To the members of the Washington Utilities Commission:

As a Puget Sound Energy customer and a lifelong healthcare worker who recognizes the strong correlation between environment and health, I strongly encourage PSE to invest in renewable energy sources that are better for both our economy and our health.

While Puget Sound Energy proposes to transition from coal to gas, citing gas as a healthier and cleaner alternative, scientists are finding significant health concerns related to the practice of hydraulic fracturing or "fracking", as well as concerns related to the "fugitive" leaking of methane from gas.

One of the largest gas extraction areas in the world is the Marcellus shale field that covers over 104,000 square miles in areas of Pennsylvania, West Virginia, New York and Ohio. The first wells in those fields were drilled in 2005. Communities near these sites have been studied by leading universities and have provided a great deal of information about the health risks associated with gas extraction. Among the universities conducting these studies are Columbia University, Duke University, Johns Hopkins School of Public Health, and the University of Pennsylvania.

These are some of their findings:

- Nitrogen and volatile organic compounds used in fracking form ground level ozone that can cause respiratory and cardiovascular symptoms including airway inflammation, cardiac arrhythmias, exacerbation of existing airway disease and increased risk for heart attack and stroke. There are increasing reports of symptoms such as headache, dizziness, disorientation, ear, nose and throat symptoms and seizures in individuals who live in communities affected by fracking. Workers at these sites are at increased risk for lung disease related to silica sand.

- Carcinogenic benzene, arsenic, hydrocarbons, heavy metals and endocrine disrupting chemicals have been found within hazard mitigation levels in both ground and surface water at fracking sites. Their effects on blood and bone marrow lead to anemia and immunosuppression. These chemicals raise concerns both for the immediate health of the surrounding communities and the long term neurologic and neurodevelopmental impact on infants and children. Many of these chemicals are known to cause neural inflammation, neurotoxic and psychomotor effects in children. Exposure to endocrine disrupting chemicals can alter developmental pathways in ways that may not be evident for decades or generations.

- An epidemiological study of more than 30,000 patients by Johns Hopkins School of Public Health, and published in the Journal of the American Medical Association, found significant association between increased diagnosis and severity of asthma, particularly in children, and fracking.

- In addition there is increased risk for both premature births and high-risk pregnancy in these communities. One study found a 40% increased risk in this population of having a low birth weight baby and a 30% risk of being classified as a "high risk" pregnancy when all other factors were controlled for. Pregnant women and their developing infants are at high risk for complications associated with exposure to endocrine disrupters.

- Fracking also emits massive amounts of methane, a gas that contributes much more significantly to global warming than carbon dioxide and is extremely flammable. There have been numerous reports of explosions during the direct flow back operation causing serious injury. Additionally there are communities in both the US and Canada where there is so much methane in the ground water that the drinking water is flammable. A study by Duke University found wells in Northeast Pennsylvania as far as 1 kilometer away from the fracking site with water that could be lit on fire.

- In addition, a study by Casey et. al from the Johns Hopkins School of Public Health published in 2015 noted that household levels of radon, which is the second leading cause of lung cancer, have been rising since 2004 in the communities surrounding the Marcellus shale fields. When comparing radon levels from 1989 to 2013 they noted significantly higher levels in those communities near the gas fields, where no differences existed before 2004. The authors hypothesize that the fracking releases radium 226, which decays into radon, leaking into well water and air.

- According to a study published by the National Academy of Sciences methane losses need to be below 3.2 % for gas power plants to have lower life cycle emissions than new coal plants over the relatively short time frame of 20 years or less. There is technology to reduce methane losses from gas power plants, but deploying those technologies would require significant new investments and practices.

Unfortunately federal laws have exempted the fracking industry from compliance with the Underground Injection Control provisions of the Safe Drinking Water Act, and a Energy Policy Act of 2005 exempted fluids and chemicals used in fracking from protections under the Clean Air Act, Clean Water Act, Safe Drinking Act and the CERCLA or Superfund. The companies that extract natural gas by fracking are not required to disclose the chemicals used and their potential health impacts.

At this point there are significant concerns about the safety and long-term effects of gas extraction as well as disagreement about whether natural gas will indeed be less costly in the long run. When the negative consequences of these exposures are still being studied, caution is advised to prevent significant health impact that may not appear until decades or generations later. As a nurse practitioner, a concerned citizen, a mother and a PSE customer, I urge PSE to reconsider their plan to rely increasingly on natural gas and to refocus their efforts on increasing use of renewable energy sources with minimal disruption to climate, air and water quality and human health.

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