WASHINGTON STATE
ENERGY FACILITY SITE EVALUATION COUNCIL

RESOLUTION NO. 332 AMENDMENT NO. 1

ENERGY NORTHWEST
COLUMBIA GENERATING STATION

Revisions to the Radiological Environmental Monitoring Program

Nature of Action. In February 2012, the Council closed Resolution No. 260 and approved Resolution No. 332 updating the Radiological Environmental Monitoring Program (REMP) for the Columbia Generating Station (CGS) to clarify its requirements and to better align with the requirements of the Offsite Dose Calculation Manual for CGS. The REMP has as its objective the determination of the significant radiological effects of CGS operations on the environment.

This Amendment No. 1 to Resolution No. 332 changes the type of dosimeter to be used for full-time monitoring of direct radiation from a thermoluminescent dosimeter to an Optically Stimulated Luminescence (OSL) dosimeter. In addition, three (3) shallow groundwater monitoring wells (MW), MW-6, MW-7, and MW-8 as listed in Attachment 1, Table 1 are dry and are no longer sampled.

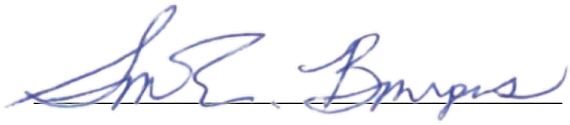
Background. In July 2022, Energy Northwest notified EFSEC that it had changed the type of dosimeters used for the full-time monitoring of direct radiation from thermoluminescent dosimeters to Optically Stimulated Luminescence (OSL) dosimeters. Although the dosimeters function differently – thermoluminescent dosimeter relies on heat and the optically stimulated luminescence dosimeter relies on optical stimulation – the accuracy and quality of the dosimeters remain the same. The new OSL meets the requirements of the American National Standards Institute (ANSI) Performance, Testing, Procedural Specifications for Thermoluminescence Dosimetry Environmental Applications (ANSI N545: 75(R1993) and the Nuclear Regulatory Commission (NRC) Regulatory thermoluminescent dosimeter specifications in NRC Guide 4.13 and will not affect the quality of the monitoring under the REMP.

Council staff has recommended that Attachment 1 to Resolution No. 332 be amended to reflect the change in the type of dosimeter to be used for full-time monitoring of direct radiation from thermoluminescent dosimeters to Optically Stimulated Luminescence (OSL) dosimeters.

Resolution. The Council hereby amends Resolution No. 332 and its Attachment 1 to require full-time monitoring of direct radiation by Optically Stimulated Luminescence dosimeters as specified in Attachment 1 to this amendment. In addition, the Council hereby amends Resolution No. 332 Attachment 1, Table 1 groundwater monitoring wells.

Dated and effective this 15th day of March 2023.

Washington State Energy Facility Site Evaluation Council

By: 

Sonia Bumpus, EFSEC Executive Director

Attachment 1: Radiological Environmental Monitoring Program

ATTACHMENT 1

COLUMBIA GENERATING STATION SITE CERTIFICATION AGREEMENT

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

I. GENERAL DESCRIPTION

The Radiological Environmental Monitoring Program (REMP) established by Energy Northwest has as its objective the determination of the significant radiological effects of Columbia Generating Station (CGS) operation on the environment. The monitored items include land, adjacent waters and their aquatic life, air, and other ecosystems, as appropriate. The program provides an environmental measurement history for evaluation by Energy Northwest and the Council. The program uses reasonable and available methods and techniques; it will be maintained throughout the life of CGS or until such time that the Council concurs in its termination.

The Radiological Environmental Monitoring Program may be modified with concurrence of the Council as detailed information acquired from the program indicates a need to change. Any modifications will be based upon: (a) CGS effects, if any, on the terrestrial and aquatic ecology including the wildlife, fish and other aquatic life in the area of influence, (b) siting of other nuclear or other facilities in areas surrounding the site, (c) technological developments in the field of environmental monitoring, (d) changes in types and abundance of the various samples and (e) changes relative to the pathways resulting in human radiation exposure. The program is designed to provide the data needed to evaluate the radiological impact CGS operation may have on the environment, establish a relationship between quantities of radioactive material released by CGS effluents and resultant radiation and radioactivity identified in the environment, and to verify that CGS is operating within its design and regulatory specifications. The monitoring program is also designed to assure appropriate reaction when an unexpected variance occurs in the data results.

