ATTACHMENT E

HAZARDOUS MATERIALS AND WASTE

HAZARDOUS MATERIALS-RELATED PERMITS

POTRERO POWER PLANT

Site	Permit	Permit Type	Agency
Potrero	Permit to Operate / Authority to Construct	Air	BAAQMD
Potrero	NPDES Permit	Water	San Francisco Bay RWQCB
Potrero	Industrial Wastewater Discharge Permit (Class I)	Water	San Francisco Department of Public Works
Potrero	Hazardous Materials Registration Certificate	Hazardous Materials Storage and Treatment	San Francisco Department of Public Health
Potrero	Aboveground Petroleum Storage Tank	AST	State Water Resources Control Board

CONTRA COSTA POWER PLANT

Site	Permit	Permit Type	Agency
Contra Costa	Permit to Operate / Authority to Construct	Air	BAAQMD
Contra Costa	National Pollution Discharge Elimination System Permit	Water	Central Valley Regional Water Quality Control Board (RWQCB)
Contra Costa	Waste Discharge Requirements for Clarifier Sludge Disposal	Water	Central Valley RWQCB
Contra Costa	Aboveground Flammable and Combustible Liquid Storage Tank Permits	AST	Contra Costa County Fire Protection District
Contra Costa	Hazardous Materials Storage Permit	Hazardous Materials Storage	Contra Costa County Fire Protection District
Contra Costa	Hazardous Waste Tiered Permit	Hazardous Materials Storage and Treatment	Department of Toxic Substances Control (DTSC) Region 2

HAZARDOUS MATERIALS-RELATED PERMITS (cont.)

PITTSBURG POWER PLANT

Site	Permit	Permit Type	Agency
Pittsburg	Permit to Operate / Authority to Construct	Air	BAAQMD
Pittsburg	National Pollution Discharge Elimination System Permit	Water	San Francisco Regional Water Quality Control Board (RWQCB)
Pittsburg	Waste Discharge Requirements (WDR) for Class I/II Surface Impoundments	Water	San Francisco RWQCB
Pittsburg	Hazardous Waste Facilities Permit (RCRA Part B Permit)	Hazardous Materials Storage and Treatment	Department of Toxic Substances Control (DTSC) Region 2

GEYSERS GEOTHERMAL POWER PLANT

Site	Permit[1,2]	Permitting Agency
Units 5, 6, 7, 8, 9, 10, 11, 12, 14, 17, 18 and 20	Permits to Operate	Northern Sonoma County Air Pollution Control District
Units 13 and 16	Permits to Operate	Lake County Air Quality Management District
Units 5, 6, 7, 8, 9, 10, 11, 12, 14, 17, 18 and 20	Permits to Operate Treatment Facility[3]	Northern Sonoma County Air Pollution Control District
West Administration Center	Permit to Operate Air Pollution Control System, Sandblast Facility	Northern Sonoma County Air Pollution Control District
Units 5, 6, 7, 8, 11, 12	Permits to Operate Liquefied Petroleum Gas Tanks	California Department of Occupational Safety and Health
Units 9, 10, 11, 12, 13, 14, 16, 17, 18, 20, Administration Center and Operations Center	Permits to Operate Air Pressure Tanks	California Department of Occupational Safety and Health

1 Some permits (e.g., Authority to Construct and Certificate of Annual Inspection of Crane and Derricks) are not included in this list.
2 Some permits were revised to accommodate plant modifications or concentration limits.
3 Treatment facilities are identified as Vent Gas Treatment Facility or Stretford Air Pollution Control System depending on the type of treatment facility at a particular unit.

