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October 31, 2013

Dr. Allison M. Macfarlane
Chairwoman
Nuclear Regulatory Commission
Commission Mail Stop O-16G4
Washington, DC 20555-0001

Dear Dr. Macfarlane,

Re: New Information regarding Seismic Hazards at the WPPSS-2/Columbia Generating Station nuclear power plant

Thank you for your reply, dated September 26, 2013, to our letter of July 19, 2013. It was gratifying to hear that you would consider accepting our invitation to visit with us and hear our concerns in person, should your travel and schedule permit. Nevertheless, it was disturbing that you did not address any of the concerns we raised with our letter.

Instead, you informed us that "[t]he NRC continues to conclude that CGS has been designed, built, and operated to safely withstand earthquakes likely to occur in its region."

We need to know what data you are using as the basis for your conclusion and are concerned this might presuppose a conclusion before Energy Northwest has reported back on its required seismic reevaluation. We are also having trouble understanding why this crucial seismic reevaluation is not due from Energy Northwest until March 12, 2015 – four years and one day after the Fukushima accident began in Japan. From what we can gather from your letter, the NRC, under your leadership, has no intention of independently evaluating readily available geological evidence about the increased seismic potential of the CGS-Hanford site until after receiving Energy Northwest's report. This does not seem in keeping with your duty as the chairwoman of the body

charged with regulating this nuclear power plant, particularly in face of a great deal of evidence that the plant may not be able to withstand a worst case earthquake.

You assert that "[t]o the extent that your letter provides new and significant information, the NRC will ensure CGS takes such information into account as the licensee reevaluates its seismic hazard." We assume this means that we will not see to what extent Energy Northwest takes new seismic information seriously until after March 12, 2015, which, again, we find to be an unacceptable long period of time to wait for such an important report.

As we stated in our original letter to you and have further documented since, your promised reevaluation of seismic hazard at the site, not due to begin for another year and half when Energy Northwest submits its report, is already several years behind the US Department of Energy's more current evaluation and decades behind the massive amount of new geological discoveries made since the original design criteria for the CGS was determined.

In the thirty years since the plant was licensed there have been numerous geologic investigations of the Hanford Reservation and surrounding region conducted by the U.S. Geological Survey, federal contractors, Battelle Pacific Northwest National Laboratory, the State of Washington, and several universities. The outcomes of these studies have piled up the geologic evidence that indicates the original WPPSS-2/Columbia Generating Station (CGS) nuclear plant's seismic risk assessment significantly underestimated the potential risks to the reactor and associated structures. We now know that the original design basis for earthquake hazard at the CGS site is critically out of date.

Among the evidence so far not considered by the NRC regulators, to our knowledge, and therefore "new" information, is the following:

1. Erroneous placement of the largest historical earthquake

The original CGS seismic risk analysis in 1981 relied on the erroneous conclusion that the largest historical earthquake to hit this region - the M6.5-M7.4 "1872 Earthquake" – was 180 miles away from the CGS. Based on this misinformation, the design criteria for the CGS were established using the M5.7, 1936 Milton-Freewater earthquake south of Walla Walla, Washington. Based on this and other information, it was determined that there was a low annual probability of exceedence (0.00011) of a 0.25 g vibratory ground motion threshold of the Safe Shutdown Earthquake for the CGS. It was licensed on that basis and this assessment has not been changed since. However, Bakun et al. (2002) determined that the "1872 Earthquake" actually had occurred 99 miles from the CGS site. The NRC should have reviewed the CGS design criteria then, but did not.

2. Number of known faults doubled from 6 to 12

The original CGS seismic design criteria was based on the six identified Yakima Fold and Thrust Belt structures:

1. Umtanum Ridge-Gable Mountain
2. Rattlesnake Ridge-Wallula Alignment
3. Horse Heaven Hills
4. Rattlesnake Hills
5. Yakima Ridge
6. Saddle Mountains

But, since CGS was constructed, six additional Yakima Fold and Thrust Belt structures were identified that could pose an earthquake risk to the CGS site:

1. Frenchman Hills
2. Manastash Ridge
3. Toppenish Ridge
4. Columbia Hills
5. Hog Ranch-Naneum Ridge
6. Hite Fault

3. Ground motion studies at Hanford Waste Treatment Plant show potential for 0.80 g vibratory ground motion (over 300% more than CGS estimate)

Subsequent seismic risk assessments performed for the U.S. Department of Energy for the Hanford Site, which factored in newly available structural geology data, generated estimates of peak vibratory ground motions that were significantly higher than those used to establish the CGS nuclear plant's license in 1981. The Geomatrix (1996) study estimated peak vibratory ground motion of 0.50 g on the Hanford site ten miles from the CGS nuclear plant. This was double that of the estimate in the CGS nuclear plant license. In 2005 new questions regarding information about earthquake hazards developed since the Geomatrix (1996) report forced the U.S. Department of Energy to suspend work on their Waste Treatment Plant (WTP) facility to allow for new data collection and updated seismic risk assessment.

Three studies (Youngs, 2007; Rohay and Brouns, 2007; Rohay and Reidel, 2005) determined that the previous vibratory ground motion estimate needed to be increased to 0.80 g, causing the US Department of Energy to order significant modification to the WTP facility. This was 300 % higher_than what the CGS was designed to meet. Given that this finding was for a facility only ten miles away from the CGS site, the NRC should have closed the CGS down at that time, pending a determination as to whether it, too, would need to have seismic upgrades to allow the nuclear reactor to meet the new seismic findings.

4. Uncoupled model incorrect – coupled model gives PGA >0.90 g

As noted by Geomatrix (1996), the seismic ground motion analysis they computed was very sensitive to uncoupled fault model versus coupled model selection. The uncoupled fault model predicted more earthquakes in the M5 to M6 range (and attendant peak ground accelerations to a maximum of 0.20 g) whereas the coupled fault model predicted more earthquakes in the M6 to M7+ range (with correspondingly greater peak ground accelerations to a maximum of over 0.90 g). Based on the available geologic data at that time, Geomatrix (1996) concluded that the major faults along the Umtanum Ridge-Gable Mountain and Yakima Ridge folds (faults closest to the CGS site) had a very high probability (0.85) of being "uncoupled." But by 2009 additional data from deep hydrocarbon exploratory wells and geophysical surveys provided compelling evidence that the major faults along the Yakima folds were "coupled" (Reidel and Tolan, 2009; Blakely et al., 2009; Tolan et al., 2009). Thus the Geomatrix (1996) data was based on an incorrect tectonic fault model and vastly underestimated the seismic risk at the CGS site.

5. Faults now known to be longer and capable of producing larger magnitude earthquakes

More detailed mapping of folds and faults in the region surrounding the CGS nuclear plant site since 1981 have shown that the folds and faults considered in the original seismic risk assessment have significantly longer lengths than originally thought. Work by the U.S. Geological Survey (Blakely et al., 2009, 2011) on the Umtanum Ridge-Gable Mountain fault will likely fundamentally change several key assumptions upon which past seismic risk assessments were based. The U.S. Geological Survey found that the maximum length of some of the Yakima Fold and Thrust Belt structures has been previously underestimated. The U.S. Geological Survey extended the Umtanum Ridge-Gable Mountain fault west across the Cascade Range and connected it with seismically active faults in the Puget Lowland. The Umtanum Ridge structure, which is located approximately 6.5 north of the CGS site, was increased from 77 miles to more than 124 miles in length, greatly increasing the known potential for larger magnitude earthquakes.

6. Faults now known to be "younger" indicate more recent earthquakes

There is evidence that the faults are geologically "young," indicating relatively recent earthquakes. Blakely et al. (2009, 2011) found several locations of previously unknown late Quaternary/Holocene (250,000 years ago to present day) movement on, and associated with, the Umtanum Ridge fault. This data suggests that the Umtanum Ridge-Gable Mountain fault may be far more "active" along its length than previously believed.

This, coupled with the increase in the mapped length of this fault, has led Blakely et al. (2011) to suggest that this fault is capable of much larger magnitude and potentially more frequent large magnitude earthquakes than assumed in previous seismic hazard assessments.

