VICTOR ATIYEH
GOVERNOR

Department of Energy

LABOR & INDUSTRIES BUILDING, ROOM 102, SALEM, OREGON 97310 PHONE 378-4040

7/14/80

Docket No.
50-344

To: Fred Lamoureaux, PGE
Paul Vundt, Trojan
Charles Trammell, NRC
Robert Engelken, NRC, Region V
Don Hull, ODOGMI
Harvey Latham, ODES
Marshall Parrott, OSHD

From: Bill Dixon, ODOE

On 7/14/80, EFSC reviewed the attached report and based upon it denied the petitions. The report is attached for your information.

A001
S-1/1

TROJAN NUCLEAR PLANT
ISSUES RELATED TO MT. ST. HELENS

Background

At the April 1980 Energy Facility Siting Council (EFSC) meeting in Lakeview the Oregon Department of Energy (ODOE) staff presented an evaluation of the potential effects of a volcanic eruption of Mt. St. Helens on the Trojan Nuclear Plant. Mt. St. Helens subsequently erupted on May 18, 1980.

At the July 11, 1980 EFSC meeting the Portland Chapter of the Physicians for Social Responsibility (PSR) and the Coalition for Safe Power (CSP) petitioned the EFSC to revoke the Trojan site certificate. Generally, the petitioners believed that Trojan was not adequately designed to withstand the effects of volcanic eruptions and that the Trojan emergency plan was inadequate. The EFSC requested that ODOE staff prepare and submit a report detailing precautions which have been taken at Trojan.

This report is in response to the EFSC request. This report includes the contentions of the PSR and CSP petitions, ODOE's assessment of these contentions and a discussion of other important issues related to Mt. St. Helens but not addressed in the petitions.

ODOE has relied on information in the technical literature and from the Oregon State Geologist, the Nuclear Regulatory Commission (NRC) staff, the U.S. Geological Survey (USGS) and Portland General Electric (PGE).

ODOE Conclusion

Based on the following evaluation and as stated previously, ODOE staff concludes that Trojan has been adequately designed for volcanic hazards and appropriate precautionary measures have been taken or will be implemented such that volcanic activity in conjunction with operation of Trojan does not present an undue risk to the public health and safety. In a discussion on July 11, 1980 John Beaulieu, Deputy State Geologist, stated that both Donald Hull, State Geologist, and he agree with this conclusion. In a discussion on July 11, 1980 Charles Trammell, Trojan Project Manager, NRC, stated that NRC agrees with this conclusion. Trammell stated the NRC is preparing a response to a similar petition to the NRC that will document this conclusion.

ODOE staff will continue to report to the EFSC and the ODOE Director on its assessment of the impact of volcanic activity on the operation of Trojan, and recommend further action, if warranted.

PSR Petition

The Portland Chapter of Physicians for Social Responsibility presented a petition that called for the immediate revocation of the Trojan Site Certificate until the following conditions are met and/or corrected.

1. Public hearings should be held to receive testimony from experts and concerned citizens regarding the dangers inherent in the continued operation of Trojan resulting from volcanic activity of Mt. St. Helens.

2. The Trojan Final Safety Analysis Report (FSAR) should be updated to include adequate emergency planning out to ten miles around Trojan in the event of a simultaneous radiological emergency and volcanic eruption.

3. The radioactive emissions from the volcano should be evaluated in conjunction with emissions from Trojan to determine whether the resulting background radiation levels are acceptable.

4. The effects of ash upon the plant's cooling system should be reviewed.

CSP Petition

The Coalition for Safe Power presented a petition also requesting revocation of the Trojan Site Certificate. The contentions of the petition are as follows.

1. Trojan was not sited or licensed to operate with an active volcano 34 miles from the plant.

2. The FSAR only considered two potential effects of ash fall--the weight of the ash on structures and the accumulation of ash in the Columbia River. The following effects need to be considered:

   a. blockage of air intakes or damage to equipment resulting from ash entrained in incoming air;
   b. electrical shorts and power outages; and
   c. blockage of the service water system intake.