Site	**Permit**[1,2]	**Permitting Agency**
Administration Center and Operations Center	Underground Storage Tank Permits	County of Sonoma Department of Health Services
Administration Center and Operations Center	Aboveground Petroleum Storage Tank Permits	State Water Resources Control Board

HAZARDOUS WASTE QUANTITIES

CONTRA COSTA POWER PLANT

California Waste Code	Waste Description	Tons in 1994
132	aqueous solution with metals	0.25
151	asbestos	33.21
181	inorganic solid waste	61.91
213	hydrocarbon solvent	0.01
221	waste and mixed oil	252.66
223	oil-containing waste	15.10
261	PCB-containing materials	0.50
291	latex waste	1.02
352	other organic solids	1.49
461	paint sludge	0.31
491	unspecified sludge waste	1.57
512	empty containers > 30 gallons	1.00
513	empty containers < 30 gallons	0.49
571	fly ash and bottom ash	2.63
611	acid-contaminated soils	0.20
725	waste mercury (recycled)	0.09
	fireside/air preheater rinse waters	102.44

SOURCE: PG&E, 1995

HAZARDOUS WASTE STREAMS

GEYSERS GEOTHERMAL POWER PLANT

Stream	Source	Composition	Quantity in 1997, tons	Disposal	% of total
Filter Press Sludge	Cooling towers, particularly from units with iron/ peroxide/ caustic H_2S abatement.	Primarily elemental sulfur with traces of arsenic and mercury.	490	Class I site	16.3
Sulfur sludge from tank bottoms	Tanks for units with Stretford H_2S abatement systems.	Primarily elemental sulfur with traces of arsenic, mercury and vanadium.	1821	Class I site	60.7
Debris geothermal	Generated from many operations, particularly process equipment maintenance and cooling tower overhauls.	Cooling tower material (packing, hangers, support beams, and louvers), oily rags and debris, plastics, metal scrap, and miscellaneous debris.	165	Class I site	5.5
Sand contaminated with metals	Sandblast of cooling towers and turbines.	Sandblast grit with trace metals such as arsenic and mercury.	132	Class I site	4.4
Oily Liquids	Change out of lubricating oil used in turbine equipment and in vehicles.	Petroleum oil fractions.	80	Oil Recycler	2.7
Sulfur sludge, non-hazardous	Co-product generated from operation of Stretford H_2S abatement systems.	Sulfur.	310	Class II site Non-hazardous	10.3
Totals			2998		99.9

