



Oregon Solar Highway – West Linn Project

August 2009

Frequently Asked Questions

What is this proposed project?

The West Linn Solar Highway project is a proposal to place enough solar arrays alongside the highway to generate 3 Megawatts of renewable energy to power Oregon's transportation system.

Where is the site?

The site is on the north side of I-205, in the south portion of the City of West Linn. On ODOT right-of-way, it is about 1/8 mile southwest of an abandoned safety rest area. ODOT acquired the acreage when it originally built I-205, because the property was a known slide area. To stabilize the land and protect the highway, ODOT created "benches" and removed the potential slide material. ODOT currently uses the site for operations and maintenance storage because it is not suitable for other development.

Why is this location a good site for a large solar project?

- The large acreage site in West Linn would allow for "utility scale," which lowers the price per kilowatt installed by spreading out the fixed costs of the project. Our demonstration project at the I-5/I-205 intersection proved that 1 Megawatt is the minimum we need to make financial sense, and larger is better.
- The West Linn site's benched land and direct southern exposure are also ideal, allowing for maximum sun exposure and easier installation and maintenance.
- The close proximity of a PGE substation permits easy access to the grid.
- Arrays would be placed so they don't interfere with future I-205 widening.

Will these panels create problems for drivers and residents on the Oregon City side?

The potential for glare from solar panels has been carefully studied over the years, with the conclusion that it is not a distraction for drivers. For example, one study showed no difference in driver behavior along an English roadway after solar panels were installed. Solar panels have been installed

at airports, including Denver, Long Beach, Fresno, and San Francisco, and other locations, demonstrating confidence that glare would not be an issue. In fact, solar panels are designed to absorb sunlight, not reflect it, to produce energy.

For residents on the Oregon City side of the interstate, views of the panels would be minimized by low-growing shrubs placed around the arrays. Currently, the view of this area includes ODOT maintenance equipment, supplies, and stacks of barriers 9 feet tall. For comparison, the tallest solar array would be just over 13 feet. To get an idea of what an array looks like, see the solar highway demonstration project in Tualatin at the intersection of I-5 and I-205. (Viewable at www.oregonsolarhighway.com)



Artist rendering of what a 3 Megawatt solar array on the West Linn site might look like, from the bluff in Oregon City to the south.

How many panels will it take to make a 3 Megawatt solar array?

It depends on the panels selected for the project, but between 13,600 and 17,000 panels will be used to generate 3 million kilowatt hours of electricity, enough to power nearly 170 all electric homes annually.

What preparation would the site need to make it ready for the project?

ODOT would need to address the environmental impacts of preparing the site for a solar array (see description of preparation efforts, following) because preparing the site would require:

- Removing trees on the lower and upper benches so the array would not be shaded; and
- Filling in a small spring-fed wetland that occurred after ODOT stabilized the slope.

What measures will ODOT perform to address the tree removal, wetland fill, and visual impacts?

- ODOT is currently evaluating the environmental impacts associated with this site. Similar to any ODOT project, this project must address the National Environmental Policy Act (NEPA) requirements.
- If the site is ultimately approved, these studies include determining conditions of permit approval, working in cooperation with local and federal agencies such as the City of West Linn, Oregon Division of State Lands, the US Army Corps of Engineers and others.
- In addition, the City of West Linn and ODOT are exploring options for additional enhancements, such as a bicycle and pedestrian trail overlooking the array and an interpretive display about solar energy.

Does removing trees conflict with the gain of clean energy?

Large trees and solar panels do not exist well together, as shade greatly reduces the productivity of the panels. However, the carbon emissions reduced through the use of solar power have a greater positive impact to the environment than the amount of carbon sequestered in the soil by trees. There is accepted scientific methodology used to confirm this on a site-specific basis, and that analysis, along with many others, will be performed for each solar highway site to ensure that the overall benefit of the panels greatly exceeds any losses.

Will cutting down the trees create erosion and drainage problems?