3. No License Technical Specifications exist for reduced power operation or shutdown due to ash.

4. The magnitude and impact of mud and debris flows has not been adequately considered.

5. It is not clear that emergency plans are adequate to implement evacuation in the event of a simultaneous radiological emergency and a major volcanic eruption.

6. Future flooding of the Cowlitz River may impact Trojan.

ODOE Staff Evaluation

The concerns raised by the petitions identify some but not all of the potential impacts of Mt. St. Helens on Trojan. The staff has identified several other concerns. All of these concerns can be grouped into five contentions for purposes of evaluation.

1. The Trojan design did not adequately account for the effects of volcanic activity. These effects include ash, lava flows, seismic activity, toxic gas, mud flows and flooding.

2. Volcanic ash may have the following adverse effects upon plant operations and safety:

   a. block air intakes,
   b. damage equipment,
   c. cause electrical shorts and power outages,
   d. block the intake to the service water system, and
   e. damage stored spent fuel.

3. There are no License Technical Specifications for reduced power operation or shutdown due to ash.

4. Adequate emergency response plans and the means to implement them do not exist in the event of a simultaneous radiological emergency and a major volcanic eruption.

5. The radioactive emissions from Mt. St. Helens should be evaluated in conjunction with emissions from Trojan to determine the effect upon background radiation levels.

ODOE staff will address each of these contentions separately below.

Contention 1: The Trojan design did not adequately account for the effects of volcanic activity. These effects include ash, lava flows, seismic activity, toxic gases, mud flows and flooding.

a. General

The Trojan FSAR, published in the early 1970s and periodically amended, states the following:

> "A detailed study was made to determine the possible effect on the site of lava flows, ash release, or mud flows related to volcanic activity in the region. Special emphasis was placed on studies of Mt. St. Helens, the volcanic cone closest to the site, and one that was active during recent time." (Paragraph 2.5.1.2, page 2.5-3)
>
> "The significance of renewed activity of these volcanoes was considered in regard to the possible effects on Trojan." (Paragraph 2.5.6, page 2.5-34)
>
> "It is therefore concluded that the volcanic activity from the existing volcanic cones in the Cascade Range present a minimal risk to Trojan Nuclear Plant." (Paragraph 2.5.6.4, page 2.5-41)

The Oregon Department of Geology and Mineral Industries (DOGMI) reviewed the geologic hazards associated with Trojan and issued a report on March 14, 1978 which states:

> "Volcanic hazards are under active long-range investigation in the Cascade Range and no new evidence has come to light to require modification of conclusions regarding the volcanic hazards as they are presented in the FSAR." (page 19)

Also in 1978, Richard B. McMullen, a geologist with NRC testified to the following regarding NRC and USGS review of the original Trojan Construction Permit and Operating License Applications:

> "During the review for the Trojan site the following potential volcanic hazards were evaluated as to their significance to the Trojan site: ash fall, mudflows, pyroclastic flow, flooding, and lava." (Paragraph 3.2, page 1)
>
> "We conclude that the assumptions and evaluation techniques used by the applicant were reasonable and we agree with the applicant's conclusion." (Paragraph B.1, page 1 referencing the Safety Evaluation Report of October 14, 1970)

McMullen goes on to state:

> "The staff reaffirms its conclusion following the licensing reviews, that the Trojan site, including the spent fuel pool, is suitable from the volcanic hazards point of view." (Paragraph 6, page 14)

In a discussion on July 11, 1980 Charles M. Trammell, Trojan Project Manager, NRC stated that based on a detailed review, NRC agrees that Trojan design adequately considered volcanic activity. In a discussion on July 11, 1980 John D. Beaulieu, Deputy State Geologist stated that both Donald A. Hull, State Geologist, and he believe that the assessment of volcanic hazards during Trojan design remains valid and conservative.