SOURCE: Camp, Dresser & McKee, 1997d

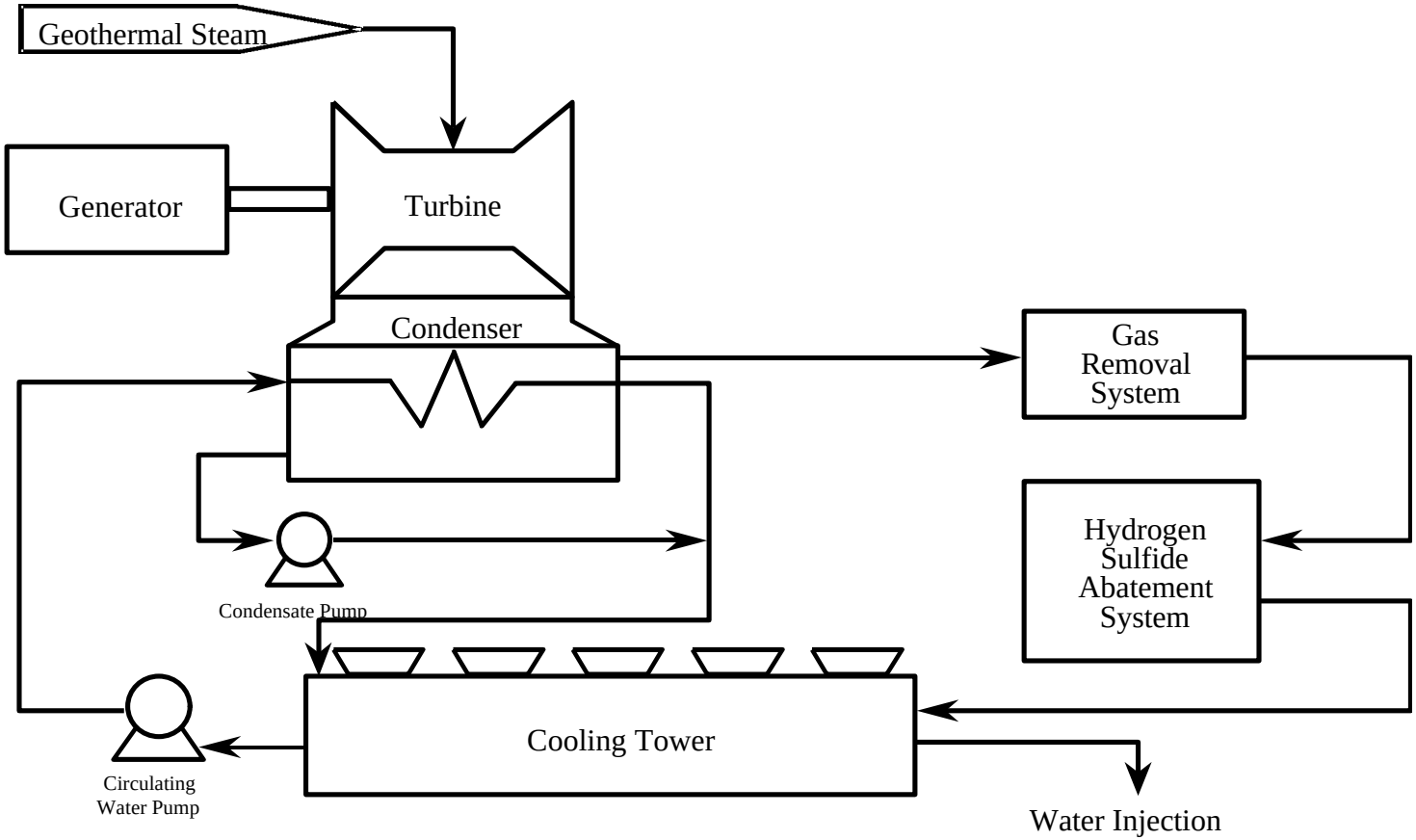
HANDLING OF HAZARDOUS CONSTITUENTS OF GEOTHERMAL STEAM

GEYSERS GEOTHERMAL POWER PLANT

The Geysers Power Plant has 14 generating units (at 11 sites) with a total net installed design capacity of 1,224 MW. Several characteristics of the Geysers plant make its operations, potential associated environmental impacts, and regulatory system different from PG&E's fossil-fueled plants. For example, because these units use naturally heated geothermal steam as their energy source, the plant does not require the use of a fuel (e.g., natural gas) for steam generation, as do PG&E's fossil plants. The Geysers plant, therefore, does not have emissions from boilers (such as nitrogen oxides, sulfur oxides and carbon monoxide) that occur as a byproduct of combustion at the fossil-fueled plants.[4] Instead, the air emissions from the Geysers plant are principally due to naturally occurring constituents of the geothermal steam released to the air during condensation of the steam after it passes through the turbine. One significant constituent is hydrogen sulfide (H_2S), and all the units are equipped with hydrogen sulfide abatement systems.

The geothermal steam contains small amounts of "non-condensable gases." These gases are removed from the condenser and transferred to a H_2S abatement system. The various H_2S abatement systems at the Geysers plant are described below. After converting the H_2S component to other sulfur species, the non-condensable gases are routed into the cooling tower and exit to the atmosphere.

[4] The Geysers plant does have relatively minor emissions of nitrogen oxides, sulfur oxides and carbon monoxide that result primarily from the use of a burner/scrubber system for the abatement of hydrogen sulfide.



* This flow diagram is for a Geysers unit with a Stretford H_2S abatement system.

Pacific Gas and Electric Company's Application No. 98-01-008 / 980125 ■

Figure 4-2
Geysers Geothermal Power Plant Flow Diagram*

HYDROGEN SULFIDE ABATEMENT SYSTEMS

Several different systems are used to remove most of the non-condensable H_2S at the Geysers Plant. These systems are:

Incinerator: This system burns H_2S to form sulfur dioxide, which is then scrubbed in a quench tower and dissolved into the quench water. The quench water is transferred to the cooling tower basin.