This Radiological Environmental Monitoring Program is part of a single integrated program for monitoring the preoperational and operation phases of CGS operations. Changes, supplements, or revisions to the Radiological Environmental Monitoring Program will be submitted to the Council for its review and concurrence.

Energy Northwest is also required to have a Radiological Environmental Monitoring Program by 10 CFR 50. This program is described in the CGS Offsite Dose Calculation Manual (ODCM).

II. MONITORING PROGRAM

A. Program Elements

1. Factors such as distance, prevailing wind direction, and dispersion and deposition values calculated from models are considered when determining sampling locations that have the most potential of showing impact from CGS operation. Other factors such as population density and land usage are also considered. Sample analysis results are to be trended and compared to operational and preoperational data as well as results from control locations in order to assert and quantify the impact CGS operation may have on the environment.

2. Air sampling stations are located in close proximity to CGS, in agriculture areas potentially impacted by CGS operation, near regions with higher population density, and at locations where the infrastructure supports operation of continuous air sampling equipment. The zone within ten miles of CGS is emphasized, with consideration given to areas in downwind sectors where populations are more concentrated or agriculture impact more likely. The ten-mile radius zone includes parts of Franklin and Benton Counties.

3. In the terrestrial monitoring part of this program (milk, soil and farm products), the area within a ten-mile radius of CGS is of primary concern. Agriculture is the primary activity in the Franklin County portion of this area. The major crops are wheat, corn, alfalfa hay, potatoes, grapes, apples and soft fruits. Farm produce is sampled as it is available and from location where CGS operation may potentially have the greatest impact.

   Particular emphasis is placed on the collection of the primary components of the food chain to man. Fresh vegetables, fruits, milk, and other food stuffs that are directly consumed by man are emphasized. Samples of domestic animals normally consumed by man, such as chickens, beef cattle, and hogs will be collected if air, soil, or vegetation results from the area indicate a measureable impact due to CGS operation and samples are available.

   Soil samples are collected from locations near CGS and in Franklin County.

4. In the aquatic program, sampling includes deep groundwater at CGS, shallow ground water collected from wells around CGS, water draining to the storm drain pond NE of the CGS site, surface water samples from the Columbia River, and drinking water from the City of Richland municipal water supply.

In addition, sediment samples are taken from the Columbia River above and below the CGS discharge point. Fish samples are taken from the Columbia River near the plant discharge and from a control location not expected to be influenced by CGS operation.

B. Surveillance Levels

1. The radiological environmental monitoring program sampling schedule outlined in Table 1 represents the current level of surveillance around CGS. The sampling locations may change from time to time if samples are no longer available. Replacement sampling sites are then added to the program to compensate. REMP sampling locations relative to CGS are listed in Table 1, most of the locations are also shown graphically in Figure 1.

2. Analytical procedures shall be compatible with but not limited to the following documents, or later documents representing state-of-the-art improvements:

   "Handbook of Radiochemical Analytical Methods" U.S. Environmental Protection Agency, EPA-680/4-75-001, February, 1975.

   "Health and Safety Laboratory Procedures Manual" U.S. Energy Research and Development Administration, HASL-300 27th Edition.

   "Standard Methods for the Examination of Water" American Public Health Association, 20th Edition.

3. Samples are to be analyzed in a manner to achieve the a priori lower level of detection (LLD) limits listed in CGS ODCM Table 6.3.1-3. Environmental water samples analyzed for tritium are analyzed to a LLD of 300 pCi/l or lower. Samples are to be analyzed in a timely manner to ensure required LLDs will be achieved and prompt and appropriate action can be taken if an impact is identified.

4. Sample analysis will be performed by laboratories which maintain a quality assurance program that meets the requirements of NRC regulatory guide 4.15 and that participate in an accredited laboratory intercomparison study traceable to the National Institute of Standards and Technology (NIST). Upon request, Energy Northwest will provide the Council or its designated representative’s access to written procedures, quality assurance audits, and the results of the laboratory intercomparison studies as performed in the implementation of the Radiological Environmental Monitoring Program. In addition, the Council designate(s) will be provided the opportunity to accompany and observe the collection and analytical process.