b. Ash Fall

Ash Fall at the Trojan site was considered in the FSAR:

> "Even if the ash fall from the Crater Lake eruption were moved to superimpose the source over Mount St. Helens (the nearest volcano to the Trojan site), the resulting ash fall could not damage the plant nor cause a loss of cooling water." (FSAR 2.5-38)

The effect of ash falls on buildings has also been considered. All of the buildings required for operation have been designed to withstand at least 4-1/2 inches of wet ash on the roof. If it appears that the design roof loadings will be exceeded due to ash fall, actions will be taken to remove the ash. Equipment for such removal is stored on-site.

c. Lava Flows

No lava flows from Mt. St. Helens have reached the plant site in the past and it is unlikely that an eruption would involve sufficient lava volume to reach and bridge the Columbia River and thus encroach upon the site. The State Geologist and Deputy State Geologist agree with this statement. No lava flows have been observed during the recent volcanic activity.

d. Seismic Activity

Seismic activity is typically localized to the volcanic site and is therefore less limiting than seismic activity due to faulting for structures distant from the volcano. Trojan was designed to continue to operate safely if subjected to forces from seismic activity (either from faulting or volcanoes) that are 25 percent greater than any of those known at the plant site over the past 200 years. The plant is designed to safely shut down and maintain a safe shutdown condition if subjected to forces from seismic activity that are more than 100 percent greater than any of those known at the plant site over the past 200 years. Trojan was designed to withstand seismic forces 150 percent larger than those which could cause Columbia River dams to fail.

Because of errors in the control building design that were discovered in 1978 and are yet to be corrected, the magnitude of the seismic forces for which the plant is permitted to continue operating have been reduced. However, the magnitude of the seismic forces for which the plant can safely shut down and maintain a safe shutdown condition remain the same.

Recently, certain block walls have been re-evaluated and determined to not meet newly developed conservative design criteria for seismic forces. However, no direct plant safety problem has been associated with the failure to meet these criteria. All such walls have been strengthened.

Trojan has not detected any seismic forces due to volcanic activity. The detectability of the installed instruments is 4 percent of the safe shutdown seismic forces. This fact has been attributed to the typically localized nature of volcanic seismic forces, the damping effect of the ground between Mt. St. Helens and Trojan, and the apparent sturdiness of the bedrock upon which Trojan is built.

e. Toxic Gases

Four separate consulting geologists have informed PGE that they do not believe toxic gases would be a potential health hazard at Trojan due to the distance from the volcano. Regardless of this, the Control Room ventilation system has been designed to ensure habitability in the event of toxic gases (e.g., chlorine from the Trojan water treatment system) or radioactivity in the outside air from an accident.

f. Mud Flows

McMullen, a geologist with NRC states:

> "The possibility of a mudlow from Mt. St. Helens endangering the site was considered during the CP (Construction Permit) stage." (Paragraph B.2.b, page 3)

The Trojan FSAR states:

> "Since Mt. St. Helens is the volcano nearest the site, the possibility of a mudflow from it endangering the Trojan site was considered." (Paragraph 2.5.6.3, page 2.5-39)

> "Mudflows and debris flows related to volcanic activity would not result in damage to the plant." (Paragraph 2.5.1.2, page 2.5-4)

If mud and debris flows were to impact the plant, the worst consequence would be blockage of the intake structure. As discussed below, alternate methods of cooling are adequate.

g. Flooding

McMullen states:

> "Any flooding caused by volcanic activity would be less severe than the failure of upstream dams on the Columbia River."

> "The staff's hydrological engineering analysis showed that the plant was safe from flooding even assuming the failure of upstream dams including Grand Coulee Dam." (Paragraph B.2.C, page 4)

In its report of March 14, 1978 DOGMI stated that all flood hazards, including the worst-case volcanic-induced flood were rigorously and adequately anal[illegible]ed in the FSAR. On July 11, 1980 John Beaulieu, Deptuy State Geologist reaffirmed this conclusion consideriong the recent volcanic activity.