Caustic: Sodium hydroxide, which absorbs H_2S, is added to the cooling water at the inlet of the condenser.

Stretford: This system chemically oxidizes the H_2S to elemental sulfur.

Metal Chelate: An iron chelate solution and air are added to the circulating water. The solution, oxygen, and hydrogen sulfide react to produce elemental sulfur, which is suspended in the circulating water.[5]

The H_2S abatement systems employed at the various units are given in Table 4-2:

TABLE 4-2
H_2S ABATEMENT SYSTEMS
GEYSERS POWER PLANT

	Units		
System	**5&6, 7&8, 11, 12**	**9&10**	**13, 14, 16, 17, 18, 20**
Incinerator	✓		
Caustic	✓	✓	
Stretford			✓
Metal chelate	✓	✓	✓

[5] Some of the chelate solution comes from PG&E's fossil plants which use EDTA (Ethylene Diamine Triacetic Acid) solution to clean boiler tubes. EDTA combines with iron to form a metal chelate.

HAZARDOUS MATERIALS-RELATED CONDITIONS OF CERTIFICATION FOR GEYSERS PLANT

A. CALIFORNIA ENERGY COMMISSION'S ONGOING PUBLIC HEALTH CONDITIONS OF CERTIFICATION

Unit	Condition Number	Condition
16	6-1	During the first year of operations, provide California Department of Health Services Radiological Health Section (CDHS/RHS) with quarterly sampling results of Radon-222 concentrations entering the plant. After first year, annual reports will be submitted.
	6-2	If Radon-222 concentration exceeds 3.0 pCi/l in the cooling tower exhaust, CDHS/RHS must be notified by written report with 30 days of detection.
	6-3	PG&E will notify CDHS/RHS and the CEC within 24 hours if levels of Radon-222 exceed 6.0 pCi/l in the cooling tower exhaust. A special report will follow outlining corrective actions taken.
17	2-1	Sample and analyze for Radon-222 quarterly and provide annual reports to CDHS/RHS.
	2-2	If Radon-222 concentration exceeds 3.0 pCi/l in the cooling tower exhaust, PG&E must inform the CDHS/RHS with a written report of the sample results within 30 days.
	2-3	If Radon concentration exceeds 6.0 pCi/l in the cooling tower exhaust, PG&E shall notify the CDHS/RHS and the CEC by telegram or telephone within 24 hours upon confirming the sample result.
	2-5	PG&E shall submit to the CEC and Air Pollution Control Officer quarterly steam reports and analysis within 30 days of the quarterly sampling.
18	2-1	Provide annual reports on radon
	2-2	PG&E shall provide a written report to the CDHS/RHS of sample results within 30 days of confirmation of an exceedance of 3.0 pCi/l in the cooling tower exhaust.

Unit	Condition Number	Condition
18 (cont.)	2-3	If Radon concentration exceeds 6.0 pCi/l in the cooling tower exhaust, PG&E shall notify the CDHS/RHS and the CEC by telephone within 24 hours of confirmation of the sample.
	2-5	PG&E shall prepare and Implement an ambient monitoring program or participate in developing and implementing a generic program for monitoring ambient concentrations of mercury (vapor and particulate state), arsenic, ammonia, and vanadium at the populated areas of Whispering Pines and Anderson Springs.
	2-6	Perform steam analysis for ammonia, arsenic, mercury and boron upon written request of the NSCAPCD.
	2-7	If the results of the quarterly steam analyses indicate significant concentrations of ammonia, arsenic, mercury, and boron, and/or if results of the baseline ambient monitoring indicate significant concentrations of ammonia, arsenic, mercury, and vanadium, then PG&E shall monitor or participate in operational ambient monitoring of pollutants in question in populated areas of Whispering Pines and Anderson Springs during the second year following commercial operation.
20	2-1	Sample and analyze for Radon-222 quarterly and provide annual reports to CDHS/RHS.
	2-2	If the Radon-222 concentration exceeds 3.0 pCi/l in the cooling tower exhaust, PG&E must inform the CDHS/RHS with a written report of the sample results within 30 days.
	2-3	If Radon concentration exceeds 6.0 pCi/l in the cooling tower exhaust, PG&E shall notify the CDHS/RHS and the CEC by telegram or telephone within 24 hours upon confirming the sample result.
	2-4	PG&E can participate in GAMP to meet ambient monitoring. If PG&E participates in GAMP, PG&E shall notify the CEC.
	2-5	PG&E shall perform annual steam analysis for ammonia, arsenic mercury, and boron. A written report will be submitted to CDHS within 30 days of the analysis. After one year, the NSCAPCD, in consultation with CEC, shall determine if annual testing is sufficient.

