



Oregon

Kate Brown, Governor



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March 5, 2021

Senator Kathleen Taylor
Representative John Reardon
Joint Committee on Ways and Means
Natural Resource Subcommittee
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RE: Response to Questions Raised at March 1, 2021 Budget Presentation

Dear Senator Taylor and Representative Reardon:

The Oregon Department of Energy and the Oregon Department of Environmental Quality submit this joint response to questions raised during and after ODOE's hearing before the Natural Resources Subcommittee on our proposed 2021-23 Governor's Budget.

What entity is responsible, and what actions are being taken around the proper recycling of energy facility siting materials, like solar panels or wind turbine materials?

ODOE Response: The Energy Facility Siting Council (EFSC) does not have a standard that requires wind turbine blades or solar panels be recycled. Most energy facilities are anticipated to have a 30-40 year lifecycle and it is difficult to know what components could be recycled or reused based on that time horizon. However, for all state jurisdictional energy facilities there are three standards related to the removal of facility components, and the recycling of wind turbine blades and solar panels have been conditioned under the Waste Minimization standard.

1. **Waste Minimization** – This standard requires that solid waste and wastewater plans are established for each facility; those plans minimize the generation of waste and require the recycling and reuse of waste to the extent reasonably practicable. Under recent amendments to repower approved wind projects, EFSC has imposed conditions to recycle the replaced turbine blades to the extent feasible. Under approved solar projects, EFSC has imposed conditions requiring solar panels that are nonfunctional or are retired to be recycled through the Solar Energy Industries Association National PV Recycling Program (or similar program).
2. **Public Services** – This standard ensures that the project will not result in a significant adverse impact to public and private service providers in the vicinity of the project. This includes the capacity of any disposal facility to accept solid waste from construction, operation or decommissioning of a facility.

3. Retirement and Financial Assurance – This standard contains two distinct parts. The first is that it is the responsibility of the owner to decommission the facility and return the site to a useful, non-hazardous condition following permanent cessation of the facility. The second is to maintain a bond or letter of credit in the amount estimated to decommission the facility should the owner be incapable of doing so for any reason. Because it is difficult to forecast whether or not specific facility materials could be recycled or reused in 30-40 years, EFSC takes a conservative approach and establishes the bond or letter of credit amounts based on the removal and proper disposal of facility materials.

DEQ Response: It would be up to the facility to properly manage any materials that become waste. They first determine if any of the materials are regulated as hazardous waste. If it is not hazardous waste, the facility then determines how they want to manage it (recycling or disposal). DEQ is not aware of any requirements in Oregon to recycle the materials. They are no different than any other facility. A bill has been introduced (HB 2186) to establish an Extended Producer Responsibility program for Solar panels.

Are you aware of any research into new and innovative recycling options being done?

DEQ Responses: DEQ is aware of some research into new and innovative recycling options for wind blades and solar panels. On wind blades, for instance, the National Renewable Energy Laboratory (NREL), a national laboratory of the U.S. Department of Energy, is working on new material for wind blades that can improve their recyclability. See <https://www.nrel.gov/news/press/2020/nrel-advanced-manufacturing-research-moves-wind-turbine-blades-toward-recyclability.html>. GE Renewable Energy also recently announced an agreement with Veolia North America (VNA) to recycle wind blades into material to replace raw material for cement production. GE estimated that, on average, nearly 90% of the blade material, by weight, will be reused as a repurposed engineered material for cement production and noted that compared to traditional cement manufacturing, blade recycling enables a 27% net reduction in CO₂ emissions. Similar recycling processes in Europe have been proven to be effective at a commercial scale. See <https://www.ge.com/news/press-releases/ge-renewable-energy-announces-us-blade-recycling-contract-with-veolia>.

On solar panels, NREL also conducted a global assessment of solar panel recycling strategies, with recommendations for silicon recycling. See <https://www.nrel.gov/news/press/2020/nrel-research-points-to-recycling-solar-panels.html> and <https://www.nature.com/articles/s41560-020-0645-2.epdf>. Washington State is also working on implementing a manufacturer-funded solar panel takeback and recycling system, as required by state law. See <https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Solar-panels>.

Is there any idea of the warming effect on the properties around solar farms if solar panels are generating any heat?

ODOE Response: During a solar PV-related rulemaking that concluded in 2020, ODOE evaluated the question of whether there could be a change in ambient air temperature under or around panels to determine whether or not additional standards were needed to protect agricultural uses surrounding solar PV projects. Research that was identified and evaluated as part of this

rulemaking is appended to this letter. The Rulemaking Advisory Committee (RAC) members included agricultural interests, natural resource interests, renewable energy developers and associated trade organizations, tribal governments, county governments, state agencies, members of the public, consumer-owned utilities, and investor owned utilities. Based on a review of available research and members own knowledge, the RAC concluded there was not enough information to establish that solar PV panels would increase the ambient air temperature even a short distance, thereby potentially negatively affecting agricultural resources or practices. Based on this conclusion, no additional standards related to solar PV projects and ambient air temperature changes were established.

Thank you for the opportunity to testify before the Subcommittee and to answer questions from the members.

Sincerely,

A handwritten signature in black ink that reads "Janine Benner". The signature is written in a cursive, flowing style.

Janine Benner
Director
Oregon Department of Energy

Sincerely,

A handwritten signature in blue ink that reads "Richard Whitman". The signature is written in a cursive, flowing style.

Richard Whitman
Director
Oregon Department of Environmental Quality

Research literature on whether there could be a change in ambient air temperature under or around solar panels.

- *The Photovoltaic Heat Island Effect: Larger Solar Power Plants Increase Local Temperatures*, Greg. A. Barron-Gafford et al (Scientific Reports, Oct. 3, 2016)
[The Photovoltaic Heat Island Effect: Larger solar power plants increase local temperatures | Scientific Reports \(nature.com\)](#)
- *Response to Technical Queries, Statement of Evidence by Greg Barron-Gafford on Solar Heat Islanding Issues*, Barron-Gafford Research Group, (May 2018)
https://greatershepparton.com.au/assets/files/documents/planning/solar/Barron-Gafford_Research_Group_Report.pdf
- *Solar park microclimate and vegetation management effects on grassland carbon cycling*, Alona Armstrong et al 2016 *Environ. Res. Lett.* 11 074016
[Solar park microclimate and vegetation management effects on grassland carbon cycling - IOPscience](#)
- *Remarkable agrivoltaic influence on soil moisture, micrometeorology and water-use efficiency*, Elnaz Hassanpour Adeg, John S. Selker, Chad W. Higgins (2018)
[Remarkable agrivoltaic influence on soil moisture, micrometeorology and water-use efficiency - PubMed \(nih.gov\)](#)