The worst-case volcanic-induced flood involves massive mud and debris flows into the reservoirs on the Lewis River with successive failure of the dams. This event would result in a maximum river level at Trojan of 39 to 41 feet above mean sea level which is below the level of the plant (45 feet above mean sea level). To minimize the probability and consequences to Washington State residents of the Lewis River dams failing, Pacific Power & Light (PP&L) has lowered the water level of the uppermost reservoir (Swift Reservoir) below the flood gates and is currently operating with the flood gates open.

As discussed in more detail below, ODOE staff has evaluated specific hazards associated with volcanic activity and the consequences of volcanic activity thus far and concludes that the Trojan design adequately accounted for the effects of volcanic activity.

Contention 2: Volcanic ash may block air intakes, damage equipment, cause electrical shorts and power outages, or block the river intake to the service water system which is important to the reactor core and spent fuel.

a. Air Intakes

Without any precautionary steps, volcanic ash could block air intakes for buildings and equipment. Air is needed to cool some equipment and for combustion in engines. PGE has reviewed this situation and installed cartridge-type pre-filters on outside building air intakes and the air intakes of that equipment required for continued operation and safe shutdown. These pre-filters performed acceptably during the only ash fall at Trojan thus far on May 25, 1980. A differential pressure gauge is installed with the pre-filters to alert operators if the pre-filters are becoming clogged. A supply of spare pre-filters is available on-site and sufficient personnel are available on-site at all times to replace the pre-filters if necessary. PGE is currently evaluating lower maintenance, longer term filtration equipment.

If the air intakes on the buildings were to become blocked, outside building ventilation could be shut off or put in the recirculation mode. The plant could continue to operate without outside building ventilation while the blockage was being removed. Rooms in these buildings containing equipment required for safe operation have back-up, self-contained water-cooled systems which will not be affected by ash fall with two exceptions. First, as discussed below, the diesel-generator rooms have an alternate source of combustion and ventilation air. Second, for the intake structure there are two redundant air intakes and the service water pumps can continue to operate for some time without ventilation; the length of time depending on outside air and river water temperatures.

The ventilation system for the Control Room is the only building ventilation system for which personnel access is required to achieve and maintain a safe shutdown condition. This ventilation system consists of two independent and redundant trains, either of which can supply ventilation for the Control Room. In the event the air intake becomes blocked, the Control Room ventilation can be put in the recirculation mode and retained in that mode for approximately 100 hours without any outside air and indefinitely with a small makeup air stream which has its own filters.

In the event the air intakes to equipment required for safe operation become blocked, the existing License Technical Specifications on equipment operability contain requirements for shutting down the plant.

b. Equipment Damage

Most of the equipment required for safe operations is contained inside buildings which will be closed during heavy ash falls. Administrative controls have been implemented to prevent accumulation of ash inside the buildings. Therefore, this equipment will not be affected by ash. The only equipment required for safe operations that are not enclosed by buildings are the condensate storage tank, refueling water storage tank, main steam check and isolation valves, main feedwater isolation valves, and main steam relief valves.

The two storage tanks are closed cylindrical tanks which will preclude ash entry. The tanks are adequate to withstand the weight of at least 4-1/2 inches of wet ash. In the event that one inch of ash accumulates, the tanks will be washed or shoveled.

The valves are contained in the main steam support structure which provides some protection from ash fall. The main steam check and isolation valves and the feedwater isolation valves are covered by several concrete decks. All of the valves in the structure have been evaluated for the potential effects of ash deposition and it is concluded that ash deposition might require more frequent maintenance but should not affect valve operability required for safe operations. PGE is evaluating installation of protection covers over these valves.