B. CALIFORNIA ENERGY COMMISSION'S ONGOING SAFETY CONDITIONS OF CERTIFICATION

Unit	Condition Number	Condition
16	9-2	On-site worker safety inspections shall be conducted by CAL/OSHA and if employee complaint is received.
17	12-2	PG&E shall note any CAL/OSHA inspections in its periodic Compliance Reports.
18	12-3	The plant shall notify the Siting Department of CAL/OSHA inspections so that they may include this information in their periodic compliance reports. (Note: The Siting Department of PG&E no longer exists. The Geysers Plant has assumed the responsibility for this Condition.)
	12-4	A) Post warnings in areas where H_2S concentration could possibly exceed CAL/OSHA regulations. B) Require employees to secure entry permits and the approval of the Operating Foreman before entering a restricted area C) Set area alarms to ring when H_2S levels exceed 10 ppm. D) Discontinue work unless approved breathing apparatus is worn. E) Instruct employees about the hazards of H_2S.
	12-8	Personnel handling H_2S abatement materials shall be provided eye protection, rubber gloves, and rubber aprons. Emergency eye wash and shower stations should be provided adjacent to chemical workstations. Warning labels shall be placed on piping and chemical storage systems.
20	12-14	PG&E and the California Department of Forestry shall annually reexamine the fire protection plan.
	12-15	Note any on-site worker safety inspections and actions by the California Department of Toxic Substances Control.

C. CALIFORNIA ENERGY COMMISSION'S ONGOING SOLID WASTE MANAGEMENT CONDITIONS OF CERTIFICATION

Unit	Condition Number	Condition
16	10-1	Keep a letter on file verifying that hazardous waste haulers have California Department of Toxic Substance Control ((DTSC) certificates of registration.
	10-2	Any sludge which accumulates in the cooling tower will be vacuumed off and hauled by a registered hazardous waste hauler to an approved disposal site.
	10-3	Notify the CEC, DTSC, and Solid Waste Management Board of the selected disposal site. Any notice of change in disposal sites will be submitted as changes occur.
	10-4	If a secondary abatement system is used to abate H_2S emissions, the plant may produce additional hazardous wastes. To ensure that these wastes are properly disposed, PG&E shall submit its secondary waste plans, if secondary abatement is required, to the CEC for review.
	10-5	Notify the CEC if PG&E files an application with DTSC for the operation of a Hazardous Waste Facility.
17	11-1	Each month PG&E shall submit completed hazardous waste manifest to DTSC in compliance with Section 66475 of Title 22, California Administrative Code.
	11-2	PG&E shall keep on file, at the project site, copies of hazardous waste manifests which shall be made available to the CEC staff upon request.
	11-3	PG&E shall notify the CEC if it files and in-lieu application with DTSC for the operation of the hazardous waste facility.
18	11-1	PG&E shall each month submit completed hazardous waste manifests to DTSC in compliance with Section 66475 of Title 22, California Administrative Code.
	11-2	Disposal site changes require notification to the CEC, DTSC, and Solid Waste Management Board.