7. Distance of active fault to CGS found to be within 2.3 miles of the reactor

In 1981 it was determined that no capable faults existed within a 5 mile radius of the CGS. Geophysical surveys conducted by the U.S. Geological Survey (Blakely et al., 2009, 2011; Wicks et al., 2009) indicates that Umtanum Ridge-Gable Mountain and Yakima Ridge anticlinal folds/faults both extend farther east than previously believed by Geomatrix, (1996). The eastward extension of the Yakima Ridge fault across the Hanford Site also goes through the location of the Wooded Island earthquake swarm, which began in January 2009. They interpret the Wooded Island earthquake swarm quakes to be related to reactivated faults on the Yakima Ridge extension. The eastward extension of the Umtanum Ridge-Gable Mountain and Yakima Ridge faults place “active” faults approximately 6.5 miles north of, and 2.3 miles south of, the CGS site, respectively.

8. Thin-skin model found inaccurate / thick skin model indicates larger area and potential for larger magnitude earthquake

Based on surface and subsurface geologic data and geophysical survey data, Blakely et al. (2011) analysis of the Umtanum Ridge fault shows that it is not just confined to the Columbia River basalt layer (which was defined as a “thin-skin fault model”). Their analysis interprets that this fault extends through the Columbia River basalt layer and continues downward into the “basement rock” (“thick-skin fault model”). Because this fault extends into the basement rock this means that the potential earthquake rupture area along this fault is far greater than previously expected and consequently can produce much larger magnitude earthquakes than previously assumed.

9. Newly found surface faulting

In the original design of the CGS, it was determined that surface faulting was not a factor. Blakely et al. (2011) trenching of surface scarps along Umtanum Ridge found evidence of geologically recent faulting indicating that this structural feature may be more seismically active than previously believed. This new information will be factored into the new probabilistic seismic hazards analysis being conducted by the US Department of Energy for the Hanford site, scheduled to be completed in 2014.

10. Faulty analysis in Energy Northwest 2010 reply letter to NRC

A July 2010 letter to Energy Northwest (ENW), the operator of the CGS nuclear plant, from the Nuclear Regulatory Commission, requested that ENW provide a review of the impact of recent U.S. Department of Energy seismic hazards work at the Hanford site for the Waste Treatment Plant in 2005 and 2007. We are concerned that the NRC is relying on the September 17, 2010 letter of reply from Energy Northwest to inform your present belief "that CGS has been designed, built, and operated to safely withstand earthquakes likely to occur in its region." If this is the case, then we urge you to carefully read the analysis of the ENW response in the Report #2 attached.

In their September 17, 2010 response, Energy Northwest confirmed their knowledge that "other fundamental aspects of a seismic hazard assessment (e.g., location of faults, active fault lengths, fault models, earthquake frequencies/magnitudes, attenuation relationships, etc.) were not reexamined in the U.S. Department of Energy studies for the Waste Treatment Plant site nor by Energy Northwest."

Report #2 notes that the "selection of these parameters and the relative values assigned to these basic components are critical in developing a seismic hazards model and computing the peak ground acceleration at the CGS site." Not reexamining these fundamental aspects was a notable failure on Energy Northwest's part since geologic investigations and data collected by the U.S. Geological Survey (first published in 2009) indicates that many of the basic geologic assumptions and earthquake models used in the Energy Northwest's seismic hazards analysis for the CGS (WPPSS, 1981, Geomatrix, 1996) are incorrect and flawed.

Energy Northwest also indicated in their response that one of the "distinct differences" between the CGS and Waste Treatment Plant sites is that the CGS site is farther away from nearby seismic sources. This is not a true statement based on work by the U.S. Geological Survey discussed in #7 above that shows that geophysical surveys have found that the eastward extension of the Yakima Ridge Fault place "active" faults approximately 2.3 miles south of the CGS site.