In the event of a heavy ash fall, ash may accumulate in the cooling tower basin. The cooling tower is required for operation and, as discussed below, as a backup to the river intake structure. If ash accumulation affects circulating water pump operation or cooling tower basin chemistry, plant contingency plans require the plant to cease operation. The reasons for this requirement are to prevent unnecessary damage to the circulating water system pumps and corrosion in the system. The system would be used to provide cooling if the intake structure could not be used.

As discussed below, due to its large size and configuration, it is unlikely that the cooling tower basin and circulating water system will become blocked with ash. Typically, the cooling tower basin does accumulate silt from the Columbia River (on the order of 2 inches per year) and this silt has not affected plant operability. During the most recent shutdown silt was removed from the basin.

If the circulating water pumps become inoperable due to ash damage and if the intake structure were also blocked, the cooling tower make-up pumps will still be available to provide the necessary cooling water flow to the cooling tower basin.

c. Electrical Shorts

Wet ash can cause electrical shorts and subsequent power outages. To counteract this concern, PGE has implemented procedures for washing ash from the insulators in the Trojan switchyard.

Reliability of electrical power for Trojan is provided by two off-site sources, the main turbine-generator and two back-up on-site sources (the diesel generators). Any one of these sources can supply adequate power. The diesel generators, which automatically start upon loss of off-site power, are equipped with standard air filters and pre-filters and are located in enclosed rooms in the Turbine Building. The normal air supply path is through the railroad bay which provides a long flow path and low-flow velocities which will enhance ash deposition prior to entering the diesel generator air intake filter system. If for some reason, both installed pre-filters on the air intakes were to become plugged, air is available from inside the Turbine Building.

d. Intake Structure

Regarding the effect of ash upon the intake to the service water system, the FSAR states:

> "Ashfalls as extensive as the largest known in the Cascades (the Crater Lake eruption), when superimposed on Mt. St. Helens, would not cause interruption in cooling water supply." (Paragraph 2.5.1.2, page 2.5-4)

Mud and debris flows might also contribute to blocking the intake structure. These effects were discussed separately above.

The volcanic activity has been responsible for depositing about 15 feet of silt on the river bottom adjacent to the intake structure. An additional 15 feet of silt would be necessary to lose this suction point. Regarding accumulation of silt in the intake structure itself, an average of 18 inches existed prior to volcanic activity (as the result of normal accumulation over the past 1-1/2 years) with no silt under the pump. As a result of volcanic activity thus far the average silt level in the intake structure has increased 3 to 4 inches with no silt under the pump. The silt level would have to approach 24 inches under the pump to affect its operabililty. PGE has removed the silt from the intake structure.

PGE has made arrangements with a private contractor to begin dredging within 24 to 48 hours if it appears that significant silting is occurring.

In the unlikely event that the intake to the service water system is lost, PGE is required by existing License Technical Specifications to shut down Trojan. In lieu of the service water system, adequate cooling can be provided for a minimum of 165 hours (nearly a week) by the circulating water system and the cooling tower basin. This cooling capacity can be maintained in the event of concurrent loss of off-site power by use of the cooling tower make-up pumps which can be connected to an emergency electrical bus supplied by the diesel generators by closing an electrical breaker. The water in the cooling tower basin will be depleted by evaporative losses. If the basin water supply is exhausted and the intake to the service water system has not been restored, additional water can be pumped into the cooling tower by temporary pumping systems or fire pumpers.

In the event of concurrent ash fall into the cooling tower and silting of the river, the cooling tower basin will remain an operable cooling water source since the ash will settle in the bottom of the basin and the circulating water system pipes (which are ten feet in diameter) are not likely to become blocked with ash.

e. Stored Spent Fuel

Spent fuel is stored in a large water filled basin in the Trojan Fuel Building. The basin is protected from ash accumulation by the building which can withstand at least 4-1/2 inches of wet ash. The spent fuel should not release its radioactivity so long as the basin water is cooled. The water will be cooled either by water from the intake structure on the Columbia River or if it has been made inoperable by silt accumulations, by the cooling tower water. Therefore, volcanic activity is not expected to have any adverse impacts on spent fuel storage.

