

Thank you for the opportunity to submit testimony for HB 4046. I write in SUPPORT of the bill.

I am Professor (emeritus) of Chemistry at Portland State University and author of the climate change science/policy text for laypersons titled *From Knowledge to Power*, which has been widely circulated in Oregon.

We should be grateful that carbon-free nuclear fission has made significant contributions to powering the electricity grid in the United States and worldwide. Were it not for nuclear fission technology, the impacts of climate change, already bad, would be even worse. And if we do not have nuclear power, the path to solving climate change will be made harder.

This bill takes only a very small step toward fixing the mistake made 46 years ago, when a ballot measure effectively banned development of nuclear fission power in Oregon. Still, perhaps the new study will be helpful in convincing legislators and executive branch agencies that the technology can play an important role in meeting Oregon's climate targets.

This bill is comprehensive in its looking out for the interests of all stakeholders. Concerns for business development, economic growth and workforce stand side by side with a hard look at storage of nuclear waste and a deep dive into new technologies.

There are many reasons to support nuclear power. A robust nuclear power sector in Oregon would reduce the need for wind and solar power, which is ecologically beneficial because these latter technologies require large tracts of land, negatively impacting biodiversity. Similarly, nuclear power would eventually make it possible to retire some hydroelectric facilities, which have broadly negative impacts on fishing, recreation, ecosystem services, municipal water supplies and indigenous peoples' rights. And because of the very high capacity factors, nuclear fission plants will provide crucial baseload power, creating less need for electrical energy storage both on the larger grid and behind the meter.

Further, in addition to its zero greenhouse gas footprint, nuclear fission has a very small land footprint, conserving biodiversity. Compared to solar and wind, nuclear power is both far more concentrated (not diffuse over large areas) and far more stable (not intermittent over time). For these two reasons, nuclear power offers perhaps the best complement to solar and wind in building a carbon-free grid that fully eliminates fossil fuels. I stand with The Nature Conservancy, the Breakthrough Institute, climate scientists James Hansen and Kerry Emanuel, and many other prominent individuals and organizations who recognize these essential, positive attributes of nuclear power.

It is difficult to see good reasons for why simply getting more information about nuclear power should be opposed by anyone. Are opponents of this bill afraid that when the benefits of nuclear power are clearly delineated, they may lose the larger argument? It seems to me that voting against this bill takes a stand against the use of rigorous science to inform policy making.

Opponents of nuclear power in Oregon argue that, despite the existential threat of climate change, its disadvantages are so severe as to justify excluding it entirely. I will address a few of the points they make and explain where they go wrong.

- Opponents conflate the severe environmental harm caused by leaching of nuclear waste from old weapons sites such as Hanford, with the storage of spent fuel (waste) at commercial reactors. These are scare tactics, intended to sway public opinion while glossing over the relevant distinctions. In fact, the highly enriched radioisotopes leaching from weapons sites in liquid form have no analog in commercial fission, which uses much less enriched fuel. That fuel is safely stored on site in solid form, and subject to extensive regulation by the NRC. In contrast, the weapons programs of the mid 20th century were developed with grossly insufficient oversight and attention to waste containment.
- Opponents state that, since the bill eliminates the need for a federal waste repository, there is therefore "no plan" to store waste from future Oregon reactors. Of course, this ignores basic facts: (i) the NRC is not going to grant licenses without plans to store waste; (ii) the plans will follow well-established approaches already in place at America's nuclear power plants today. The waste storage issue has clear solutions - first cool the uranium fuel under water for several years, then move it into heavy concrete and steel dry-cask containers for storage on site, where many tests establish that it is able to withstand extreme conditions such as fires, earthquakes, and direct hits by airplane crashes. There have been no significant dangerous incidents associated with nuclear waste storage in the US.
- Opponents assert that high costs of building and operating nuclear power plants make them uneconomical. This argument fails on several grounds. First, the benefits of nuclear power in complementing solar and wind are so great that taxpayer-funded federal subsidies can be justified as a way to solve the climate crisis. Second, if we exclude nuclear power on this basis, we would also have to exclude high-cost new technologies like green hydrogen and offshore wind from the mix. If private firms want to take the investment risk - and a burgeoning number are now doing so - then we should not stop them from trying. Third, the development of small modular reactors has a real chance to sizably cut costs through standardization. The cost overruns and delays associated with attempts to build the first generation of nuclear reactors in Oregon - many decades ago - are no reason to block a new technology with the potential to overcome those issues.
- Opponents assert that the plausibility of constructing viable paths to a carbon-free grid without nuclear power make it OK to exclude nuclear power *a priori*. This is really quite arrogant. In fact, nobody knows what barriers other potential technologies such as pumped storage, geothermal power generation, tidal power etc may encounter. Suppose we exclude nuclear and it turns out that there is no good alternative developable at scale?
- Opponents repeatedly cite three accidents - Three Mile Island, Chernobyl and Fukushima - to justify excluding nuclear power. I suggest we might instead marvel at the exemplary

safety record of an industry that has been producing carbon-free power around the world for well over a half century, while suffering only three such incidents. But in any event, the concerns are unjustified. The 1979 Three Mile Island meltdown harmed no one and the accident became the basis for exhaustive improvements in design, operation and regulatory review. The graphite-moderated, water-cooled Chernobyl reactor design is recognized to be unstable and was never used in the US. The Fukushima disaster resulted from a tsunami, not a design failure. Even this horrific event produced no deaths from radiation exposure. And, of course, any future Oregon reactor will not be built in a tsunami hazard zone.

Finally, I would ask opponents of this bill to ponder what is at stake - nothing less than the livability of the planet for future generations. For their sake, we cannot leave any stone unturned in our quest to solve the global warming problem.

Thank you very much for the opportunity to submit testimony in SUPPORT of HB 4046.