Talking points about small-scale nuclear reactors

"You have all these reactor vendors pitching their wares, and making all sorts of outrageous and false claims,"
— Edwin Lyman, director of nuclear power safety with the Union of Concerned Scientists

"I think it is important that we get control of this horrible force and try to eliminate it."
— Admiral Hyman G. Rickover, the "father" of nuclear warships

The following information is based upon an exceptional report offered from the Oregon Physicians for Social Responsibility by M.V. Ramana, PhD, "Eyes Wide Shut" (www.oregonpsr.org/report-uamps-nuscale-smrs); extensive literature on the issues listed; the Oregon Conservancy's "Nuclear Power in Oregon?"leaflet; and conversations with professionals who practice in these fields. The Ramana report alone cites 124 basic references on nuclear power in general and small-scale in particular.

"Small-scale nuclear reactors" are defined by the World Nuclear Association as producing less than 300,000 watts of electricity (300MWe) and built in small modules that can be assembled in groups. One company that proposes to produce these reactors is NuScale Power, headquartered in Tigard OR. Its reactor employs a Pressurized Light Water Reactor technology using enriched Uranium 235. This is the reactor technology used in nuclear submarines and aircraft carriers, and in two-thirds of the 56 operating commercial nuclear power plants in the United States.

The status of NuScale's proposal is that the Nuclear Regulatory Commission (NRC) has approved designs that keep changing, and is trying to resolve some design conflicts. NuScale's own design changes have caused significant cost overruns. NuScale proposes to build its first reactor — 12 units in number — at the Idaho National Laboratory (www.energy.gov/ne/articles/nations-first-small-modular-reactor-plant-power-nuclear-research-idaho-national). The company offers these reactors in 6-, 8-, and 12-pack groups. A "12-pack" output would equal 80% of the output of a full-scale reactor, so the use of the word "small" is misleading. In essence, measured by these "pack" offerings, NuScale is proposing to build reactors that, on-site, would generate at least 40% of what a full-scale nuclear produces.

The purpose of these talking points is to counter the propaganda spread by NuScale and its supporters about how this new technology can "improve" meeting electricity needs.

Small-scale modular nuclear power produces deadly radioactive waste.

NuScale and the other small modular reactor developers claim small-scale produces less waste. But they produce *more waste per unit of electricity* delivered than do full-scale pressurized water reactors
(*"Eyes Wide Shut"* report, p. 16; Alexander Glaser, Laura Berzak Hopkins, and M.V. Ramana, "Resource Requirements and Proliferation Risks Associated with Small Modular Reactors," *Nuclear Technology* 184 (2013): 121–29; Nicholas R. Brown, Andrew Worrall, and Michael Todosow, "Impact of Thermal Spectrum Small Modular Reactors on Performance of Once-through Nuclear Fuel Cycles with Low-Enriched Uranium," *Annals of Nuclear Energy* 101 (2017): 166–73).

Currently, the federal government has failed to secure proper long-term storage for nuclear waste. Until we can safely dispose of existing deadly nuclear waste, no "benefit" justifies producing more. *Society and the natural world can no longer tolerate more harmful nuclear waste*.

Nuclear power generation is not "clean" and "carbon-free".

The first words on NuScale's website (www.nuscalepower.com/) are "Carbon-free energy". This is a lie. At each stage of the nuclear fuel cycle (including mining, transport, enriching fuel, plant decommissioning, and waste disposal) carbon is emitted. The life-cycle emission figure for nuclear is about 66 grams of carbon dioxide per kilowatt-hour electric (kWHe) versus 10-13 grams per kWHe for renewables (https://theecologist.org/2015/feb/05/false-solution-nuclear-power-not-low-carbon and https://journalistsresource.org/studies/environment/climate-change/nuclear-power-greenhouse-gases/).
The lie comes from the U.S .Department of Energy, which *defines* (without justification) "clean

energy" to include nuclear (www.energy.gov/science-innovation/clean-energy). The "choice" between nuclear and salmon-killing dams is a false choice. For the reasons cited here, we do not need to replace the electrical power from dams with nuclear in any form.

Nuclear power in any form is unsafe.

The alleged safety features of NuScale do not and cannot operate perfectly. This claim follows the deceptive propaganda history of nuclear power: safety promises repeatedly have been proven false by such disasters as Three Mile Island, Chernobyl, Fukushima and the 166 near-misses reported by Greenpeace and known to the NRC (www.greenpeace.org/usa/research/nuclear-energy-power-plant-accidents-united-states/). Decentralized small-scale reactors can be located in even more vulnerable places (earthquakes, volcanoes, flooding) than those that produced the deadly meltdown at Fukushima. The Food and Drug Administration uses a cost-benefit analysis to rule on drug safety. Such analysis cannot be applied to nuclear because there is no level of "benefits" that can justify the harm caused by a nuclear accident, and there are safer ways to produce the "benefit" of generated electricity. Furthermore, inadequate safety rules shift the risk onto citizens and therefore add yet another indirect subsidy.

The electricity produced is not needed.

Future demand can be met by energy conservation, which is and always has been the cheapest way to address demand for electricity. Federal statistics show two important things: nuclear provides about 18% of the nation's electricity; and more than 20% of the nation's electricity could be provided by further cost-effective and affordable energy conservation and efficiency (www.aceee.org/fact-sheet/halfway-there). We need to clean up two wastes — the deadly nuclear waste and the avoidable waste of the electricity already generated — before we talk about *any* further electricity generation.

Nuclear electricity generation, including small-scale, costs more than alternatives.

Nuclear in any form requires massive taxpayer subsidies, yet still is the highest-cost producer of electricity other than coal (www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf, page 8). Costs are going up for nuclear, down for renewables. And saving energy through conservation and efficiency measures still is the cheapest option. Furthermore, any form of nuclear generation leads to massive decommissioning costs and cleanup costs, with which we will burden our children and grandchildren. These costs, unique to nuclear, are not reckoned in the cost comparisons of different ways of generating electricity. Likewise, the costs that are borne by citizens harmed by accidents such as Chernobyl or Fukushima also are not included. The cost comparisons between nuclear and solar/wind/conservation are therefore bogus, unfairly skewed in favor of nuclear. Importantly, money spent on any form of nuclear leaves less money available to support truly clean renewable energy alternatives.

Decentralized technology is more difficult to regulate.

The difficulty is built-in. Since the technology is fundamentally unsafe, effective regulation is constantly required. Regulation is already being made more difficult by budget cuts. Decentralizing nuclear power production would only make it even more difficult.