installation required access inside post-accident monitoring (PAM) panel PAM2. During the upgrade, the high range sampler, RX-40, was planned to be removed from service and deenergized as a precautionary measure against possible damage and

personnel injury. RM-32 and the old RE-24 were planned to be removed from service and abandoned.

On February 26, 1993, at 0136 PST, RM-32/RE-32 was declared inoperable. At 0437 PST, RX-40 was declared inoperable. The alternate sampling pump for RE-24 was installed at 1715 PST, in the former RE-24 sampler location. The alternate sampler consisted of a portable RADECO pump assembly with a particulate filter and a silver zeolite iodine cartridge. At 0747 PST, RM-29 was declared inoperable because its alarm functions (IL)(RA) were disconnected. Although the alarm functions were disconnected, RM-29 was still functional as an indicating device on the control room (NA) PAM panel and had a local panel alarm operable. At 1815 PST, plant operators opened the electrical breakers (ED)(BKR) for RM-32 and RX-40. At 1840 PST, plant operators opened the electrical breaker for RE-24. At 1846 PST, PG&E General Construction electricians initiated work activities inside the panel.

On February 28, 1993, at 2140 PST, the alarm functions for RM-29 were restored, and RM-29 was declared operable.

On March 4, 1993, at 1034 PST, PG&E General Construction electricians completed all work activities associated with the PAM panel. On March 4, 1993, at 1619 PST, the breaker for RX-40 was closed, thereby restoring power.

On March 5, 1993, RX-40 was functionally tested. The functional test determined that the heat tracing (FE) temperature was within specification but low due to wet insulation (FE)(ISL) and that the sampler flow was out of tolerance ("pegged" high). On March 5, 1993, reliance for the RE-32 function was placed on an alternate to RE-24. On March 9, 1993, at 1700 PST, trouble shooting activities were initiated on the sampler flow indication and determined the flow to be acceptable. Subsequently, operators declared RX-40 operable at 2109 PST on March 9, 1993. RX-40 was conservatively determined to be inoperable for 12 days and 16 hours.

D. Inoperable Structures, Components, or Systems that Contributed to the Event:

None.

E. Dates and Approximate Times for Major Occurrences:

Event 1

1. December 1989/January 1990: PG&E installed the dissolved hydrogen in-line method in Units 2 and 1.

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2. August 18, 1992: Event Date - PG&E discontinued the GC method as the backup for dissolved hydrogen analysis.

3. May 13, 1993: Discovery Date - The NRC Inspection Report was issued stating that backup methods do not meet GDC 19.

Event 2

1. February 26, 1993, at 0437: RX-40 was tagged out-of-service.

2. February 26, 1993, at 1815: The clearance starts for RM-32/RE-32; the breaker for RX-40 is opened.

3. March 4, 1993, at 1619: The clearance ends; the breaker for RX-40 is closed.

4. March 5, 1993: A functional test of RX-40 initially identified a high sample flow rate.

5. March 9, 1993, at 2109: RX-40 is made operable and the out-of-service tag is removed.

F. Other Systems or Secondary Functions Affected:

None.

G. Method of Discovery:

Event 1

During an NRC inspection, the inspector noted that alternate dissolved hydrogen sampling methods did not meet GDC 19 dose limits and the in-line monitor was frequently inoperable for Unit 2.

Event 2

During an NRC inspection, the inspector noted that alternate sampling methods did not meet GDC 19 dose limits.

H. Operator Actions:

None.

I. Safety System Responses:

None.

III. <u>Cause of the Event</u>

A. Immediate Cause:

Event 1

The backup GC method was discontinued without an alternate to the in-line hydrogen monitor being available that met GDC 19 dose criteria.

Event 2

The backup method for sampling post-accident plant vent effluents did not meet the GDC 19 dose criteria.

B. Root Cause:

Event 1

The root cause was determined to be personnel error (cognitive) in that non-licensed plant personnel did not review the licensing requirements in NUREG-0737 for the PASS.

Event 2

The root cause was determined to be a procedural inadequacy which provided inadequate requirements for controlling the RX-40 allowed outage time.