Energy Northwest was correct in pointing out the "soil structure" is different below the Waste Treatment Plant than below CGS, however this means nothing unless the correct "coupled model" is used in the analysis of the soil structure. Energy Northwest also stated that the shear wave velocity profiles are different between the WTP and the CGS. But Energy Northwest has not integrated the Waste Treatment Plant shear wave velocity data with the Ringold Formation into which CGS is built. Even if they were to do this, the re-assessment would be of questionable value if it were based on the existing flawed model for the CGS site. A new seismic model for the CGS site would have to be developed (incorporating a "coupled" fault model, extended active fault lengths, reevaluation of earthquake magnitude/frequency, etc.) before the CGS site-specific subsurface velocity data could be used to help constrain estimates of vibratory ground motion from various earthquake scenarios.

In conclusion, since both the U.S. Department of Energy's (Reidel, 2005; Youngs, 2007) and Energy Northwest's seismic hazard analyses rely on the flawed and outmoded

seismic assessment model developed by Geomatrix (1996), one needs to question the basic adequacy of the existing CGS seismic hazards analysis in light of the new and recent data and findings presented by the U.S. Geological Survey.

None of this new information has been addressed by Energy Northwest to our knowledge, and yet the Nuclear Regulatory Commission allows them to continue to operate the Columbia nuclear plant at full power under the clearly inadequate original licensed earthquake standards.

11. Plant not meeting current, inadequate seismic standards

The new earthquake data available on the Hanford Nuclear Reservation was not considered during the May 2012 relicensing of the Columbia nuclear plant by the Nuclear Regulatory Commission because it was said to be part of the "ongoing regulatory oversight." Just prior to and after approving the relicensing of the CGS nuclear power plant until 2043 without reviewing its inadequate earthquake standards, this NRC oversight seems to have consisted of two inspections.

In response to post-Fukushima requirements established by the NRC, on April 29, 2011, Energy Northwest carried out an inspection of the CGS. The inspection determined that the nuclear plant does not even meet the inadequate and unchanged original seismic standard. The 2011 Inspection Report stated that, "the licensee determined that the Emergency Response Facilities, the Tower Makeup system, the fire protection systems, floor drain isolation valves and sump level switches (used to mitigate internal flooding) were not seismically qualified." To date we have nothing in writing to show that these problems have been addressed and that they meet even the original seismic standards.

Then, on November 30, 2012 , a series of seismic walkdowns of the CGS was completed. The Walkdown Report specifically says that it is based on the 0.25 g maximum ground motion criteria from its 1983 license. 135 seismic walkdowns were planned, of which 120 seismic walkdowns were performed in time for the report. These resulted in 35 "potentially adverse seismic conditions" identified. A separate series of area walk-bys consisted of 55 unique areas that were examined, and resulted in the identification of 74 "potentially adverse seismic conditions."

15 walkdowns were deferred until the refueling outage in May 2013. As of October 2013, the results of these 15 walkdowns have not been made public. Even without that information, a finding of at least 109 potentially adverse seismic conditions – 35 from the walkdowns and 74 from the walk bys – that don't meet the original inadequate seismic criteria is of concern considering that the plant should be able to withstand ground motion forces that could be more than three times as strong as it was originally designed for.

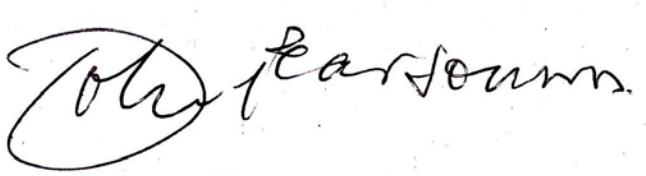
All of this evidence leads us to urge you to fulfill your mandate as nuclear regulators and put the safety of the public in the Pacific Northwest above the utility's interests to

continue operating. We urge you to shut down the CGS nuclear power plant immediately until it can be shown that it meets adequate earthquake standards.

A Report by the Japanese Diet's Fukushima Nuclear Accident Independent Investigation Commission called their nuclear crisis a "profoundly man-made disaster that could and should have been foreseen and prevented." May we never have to say this about the NRC's lack of oversight at the CGS nuclear power plant. As you know, earthquakes are unpredictable and unforgiving – and are not respecters of person or politics.

Please read the enclosed reports we have commissioned to summarize current geological knowledge. When you do, I know you will want to lead the NRC in doing the right thing and closing this reactor until it can be properly shown that it can be safely operated in this seismically active area.

Sincerely,



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