No. Registered engineers will perform storm water and geotechnical studies prior to designing a storm water system for the site. These analyses will include a review of the existing drainage system in the vicinity of the project. The resulting storm water design would ensure all storm water flows are accommodated. We do know the soils on site are very thin, so root systems of the existing trees and other plants are lateral and shallow, not deep. In the past, a lot of material (over 100 feet of depth in some places) was removed from the site in order to stabilize the hillside down to bedrock. The geotechnical study will also ensure that the stability of the site will not be at risk if trees are removed and the solar installation is completed.



Aerial view of the potential West Linn site for the "Largest Solar Highway Project in the World"

What will electricity generated at this site be used for?

Every kilowatt hour produced by Oregon Solar Highway projects will be credited to ODOT to power the transportation system. Because solar highway projects are located on land acquired with constitutionally dedicated highway funds, the electricity can only be used for the transportation system. How? For the demonstration project, solar energy produced by the array feeds into the grid during the day. At night, the meter essentially runs backward, as energy flows back from the grid to light the interchange. ODOT, through a Solar Power Purchase Agreement with PGE, buys the energy produced by the array at the same rate the agency pays for regular energy from the grid. This is essentially the same model contemplated for future solar highway

projects, except that ODOT will receive a site license fee for use of the land.

What are the economic and financial considerations?

- A solar array of this size is estimated to create between 140 – 150 direct and indirect jobs.
- It would cost approximately \$20 million to build this 3-megawatt site, and these costs would be paid for through a partnership similar to the one that paid for the first solar highway at I-5/I-205. It involves private financing, tax credits and public investment.
- Communities nearby may experience other ongoing economic benefits if they decide to include interpretive areas describing the site.

If the site includes a bike path and/or interpretive center, will that increase crime in the area?

Security measures are required around solar arrays, such as the one at I-5/I-205, and to date, they have proven effective at that site. The community of West Linn will have the opportunity to decide whether a trail or interpretive center is consistent with community interests and what design, security, and/or maintenance measures are needed to protect adjoining properties.

Will property values be adversely affected by a loss of view?

The view from Oregon City across the river from the site will change, but it will not be a loss of view. Traditionally, unless an easement protects a view, there is no property right to a specific view without a view easement. No known study supports the contention property values would be adversely affected by solar panels. Analogous studies imply any effect would be nominal and indistinguishable from any distance or over time.

On the solar project site, highway construction staging and maintenance activity are ongoing. In the immediate area near the solar panel site, there is a school bus parking lot, a sewage treatment plant, paper mills, and a major freeway, so finding out if solar panels by themselves affected property values would be difficult.

What about the costs associated with this large project?

While the cost of solar is coming down, it is still too expensive for ODOT to buy its own panels. Tax credits, accelerated depreciation, and utility incentives are necessary to finance our solar installations. But ODOT, as a governmental entity, doesn't have a tax liability. So in order to take advantage of the tax credits and accelerated depreciation, ODOT would enter into a public-private partnership with a third party power provider — with the demonstration project, that partner was PGE. The third party finances, owns, operates and maintains the solar installation. PGE's customers receive the benefit of the tax incentives, which makes it possible for PGE to secure renewable resources as required by law but at a lower cost to its customers. While the specifics of the business model can vary, they all include using:

- a 50 percent state Business Energy Tax Credit;
- a 30 percent federal investment tax credit;
- accelerated depreciation; and
- utility incentives available through the Energy Trust of Oregon to customers of PGE and Pacific Power (about 20 percent).

This model makes it possible for a third party power provider to sell energy from the installation that they own back to a solar "host" — which will be ODOT— at a cost no more than that paid for electricity from the grid. Through a net metering agreement, ODOT pays for electricity produced but makes no capital investment or investment in operations or maintenance. If the land is needed for some other transportation use, ODOT has call back rights.