IV. <u>Analysis of the Event</u>

Event 1

The PASS dissolved hydrogen analysis is not used for mitigation of a design basis accident. The PASS dissolved hydrogen analysis was originally intended to be used to obtain information to indicate the possible presence of a hydrogen bubble in the reactor vessel (RCT)(AB) following a postulated severe accident. Emergency Procedure (EP) FR-I.3, "Response to Voids in the Reactor Vessel," directs the operators regarding detection of the possible presence of and elimination of an RCS gas bubble. The size of the bubble is unverifiable by the dissolved hydrogen concentration analysis. Other noncondensable gases (i.e., nitrogen from the accumulators and noble gases) could also be present. In addition, RCS venting procedure EP FR-I.3 does not use dissolved hydrogen, but uses other indications to give operators an estimate of the presence of a gas bubble in the reactor vessel. EP FR-I.3 uses the reactor vessel level indication system (RVLIS) (IP) as the primary

indicator of the presence of a noncondensable gas bubble in the reactor vessel. Other indications that operators can use, other than dissolved hydrogen in the RCS, include the subcooled margin monitor (JD)(MON), incore thermocouples (JD)(TT), and pressurizer (AB)(PZR) level/pressure response characteristics. These parameters would indicate to operators the conditions of the RCS during the mitigation of an accident.

Based on the above discussion, plant operators have multiple parameters with which to assess the presence of a hydrogen bubble in the RCS without the use of dissolved hydrogen. By itself, dissolved hydrogen analysis from RCS samples does not represent a loss of emergency assessment capability. In addition, emergency procedures, such as, EP RB-14, "Core Damage Assessment," do not utilize dissolved hydrogen. Therefore, the inability to analyze dissolved hydrogen in the reactor coolant liquid samples would not have a significant effect on the ability to mitigate and recover from any postulated accident.

Proposed industry severe accident guidelines do not rely on reactor coolant dissolved hydrogen. In addition, the NRC and the nuclear industry are reviewing PASS requirements to determine whether they are marginal to safety and can be eliminated (Federal Register 55156, November 24, 1992).

Event 2

RX-40 is used as post-accident sample collection device in the event of a worst case accident. RX-40 enables sample collection of the plant vent followed by on-site analysis for high concentrations of radioiodines and radioactive materials in particulate form. This enables determination of particulate and iodine release rates and the resulting dose and dose rates to population receptor locations, which supports decisions for protective actions. The purpose of this is to protect the health and safety of the public in the event of a severe accident.

Other methods and equipment are available to develop protective action recommendations, as part of the Diablo Canyon emergency preparedness program.

1. EP R-2, "Release of Airborne Radioactive Materials"

This procedure describes the steps to be taken to evaluate the consequences of an airborne release that may result in the emergency plan activation. EP R-2 is performed by the operating staff on watch, and is a prompt initial assessment of potential doses to the public. EP R-2 provides methods to determine the noble gas release rate, and by a defined ratio, the iodine release rate. EP R-2 uses, among others, the high range noble gas monitor, RE-29, which was functioning as a radiation monitor during the period and could have been used for this purpose. EP R-2 also has a table of "default release rates" for a variety of analyzed accidents, which could be used in the event that

release rates could not be calculated.

2. Emergency Assessment and Response System (EARS)

EARS (IL) is a computer-based system that receives plant parameter inputs, including radiation monitors and meteorology (IS) data. EARS calculates the radiological impact of accidents, both in a "projection" mode, and in an "update" mode (real-time assessment). EARS calculates release rates and dose rates for noble gas and iodines and particulates, and provides guidance for protective actions and emergency classification. If data are limited, EARS can use FSAR Update analyzed accident data as a default, both for "design basis" cases and "expected" cases.

3. EP RB-9, "Calculation of Release Rates"
   EP RB-11, "Emergency Off-Site Dose Calculations"
   EP RB-14, "Core Damage Assessment Procedure"

These procedures can be used to calculate release rates. As an example, EP RB-9 provides guidance for calculating the noble gas release using RE-29. Two figures in EP RB-9 (Figures 8 and 9) characterize the Design Basis Noble Gas Release Rate and the Design Basis I-131 Equivalent Release Rate as a function of time. Having determined the noble gas release rate using RE-29, the I-131 equivalent release rate can be calculated using the ratio of noble gas to I-131 equivalent derived from these two figures.