C. Sample Types and Media - General Discussion

1. Background Radiation

Background radiation levels are determined by exposing Optically Stimulated Luminescence (OSLs) dosimeters at twenty-five or more locations within a ten-mile radius of the site. The OSLs are exchanged and read quarterly. The type of OSLs used is designed for environmental monitoring. Measurement of background exposure rates are made in units of milli-Roentgen (mR) and reported in units of mR/day and/or mR/quarter. Results from each location are compared to results from a control location and also compared to historic results in order to determine what direct radiation effects CGS operation may be having on the surrounding area. Additionally, the REMP also performs OSL monitoring of the CGS Independent Spent Fuel Storage Installation (ISFSI).

2. Airborne Particulates and Iodine

Sampling for airborne radio-particulates and radio-iodine is performed on a weekly basis from nine or more sampling locations including a control location. Samples are collected weekly. The filter housings are located 5-6 feet above ground level in order to obtain the sample from the breathing zone, help reduce dust loading, and minimizes the impact of radon and radon daughters on the sample results. Iodine cartridges are typically analyzed within 2 days of collection for radio-iodine. Air particulate filters are decayed for a set time period (GT 24 hours, typically 6 days) before performing gross beta analysis. The same decay period is used consistently to reduce variability when trending results. Particulate gross beta results are subject to weekly and seasonal variability due to weather and environmental fluctuations.

3. Drinking Water

Samples of drinking water are collected on a monthly basis from at least one location downstream of the CGS Columbia river discharge location. The primary sample location is the City of Richland treatment facility which is the closest public drinking water collection facility located downstream of the CGS discharge point. A representative composite sample is collected using equipment which is capable of collecting aliquots on a flow proportional or timed interval basis.

4. River and Discharge Water

Samples of Columbia River water are collected on a monthly basis from locations upstream and downstream of the plant discharge point. The upstream sample is taken from the CGS intake water system (tower makeup). The downstream sample requirement is conservatively met by taking a sample from the cooling tower discharge line just prior to final discharge into the Columbia River. A representative composite sample is collected using equipment which is capable of collecting aliquots on a flow proportional or timed interval basis.

5. Storm Drain Water

Samples of water flowing into the CGS storm drain pond are collected monthly. A representative composite sample is collected using equipment which is capable of collecting aliquots on a flow proportional or timed interval basis.

6. Ground Water

Sampling of groundwater is performed quarterly from at least one deep well used for fire protection and/or as a backup drinking water source. Sampling is also performed from at least 2 shallow wells used to monitor the unconfined aquifer under CGS. Note: Tritium is known to exist in the unconfined aquifer under CGS as the results of past Department of Energy activities on the Hanford site. Sampling from the unconfined aquifer is performed to assess any contribution CGS may be making to the known ground water contamination issue.

7. Sanitary Waste Water

All sanitary waste water sampling and analysis requirements relating to the Energy Northwest Sanitary Waste Treatment Facility are listed in a separate EFSEC Resolution and not included as part of this resolution.

8. Soil and Sediments

Soil samples are collected annually from air sampling locations near CGS and from locations in Franklin County. Columbia River sediment is collected at least annually upstream and downstream from the CGS discharge point. Samples are analyzed for gamma emitters and if required for Sr-89/90. Sample results are compared to results from control locations, historic results, and levels known to exist in local soils. Sample and analysis requirements for cooling tower sediments is given in a separate EFSEC resolution and not included as part of this resolution.

9. Milk

Milk is sampled semimonthly during periods when milking animals are on pasture and monthly at other times. Samples are obtained from at least one milk producer located within ten miles of CGS, if available. Milk from a control location greater than 20 miles from CGS and in a sector least likely to be influenced by CGS operation is also collected on a monthly basis. Information regarding the source of feed should be documented for each sampling location if possible. If no milk producers within 10 miles are available, samples of broadleaf vegetation may be sampled monthly during the growing season in lieu of milk sampling.

10. Fish

Fish are collected annually from the Columbia River near the plant discharge and from a control location not influenced by plant discharge, usually the Snake River. The same species are collected from both the indicator and control locations, if possible. The exact time of sampling depends upon such factors as the water depth, weather conditions, and fish availability.

11. Fruits, Vegetables, and Vegetation

Fruits and vegetables grown for human consumption are collected from areas that potentially could be affected by CGS operations. Both the gaseous and liquid pathways are considered. When possible, fruit and vegetable samples are collected from locations in a predominant downwind location that are irrigated with Columbia River water withdrawn downstream of the plant discharge location.