Contention 3: There are no License Technical Specifications for reduced power operation or shutdown due to ash.

There are no specific License Technical Specifications relating to ash. However, there are License Technical Specifications that clearly and completely define what systems and equipment must be operable to ensure safe operations. If any of these systems or equipment become inoperable, regardless of the cause (volcanic activity, earthquake, ice storm, mechanical failure, etc.), the License Technical Specifications require actions to shut down the plant. Since the only way ash can affect the safety of plant operations is by affecting the systems or equipment needed for safe operations, no specific License Technical Specifications concerning ash are needed.

Contention 4: Adequate emergency response plans and the means to implement them do not exist in the event of a simultaneous radiological emergency and a major eruption.

a. Background

An accident at Trojan could release radioactivity in the form of gases and particulates. In the event of an accident, people would be advised to stay indoors or to evacuate in order to reduce their radiation exposure. Radiation levels would decrease with distance from the plant as particulates settle to the ground and gases become dispersed. Currently, detailed plans for sheltering and evacuating people out to a ten mile radius from Trojan exist. The plans also provide for control of food stuffs out to 50 miles. Annual drills have been held since before Trojan startup although only the 1979 drill tested plans out to ten miles.

b. Simultaneous Eruption and Accident

As discussed above, precautions have been taken to prevent an accident at Trojan caused by an eruption. Trojan may be unaffected by an ash fall but motor vehicle traffic could be curtailed. During this period, if an accident occurred at Trojan, evacuation of people could be difficult.

It is possible to postulate adverse conditions during which an evacuation would be difficult. For example, extreme snow and ice conditions could also affect evacuations. In this sense an eruption of Mt. St. Helens is not unique. Emergency plans rely on sheltering duing times of adverse road conditions. The effectiveness of sheltering is discussed below.

PGE may shut down Trojan during a heavy ash fall for two reasons. First, if a heavy ash fall did occur it would be difficult for Trojan workers to report for work. Second, other workers at large industries such as aluminum companies would not be able to report to their work. Consequently, the power from Trojan might not be needed at that time.

The staff will evaluate Trojan operation during a heavy ash fall and recommend any actions to the EFSC and ODOE Director.

c. Concept of Emergency Plans

The following discussion describes the Trojan Emergency Plan. This plan has been prepared by the joint efforts of agencies in Oregon, Washington State, Cowlitz County, Columbia County, and PGE. Governors Atiyeh and Ray have taken a personal hand in assuring adequate response plans.

d. Notification

The Trojan emergency plan specifies specific plant conditions which require PGE to notify the States of Oregon and Washington and Columbia and Cowlitz Counties. Additionally, the EFSC has radiation detection equipment installed at Trojan which will alarm in Salem if a release of radioactivity has occurred. An ODOE staff member is always on call to respond to these notifications and to advise state and local officials.

e. Public Warning

County and state officials will provide instructions and advice to the public via the Emergency Broadcast Radio System. This warning system will be strengthened by the installation of sirens in 1981. Sirens will alert people within ten miles of Trojan to turn on their radio for instructions.

f. Decisions for Protective Actions

Decisions to take protective action depend on road conditions, off-site radiation conditions and the plant status. Depending on these factors people will be advised to stay indoors or to leave the area. Advice will be broadcast over the radio. Road conditions will be available from the State Police. Off-site radiation levels will be projected from plant instrument readings and by direct measurements taken by field and airborne teams. The plant status will be obtained from PGE personnel and ODOE's on-site inspector. Protective action will be coordinated between Oregon and Washington State.

g. Communications

Communication systems have been installed between Olympia, Longview, Trojan, St. Helens, Portland and Salem. These systems include two redundant telephone systems. A hard copy data transmission system will also be installed. The purpose of these systems is to provide for information exchange and to minimize confusion between different agencies.

h. Effectiveness of Protective Actions

Studies have been performed to evaluate the effectiveness of different protective actions during an accident at a nuclear plant. The effectiveness of the plan will depend on how much warning time exists and the conditions of the roads as discussed above. Further, these studies show that both evacuation and sheltering can reduce radiation exposures.