If ODOT were to purchase the array, own, maintain and operate it without the option of tax credits and accelerated depreciation, it would take over 100 years to pay it off using savings from the energy generated and assuming current energy rates and regulatory structure. Under the third-party financing arrangement, ODOT receives green power that would usually cost 8 – 10 percent more at no greater cost than it would otherwise pay. ODOT then begins receiving net benefit the day the solar installation begins generating power.

Why not use wind power instead of solar power?

While wind turbines need sites with strong winds, solar arrays can be placed wherever there is good southern exposure to the sun. For that reason, solar arrays can be sited in communities where wind may not be possible. Siting solar resources in areas close to where the energy is used saves energy lost in transmission over long distances.

Why can't this installation be placed in eastern Oregon where there is more sunshine?

Most of ODOT's electricity load is in northwestern Oregon; ODOT gets more of its power to run the transportation system from PGE than any other utility in the state. With the West Linn site, each kilowatt hour produced by the solar array would be credited to ODOT, offsetting electricity ODOT would have needed from PGE. This is called net metering. Under Oregon law, an ODOT net-metered facility must be:

1. located in PGE's service area;
2. on ODOT's own property; and
3. for ODOT's own use.

The proposed West Linn site would meet all of the statutory requirements. A project in central or eastern Oregon intended to supply energy to offset ODOT's needs in PGE's service area would not meet those statutory requirements. Having the project in PGE's service area also saves transmission and distribution losses. For the three solar highway projects currently under consideration, those "line loss" savings would be enough to supply the electricity needed by 27 all electric Oregon homes over the life of the project.

Where else might ODOT place solar highways in Oregon?

ODOT is exploring several locations throughout the state, including an expansion of the existing I-5/I-205 project site, the Baldock rest area on I-5 northbound, and others outside the Portland metropolitan area. ODOT's goal is to explore as many opportunities as possible for developing renewable resources to power the transportation system with 100% green power.

Does Oregon have enough sunshine for solar to work?

Yes, solar energy is the most abundant renewable energy resource in Oregon. According to the *Renewable Energy Atlas of the West*, Oregon has a 68 million megawatt-hour solar generation potential and could generate its annual energy use of 48 million megawatt-hours with partial development of these resources. *Solar Oregon* reports "Germany is installing more new solar energy systems per capita than any other country, yet its capitol, Berlin, receives less sun than the cloudiest location in Oregon, near Astoria." See: <http://www.solaroregon.org/learn/oregon-solar-resource>

Are there plans to make a "phase 2" enlargement of this project?

No. Any significant later expansion is unlikely given cost considerations and the engineering challenges of locating panels on a slope, but any such expansion would go through its own public review process. Although the West Linn site could theoretically hold up to 6 megawatts of solar, the only project being considered is one that would have between 13,600 and 17,000 panels depending on the panels selected to generate 3 million kilowatt hours of electricity annually.

What is the life expectancy of solar panels, and how are they dealt with when they are no longer working?

Solar panels at the first solar highway project (I-5/I-205 interchange) used mono-crystalline modules manufactured by SolarWorld in Hillsboro and are warranted for 25 years. Based on past performance, it's likely they will produce energy much longer. For example, SolarWorld panels made 27 years ago are still producing 87% of their original power, and the world's first mono-crystalline solar panels made by Bell Labs in 1953 are still working today, 56 years later.

Solar panels can be recycled. SolarWorld, with its own recycling facilities, uses the materials as "seed" to grow new solar wafers, which make up the panels. Cells and modules made of recycled panels meet the same quality and performance criteria as modules from non-recycled materials. A recent move toward automation has streamlined recycling processes, making

production of recycled products less energy-intensive than primary production.

All Oregon Solar Highway projects will require recycling from any solar panel supplier – if the company cannot commit to recycling the panels at the end of their useful life, the vendor will not be considered.

What about hazardous materials in solar panels?

Any solar panels installed in the Oregon Solar Highway projects would meet strict standards for ensuring no hazardous materials are released into the environment.

Is a byproduct of solar panel creation — silicon tetrachloride — something we should be concerned about here in the U.S.?