For locations where the predominate pathway is gaseous, leafy vegetables or vegetation is the preferred sample media. For locations where the predominate pathway is liquid, root crops are the preferred sample media. Analysis is performed on edible portions only. Samples from control locations are obtained annually for comparison.

D. Sampling and Notification Requirements

1. Split Sampling

   The CGS REMP will provide split samples of routinely collected samples to the Washington State Department of Health (WDOH) for independent verification of sampling results. A split sample schedule is to be agreed to by both parties at the beginning of each year.

2. Changes to the CGS ODCM

   Notification of any changes to the ODCM that effect CGS REMP sampling and analysis are to be communicated to WDOH and/or EFSEC.

3. Notification of Sampling Deviations, Abnormal Results

   CGS will inform WDOH and/or EFSEC of any sampling deviations, abnormal results, or trends that may show impact to the environment due to CGS operation. Any condition reports written on REMP related issues should be communicated to WDOH and/or EFSEC.

4. Reporting of Results

   Results of all Resolution required sampling is to be reported in the CGS annual radiological environmental operating report (AREOR). The report will be made available to WDOH and EFSEC. Sampling results not included in the annual report may be provided to WDOH and/or EFSEC if requested.

5. Sampling Requirements

   Samples shall be collected and analyzed as outlined in Table 1. Deviations are permitted from the Table 1 sampling schedule if samples are unobtainable due to hazardous conditions, seasonal availability, malfunction of automatic sampling equipment, or other legitimate reasons. Significant sample deviations (i.e., sample not obtained, ODCM LLD not achieved) will be documented in the annual report. If samples are unobtainable due to sampling equipment malfunction, efforts shall be made to complete corrective action prior to the end of the next sampling period. If extended sampling failures occur (two sampling periods), arrangements shall be made to obtain adequate alternate samples.

All locations are identified relative to their distance and direction from CGS containment.

Sample Type	Location and Station ID	Sampling and Collection Frequency	Required Analyses
Airborne Particulate and Radioiodine	1.3 miles S (ST-1) 3.0 miles ESE (ST-23) 4.6 miles NE (ST-48) 9.6 miles SSE (ST-4) 6.5 miles SE (ST-40) 7.7 miles S (ST-6) 2.8 miles WNW (ST-7) 4.4 miles ESE (ST-8) 28 miles WSW (ST-9)	Continuous Sampling Weekly Collection	Radioiodine analysis (I-131) Weekly Particulate Gross Beta analysis weekly Particulate gamma isotopic of quarterly composite (by location)
Particulate filters are analyzed for gross beta following a 24 hour or longer decay period. If gross beta results are significantly greater than the results from the control location and/or the results indicate an impact that could reasonably be attributed to CGS operation, gamma isotopic analysis is performed on the individual air filters.			
Direct Radiation Environmental	9.6 miles SSE (ST-4) 6.5 miles SE (ST-40) 7.7 miles S (ST-6) 2.8 miles WNW (ST-7) 4.4 miles ESE (ST-8) 28 miles WSW (ST-9) 3.2 miles E (ST-10) 3.2 miles ENE (ST-11) 6.7 miles NNW (ST-12) At least 1 OSL within each 22 1/2° sector around CGS located between 0.9 and 2.2 miles of CGS.	Continuous Exposure Quarterly Collection	Exposure Rate (milliroentgen/period)
Direct Radiation ISFSI	4 or more OSLs located on ISFSI security fence line.	Continuous Exposure Quarterly Collection	Exposure Rate (milliroentgen/period)
Optically Stimulated Luminescence (OSL) dosimeters containing multiple sensors will be used. Sensor results from each OSLs should be compared for anomalies. Direct radiation monitoring at ISFSI is to be performed during periods when spent fuel is stored at that facility.			

