Statement to UTC

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I wanted to speak directly to PSE's Integrated Resource Plan for the next 20 years. Now would be an excellent time for our utility to pivot towards greater stewardship and responsiveness to customers' desires to achieve a resilient, renewables-dominated grid with dispersed, distributed generators and cogeneration facilities, whether industrial, commercial or residential.

One very positive step was the move in October of 2016 to join the Energy Imbalance Market operated by the California Independent System Operator. On the supply side, this allowed variable energy resources such as wind and solar to be spread across a larger geographic footprint. On the demand side, service across two time zones and latitudes with different seasonal trends should now diminish short-term and long-term forward market variability.

Another challenge that PSE must focus on is constructing more high-voltage long-distance transmission, both AC and DC, so as to be able to bring power from east of the Cascades to population centers on the west, plus profitable wheeling of power to other ISOs, simultanously avoiding *curtailment* of inexpensive, free-fuel renewables.

One advantage of such enhanced connectivity would be the progressive deployment in south central Washington of three types of renewables abundantly available, not just wind and solar but also geothermal. There is even a geothermal resource in my home County of Whatcom, in the Mt. Baker area, not yet exploited. Geothermal power typically demonstrates a capacity factor higher even than brittle and inflexible coal and nuclear generators, while also serving as a rapidly *dispatchable* power source comparable to hydropower.

But energy efficiency is always the easiest, fastest and cheapest way to accomplish electrical end-use services. Thomas Edison invented the first incandescent light bulb in 1879, but to the current day these devices still provide only about 5% light and 95% heat. Fluorescents average about 20% light and 80% heat and contain elemental mercury. But LEDs now release about 60% light, and the limit of the physics of light-emitting diodes is going to be about 90% illumination.

Why is this important? Because globally some 7% of electricity goes to lighting, and if we hypothetically changed out all incandescent and fluorescent lights to best-of-show LEDs, then immediately more than 6% of world electricity demand would vanish. Efficiency: faster, easier, cheaper and typically permanent.

PSE struggles with the albatross of shares of four units of the Colstrip coal plant in Montana. Certainly these need to be shut down as urgently as possible, even before 2025, and the site turned into a Superfund clean-up site, as necessary and planned.

Finally, natural gas is not a bridge to the future, but instead a bridge instead to a sparsely populated Alaskan island, in a metaphorical sense.

I will close with 2 simple points about the pronounced disadvantages of what is more appropriately called methane or swamp gas, since methane represents 95-98% of natural gas. First, liquified natural gas in seaborne transport requires significant energy consumption in liquefaction, and the ships' power plants consume about 5% of their cargo in transit. Second, if fugitive methane releases [even excluding oilfield flaring], add up to 3% or more of the produced gas, then the heat-trapping effects of that methane make natural gas *as polluting as coal.*