No — because we have strict environmental regulations. The Silicon Valley Toxics Coalition's January 2009 white paper, [Toward a Just and Sustainable Solar Energy Industry](#), says "Although it is easily recovered and reused as an input for silane production, in places with little or no environmental regulation, silicon tetrachloride can constitute an extreme environmental hazard." The white paper cites an article in the *Washington Post* that reports environmental abuses in China, where there are no recycling facilities, but says "Because of the environmental hazard, polysilicon companies in the developed world recycle the compound, putting it back into the production process." See earlier response about recycling facilities in Oregon.

I've read being next to electromagnetic fields can harm our health. Is this a problem with a large solar array?

Electromagnetic radiation is all around us – it is not inherently harmful. It is in the sunlight that warms the earth, and it is what is converted by solar installations into useful energy while producing few electromagnetic emissions of its own. In fact, studies show even in homes just 250 feet away, electromagnetic emissions would be less than those produced by a common household appliance such as a refrigerator, washing machine or television.

What about the UK report stating potential health problems?

The Health and Survey Executive (HE) Horizon Scanning Report, produced by a government agency in the United Kingdom in July 2009, discusses potential future health and safety implications of the growing use of solar in the United Kingdom. The intent of such reports is to foster development of the resources and skills to ensure that such potential implications do not become a reality. In Oregon, such potential health and safety issues are being addressed well. The following statements in italics are from the referenced report:

- *The next generation of solar photovoltaic modules may use chemicals such as cadmium telluride or other chemicals that may present hazards in solar panel manufacturing and recycling. Solar manufacturing and recycling processes are and will be subject to regulation in the United States through state and federal environmental and occupational health and safety regulatory agencies.*
- *With more solar photovoltaic panel installations there will be the need for installation and interconnection skills. Oregon has anticipated installation skill requirements and trains and certifies solar photovoltaic installers through the Energy Trust of Oregon. The Public Utility Commission of Oregon regulates interconnection requirements in Portland General Electric's (PGE) service area and all solar photovoltaic installations completed in PGE's service area must meet those requirements as approved by PGE.*
- *Solar thermal power (STP) uses the sun's energy to heat air or water and apparently may be interconnected to gas central heating requiring plumbing skills. There are no ODOT projects now contemplating using solar thermal power interconnected to gas central heating. Such gas interconnections are regulated in Oregon and would only be completed by qualified personnel following specific safety and code standards. Solar photovoltaic panels include no combustible gases.*

What is the energy conversion plant or process?

The “energy conversion plant” is an inverter, which turns the direct current (DC) electricity produced by the solar panels into alternating current (AC) so it can be used on the grid.

The inverters don’t show up on artist renderings because the exact number, location, and size of them has not been designed. They will be located behind the panels just as on the demonstration project site at the I-5 and I-205 interchange, at regularly spaced intervals.

PGE has two feeder lines on the West Linn site which would put the power on the grid; no new power lines would be needed. The ease of interconnection contributes to the quality of this site for a solar array.

What is the federal government’s concern about solar arrays on public lands?

The concerns of federal land management agencies over solar development are associated with the use of large tracts of land required for utility-scale solar development. Public lands were generally acquired for significant resource values other than solar resource development, but that’s not to say that solar resource development cannot be consistent with those resource values: it does mean that care must be taken to ensure that objective is fulfilled. ODOT is committed to ensuring that objective is fulfilled on the public lands for which it is the steward. If it can do so while also powering the transportation system with sustainable energy resources, the public interest is well served.

Isn’t the technology changing so rapidly that these solar panels will be outdated?

The newer generation of solar panels are larger and produce more energy than the previous generation. That does not mean that the earlier panels do not perform well. The smaller panels at the I-5 and I-205 interchange have performed very well. Both Oregon and the nation have committed to investing in renewable energy resource technology to further our collective goal of developing sustainable energy sources.

For more information about Oregon’s solar highway, visit www.oregonsolarhighway.com.