One study compared the various radiation doses for a hypothetical accident with no protective actions, with sheltering, or with evacuation. Radiation levels with sheltering were about 25 percent of those that would occur with no protective actions. Levels were reduced to about ten percent by evacuation. These values are illustrative only because some buildings provide better protection than others and some evacuations are faster than others (Examination of Offsite Radiological Emergency Protective Measures for Nuclear Reactor Accidents Involving Core Melt, October 1979, NUREG/CR-1131, SAND78-0454).

The effectiveness of evacuation of the area around Trojan has been analyzed by Stafco, Inc. and CH2M-Hill for PGE. The study demonstrates a difference between Oregon and Washington. In Oregon within ten miles of Trojan there are no hospitals, nursing homes or jails. It is estimated that during normal driving conditions residents, businesses, industries and schools could be evacuated within about 1.5 hours after they are notified. If heavy rains are occurring, this time extends to two hours.

In Washington the towns of Kelso and Longview may require evacuation. Evacuation includes hospitals, nursing homes and a jail, as well as schools, residents, businesses and industries. Evacuation times for normal weather and heavy rains are 2.5 and 4 hours, respectively.

The estimate of evacuation times are based on numbers of people in specific areas, capacities of roads to be used by each group of people and an assumption that most people will begin to evacuate within 30 minutes and the remainder will leave their starting points within one hour of being notified (Draft Trojan Evacuation Analysis Report, July 1980).

Experience from the May 25, 1980 eruption was not more severe than conditions assumed for heavy rains in the scudy (Draft Trojan Evacuation Analysis Report, July 1980).

i. Procedures specific to Mt. St. Helens

The FSAR states the following:

> "Of considerable importance from a safety standpoint should volcanic activity increase in the Cascades, is the usual fairly lengthy warning period indicating renewed volcanic activity. Few, if any, volcanic eruptions have not been preceeded by either thermal changes, increased minor seismic activity, swelling of the ground from internal pressure, small emissions of steam or ash, or other signs." (Paragraph 2.5.1.2, page 2.5-4)

This statement has been borne out in that the signs of an impending eruption were evident for nearly two months prior to the May 18, 1980 eruption. To ensure adequate warning is provided and appropriate precautionary measures are taken, PGE has formalized a notification agreement with the U.S. Forest Service, who has the lead for overall direction of emergency efforts during volcanic activity on Mt. St. Helens. During periods of little or no activity, PGE is notified of the volcano status at least once per day. During periods of impending or significant activity, PGE is immediately notified and a PGE representative mans a station in the Forest Service Headquarters to relay further information to PGE. In the event of significant activity, PGE immediately notifies ODOE staff and NRC (U.S. Forest Service, Mt. St. Helens Contingency Plan, April 1980).

Additionally, procedures of the Oregon Emergency Services Division provide for notification of ODOE if activity occurs at Mt. St. Helens.

ODOE concludes that existing emergency plans can be used to reduce radiation exposures to the public. Detailed plans exist out to 10 miles. Precautions have been taken to prevent an accident caused by an eruption. If ash fall precludes motor vehicle travel Trojan may not be operating. If it is operating and an accident does occur sheltering would be used to reduce radiation exposures. The staff will evaluate the advisability of Trojan operation after a heavy ash fall in light of conditions existing at that time.

Contention 5: The radioactive emissions from Mt. St. Helens should be evaluated in conjunction with emissions from Trojan to determine the effect on background radiation levels.