Sample Type	Location and Station ID	Sampling and Collection Frequency	Required Analyses
Soil	Two samples from locations near CGS historically sampled, two samples from locations in Franklin County, one sample from control location.	Annual Grab Sample	Gamma Isotopic Sr-90 as needed (see note)
Locations near CGS historically sampled include air sample stations 1, 21, 7, and 23. Samples should be alternated so that these locations are sampled bi-annually. Samples from Franklin County should be from agricultural areas that may be impacted by CGS operation. Control is ST-9, 28 miles WSW of CGS. Individual soil samples will be analyzed for strontium-90 if gamma results indicate the presence of radionuclides attributable to CGS operation at levels that are greater than 5 times the historic trend and greater than 5 times the analysis LLD.			
River Intake, Plant Discharge, Storm Drain, and Drinking Water	3.2 miles E (ST-26) 3.2 miles E (ST-27) 0.22 miles ENE (ST-101B) 11.6 miles SSE (ST-29)	Composite Aliquots Monthly Collection	Gamma Isotopic, Gross Beta, and Tritium on all samples. Sr-90 on drinking water as needed (see note)
A representative sample will be collected using automatic composite sampling equipment that collects samples on a flow proportional or a set timed interval. When timed interval sampling is used, the sample collection frequency is short (e.g., hourly) relative to the compositing period (e.g., monthly). Flow proportional sampling is preferred. If the gross beta activity in a drinking water sample is greater than 8 pCi/l, strontium-90 analysis will be performed. This requirement does not pertain to river intake, storm drain, or plant discharge water.			
Ground Water	0.1 miles N(ST-52) From two shallow groundwater well locations.	Quarterly Grab Samples	Gamma Isotopic and Tritium.
Shallow groundwater sampling locations include MW-3,5, 9,10,11,12,13,14.			
River Sediment	~2.0 miles upstream (St-33) ~1.0 miles downstream (ST-34)	Annual Grab sample	Gamma Isotopic
Sample should consist of shoreline sediment and not deep water sediment. Samples should be taken from areas known to be underwater during high water periods and were the potential for river silt or sediment accumulation is likely.			

Sample Type	Location and Station ID	Sampling and Collection Frequency	Required Analyses
Milk	Milk from at least 1 Dairy within 10 miles of CGS. (see note) Milk control from Dairy > 20 miles from CGS and in sector not likely to be affected by CGS operation.	Semi monthly when milk animals are on pasture, monthly at other times.	Gamma Isotopic and I-131 analysis on all samples collected. Sr-90 if Cs-134/137 identified in excess of 30 pCi/l
Samples are obtained from at least one milk producer located within ten miles of CGS, if available. If more than one producer is available, collection from more than one location should be made. If multiple locations (GT 2) are available, the 2 locations with the highest dose potential should be sampled. If no milk producers within 10 miles are available, samples of broadleaf vegetation or feed grown near 2 offsite locations with higher predicted ground level D/Q values may be sampled monthly during the growing season in lieu of milk sampling.			
Fruits and Vegetables	Samples of fruits and vegetables grown for human consumption from locations using Columbia River water obtained downstream of CGS discharge or from locations potentially impacted by CGS gaseous emissions (ST-37). Samples of fruits and vegetables from control locations	During growing season, at time of availability. Annual control collection	Gamma Isotopic on edible portions.
Samples should be obtained from farms or gardens in close proximity to CGS. Sample of root crops, leafy vegetables, and fruits should be collected as they are in season; different varieties should be obtained. For locations where the predominate pathway is gaseous, leafy vegetables are the preferred sample media. For locations where the predominate pathway is liquid, root crops are the preferred sample media. Vegetation samples taken from locations within 2 miles of CGS may be taken in place of leafy vegetables. One control root crop, leafy vegetable, and fruit sample should be collected each year.			

Sample Type	Location and Station ID	Sampling and Collection Frequency	Required Analyses
Fish	One sample from 3 species (one anadromous and two resident) in the vicinity of the plant discharge area (ST-30). One sample from the same or similar species from areas not influenced by plant discharge.	Annually, unless an impact is indicated, then semiannually	Gamma Isotopic on edible portions
If any of the analytical results of the Columbia River fish samples are significantly higher than the results of the control samples or results from previous years, sampling is to be conducted semiannually. Anadromous species may be collected at local hatcheries. Fish species with recreational value should preferentially be collected if available.			
Meat and Poultry	Closest available sample to location of identified impact	As available, when impact identified	Gamma Isotopic on edible portions
Meat and/or poultry are to be sampled when vicinal soil, air, or vegetation samples indicate an impact that may reasonably be attributed to CGC operation or when dose projection model indicate a measureable impact. Sample frequency for meat and poultry shall be as available at time of harvest.			

Select CGS REMP Sampling Locations Within 10 Miles of CGS