Unit	Condition Number	Condition
18 (cont.)	11-3	In the event hazardous wastes including Stretford sulfur effluent are stored on site for more than 90 days, PG&E shall obtain a hazardous waste facility permit from DTSC or a waiver of such permit.
20	11-1	PG&E shall keep letters on file verifying that hazardous waste haulers for Geysers Unit 20 have valid DTSC certification of registration.
	11-2	PG&E shall each month submit completed hazardous waste manifests to DTSC in compliance with Section 66475 of Title 22, California Administrative Code.
	11-4	PG&E shall promptly notify the CEC if it files an in-lieu application with DTSC for the operation of a hazardous waste facility.
	11-7	Comply with all applicable provisions of the Resource Conservation and Recovery Act and California Hazardous Waste Laws; provide copies of all required documents under such laws to the CEC within 60 days of filing with the appropriate agencies.
	11-8	Notify the CEC within 10 days of notification of an impending enforcement action against PG&E, the waste hauler, or disposal site operation.

D. CALIFORNIA ENERGY COMMISSION'S ONGOING WATER QUALITY, HYDROLOGY AND WATER RESOURCES CONDITIONS OF CERTIFICATION

Unit	Condition Number	Condition
16	11-2	PG&E shall comply with the Emergency Accidental Spill and Discharge Control Plan and Procedures, Geysers Power Plant (revised February 15, 1980). (Note: The Emergency Accidental Spill and Discharge Control Program was renamed the Zero Discharge Program and revised February 28,1996.)
	11-5	To prevent spills of Stretford process material from leaving the immediate vicinity, PG&E shall surround the H_2S abatement process area with an impermeable concrete barrier. Spilled Stretford process material will drain to a sump where it will be pumped to a chemical storage tank for reuse in the Stretford process or for disposal off site at an approved Class II-1 solid waste disposal site.
	11-6	Should a spill of condensate or other material occur, the spill would flow to a 1,000 gallon, concrete-lined catch basin located at the lowest point on the plant site. The catch basin shall be equipped with a 100 gallon per minute pump to return spilled material to the cooling tower basin for reinjection. If a spill occurs which is larger than the capacity of the pump, PG&E plant personnel shall use a portable pump to remove excess material. Alarm systems will notify plant operators when a spill has occurred and when the catch basin has started. PG&E plant personnel shall respond to the alarm within 30 minutes and take measures necessary to correct the problem.
	11-7	PG&E shall ensure that rainwater entering the Stretford process area will not enter surface or groundwater. The rainwater shall be used in the Stretford process or pumped to the cooling tower overflow structure. The steam condensate from the plant shall be used for cooling water, with any excess reinjected into the geothermal reservoir.
	11-8	To minimize the potential adverse impacts of storm runoff on the quality of Bear Canyon and Anderson Creek below the confluence with Bear Canyon Creek, PG&E shall return plant site runoff to the cooling tower basin for subsequent reinjection into the geothermal reservoir. When capacity of the return system is exceeded and a spill has not occurred, runoff may, if necessary be released from the site through a manually controlled valve. If storm runoff is released from the power plant site, PG&E shall satisfy the Basin (5A) Plan intent and any applicable requirements of the CVRWQCB.
	11-9	PG&E shall dispose of domestic wastewater by reinjection into the steam supplier's reinjection system. The waste will be treated in a septic tank to remove solids, and discharged to the reinjection line at a point between the condensate surge pond and the reinjection well.

Unit	Condition Number	Condition
17	6-1	Condensate spill letters and lab results will be kept on file and be made available to the CEC or public upon request.
18	6-2	At the end of construction activities, PG&E will submit to the CEC and the SCBO "as-built" drawings for the spill containment basin signed by a registered civil engineer. PG&E and Sonoma County will maintain "as-built" files for the life of the project and guarantee CEC access to these files.
	6-3	Report a spill to the NCRWQCB by telephone within 24 hours and by written report within 2 weeks of spill occurrence.
20	6-14	Notify CEC immediately following an accidental discharge by vehicle into Anderson or Gunning Creek and provide descriptions of problem and corrective actions.