Background radiation levels depend, in part, on altitude and naturally occurring radioactivity in soils and rocks. Thus, background levels will be different from one location to another. For example, Newport, Oregon has a background level of about 70 millirem per year (mr/yr), Corvallis is about 90 mr/yr, Ontario is 110 mr/yr and Denver is 210 mr/yr.

Radioactivity discharged from Trojan is at such a low level that exposures to people cannot be measured directly. However, instruments at the plant record how much radioactivity is discharged to the air and water. From these data estimates of radiation exposures are possible. For the year during which Trojan operated the most--1977--it is estimted that the individual closest to the plant received less than 1 mr/yr above what would have occurred naturally. The maximum allowable radiation dose due to normal operation of Trojan is 5 mr/yr.

Several agencies have analyzed the radioactivity in volcanic ash including, at least, the Oregon State Health Division, the University of Washington, Washington State University, and Battelle Northwest Laboratories. All individuals contacted have reported radioactive concentrations the same as typical soil in the Pacific Northwest (0.5-1.0 picocuries per gram). The Battelle study appears to be the most complete and will be discussed.

Battelle Northwest Laboratories in Richland, Washington has conducted evaluations of chemical, physical, and radiological parameters of ash. Samples were collected at ten locations in eastern Washington and Montana following the May 18 eruption. Analyses were published in June 1980 (Preliminary Report on Physical, Chemical, and Mineralogical Composition and Health Implications of Ash from the Mount St. Helens Eruption of May 18, 1980; PNL-SA-8674). Additional analyses of that and later eruptions have been done since, according to Dr. J. S. Fruchter and will be published in Science Magazine within a few weeks. Since the latest eruption Battelle and the Environmental Protection Agency (EPA) have installed continuous radon monitors at ground level around Mt. St. Helens.

From ash collected immediately after it fell on May 18 Battelle estimated that 100,000 curies of radioactive radon gas were released from Mt. St. Helens. This number is somewhat tenuous because the ash may have absorbed some naturally-occurring radiation which was in the air before the eruption. The ash included radiation from two other sources. First, the ash, like most other soils, had radiation (radium) included in it. Second, the radon gas and its decay products released at the time of eruption collected on the ash surface as it fell.

Battelle did not report any calculations to indicate the exposure to individuals. ODOE has made the following rough estimate. Because the ash has the same levels of radiation as the ground it covers, no additional exposure would occur from this source. Radiation exposure would occur by inhalation of ash. Use of masks would eliminate this remaining source of radiation exposure.

Radiation exposure would be higher immediately during the ash fall because of the relatively large amount of short-lived radon gas released. Subsequently, exposure would result from radium incorporated into the ash structure. Calculations of exposure were based on ash concentrations of 5,000 micrograms per cubic meter of air. This is the maximum level reported by Department of Environmental Quality (DEQ) in Portland. The dose during the ash fall would be about 0.0015 mr/hr then decrease to insignificant levels (approximately one thousand times lower than during the ash fall).

ODOE staff concludes that both Trojan and Mt. St. Helens release radioactivity into the atmosphere but the effect of either or both on background levels is negligible. The combined effects are about one order of magnitude smaller than variations in natural background in Oregon and are about two orders of magnitude smaller than the total background at any location in Oregon.

The staff will continue to evaluate data as they become available and make any changes as necessary. Additional data will be available at least from ODOE's radiological monitoring program around Trojan and from the University of Oregon Health Sciences Center (UOHSC).

The UOHSC has been funded to conduct a complete evaluation of the long-term health effects of volcanic ash. The plan for this study is being developed at the present time by Dr. Sonia Buist of the UOHSC. Dr. Leonard Laster, President of UOHSC, and a panel of medical professionals from Oregon and Washington will approve the project plan and coordinate its implementation.

DG:sh
8403A
7/14/80