In the event that the release due to the postulated accident was not via the plant vent, but rather was due to containment leakage, EPs RB-9, RB-11, and RB-14 describe methods to determine both noble gas and iodine release rates. For example, the dose rate at the containment equipment hatch (NH)(DR), or personnel hatch, can be determined, using a high range dose rate survey meter, such as a teletector, and this enables determination of the source term within containment (from Figures 4 or 5 in EP RB-14). This, in turn, enables determination of the release rate via containment leakage, as described in EP RB-9.

Additionally, EP RB-9 has accident summary sheets for various accidents that have been analyzed in the FSAR Update. These summary sheets can be used to estimate whole body and thyroid doses as "default" values.

4. EP RB-7, "Emergency On-Site Radiation Environmental Monitoring"
   EP RB-8, "Emergency Off-Site Radiation Environmental Monitoring"

These procedures provide direction for making environmental radiation measurements, including radioiodine and particulates in air samples. This information can be used to support protective action decisions. Also, by using prevailing meteorology data, it is possible to

calculate release rates from the plant.

It should be noted that RCS parameters such as reactor vessel level indicators, core exit thermocouples, and emergency core cooling system (BQ) flow rates can be used to estimate the extent of fuel (AC) degradation. In the event of a containment breach, release rates can be determined from containment pressure differences, the status of the vent system, and site boundary dose based on site pressurized ion chamber readings and site field team reports. These methods are available and may provide more realistic information about effluent release rates that would affect the general public.

In emergency conditions, as part of the emergency planning program, the dose limits for personnel are carefully monitored by radiation protection (RP). RP technicians conduct surveys in each area prior to the workers/technicians entering the area. The tailboard process is used in emergency procedures to ensure personnel do not receive a dose exposure in excess of a predetermined, authorized level. For this reason, had a severe accident occurred, personnel would not have exceeded the 5 rem whole body dose rate because RP would have assessed radiological conditions in order to limit exposure to personnel.

Thus, these events have in no way affected the health and safety of the public.

V. Corrective Actions

A. Immediate Corrective Actions:

The GC method for reactor coolant dissolved hydrogen analysis was reinstated and made operable on both units by the following actions:

1. The GC method was upgraded to add a liquid coalescing filter to reduce moisture carryover and extend thermal conductivity detector life.

2. Calibration of the gas chromatograph for dissolved hydrogen was performed.

3. Surveillance Test Procedure (STP) G-14, "Operability Determination of Post-Accident Sampling Program," and the EP RB-15 series, "Post-Accident Sampling System," were revised to reinstate calibration and sampling steps.

4. Interim training was provided for the GC method for dissolved hydrogen analysis.

5. All PASS assigned shift chemistry and radiation protection technicians received formal training on the GC method.

B. Corrective Actions to Prevent Recurrence:

1. ECG 11.1 has been revised to include an annotation stating which alternate methods of analysis do not meet GDC 19 criteria. STP G-14 was revised and annotated to add a precaution to evaluate prospective dose prior to utilizing the non-qualified GDC 19 backup methods under accident conditions.

2. The calibration procedure (Loop Test 11-1109B, "Post-LOCA Sampling System Dissolved Hydrogen Channel ANI-1109 Calibration") will be revised to ensure proper alignment of the in-line sensor inlet and the sample inlet probe during maintenance.

3. ECG 11.1 has been revised to include RF-87A or RF-87B or RX-40 as the primary methods of sampling radioiodines and particulates under accident conditions. This is an interim configuration. RX-40 may be removed from service in the future.

4. EP RB-12 was revised to include the use of the new radiation monitors.

5. A comprehensive review of PASS GDC 19 dose limit requirements will be conducted.

6. A sensor probe alignment tool is being manufactured to ensure proper alignment of CEL-1109 during cell replacement.

VI. Additional Information

A. Failed Components:

Event 1

In-line monitor CEL-1109
Whittaker Corporation (Electronics Resource Division)

Event 2

None.

B. Previous LERs on Similar Problems:

None.