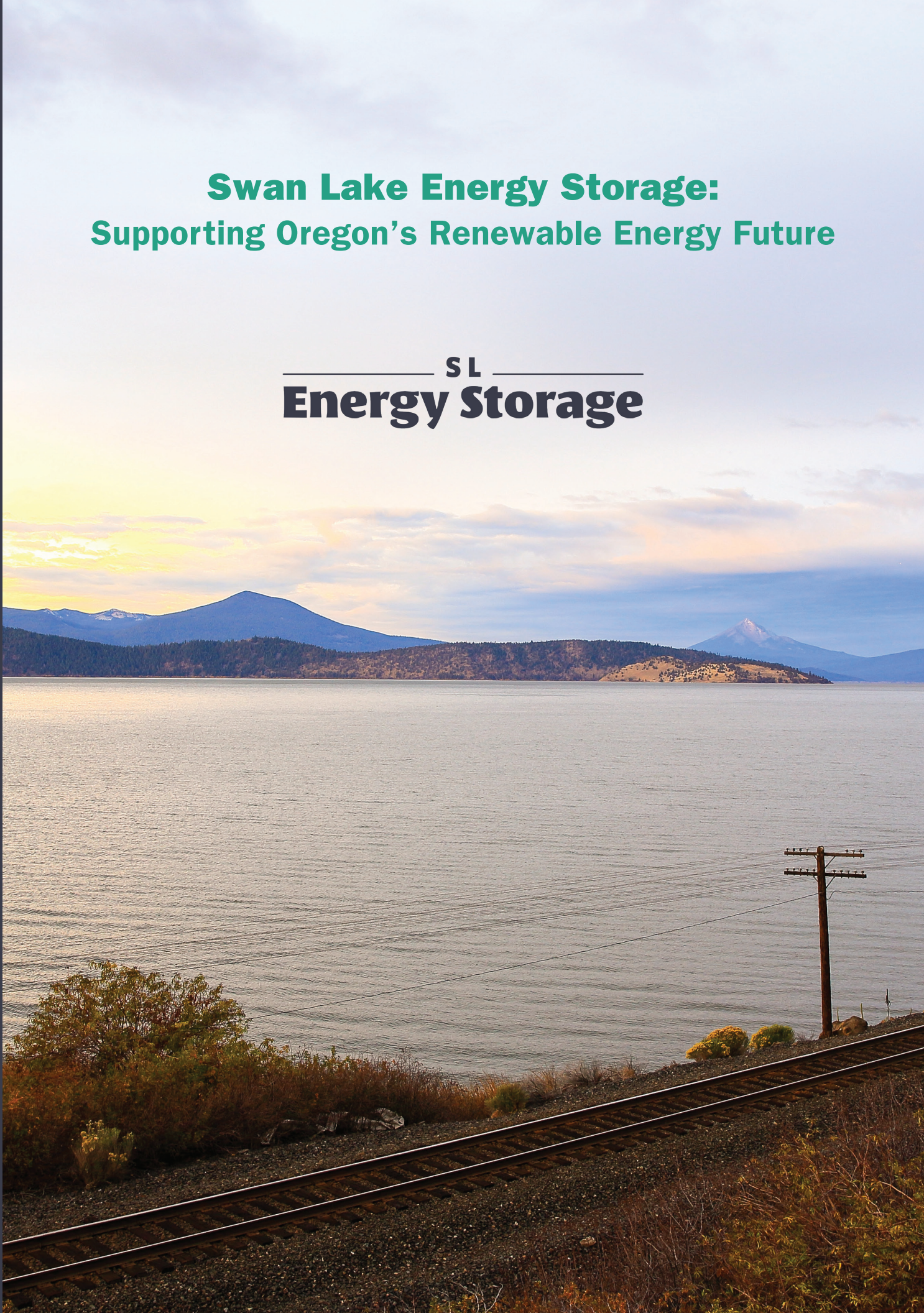


Swan Lake Energy Storage: Supporting Oregon's Renewable Energy Future

SL
Energy Storage



REDUCING CARBON BY STORING CLEAN ENERGY

ENERGY STORAGE HELPS RENEWABLES

Oregon, Washington and California are among the nation's leaders in reducing carbon emissions from power production, and each state has set aggressive goals for increasing the amount of electricity sourced from renewables. Wind and solar are clean and reliable, but the energy they produce depends on natural cycles that may not match up with the times of day people use the most electricity.

That's where energy storage comes in. When wind farms and solar panels produce more energy than is needed, the energy can be stored (usually for a few hours) and released when energy demand picks up.

Swan Lake Energy Storage is a proposed pumped hydro facility. Located 11 miles northeast of the city of Klamath Falls, Swan Lake Energy Storage has the ability to play an important role in Oregon's transition to a renewable energy future.

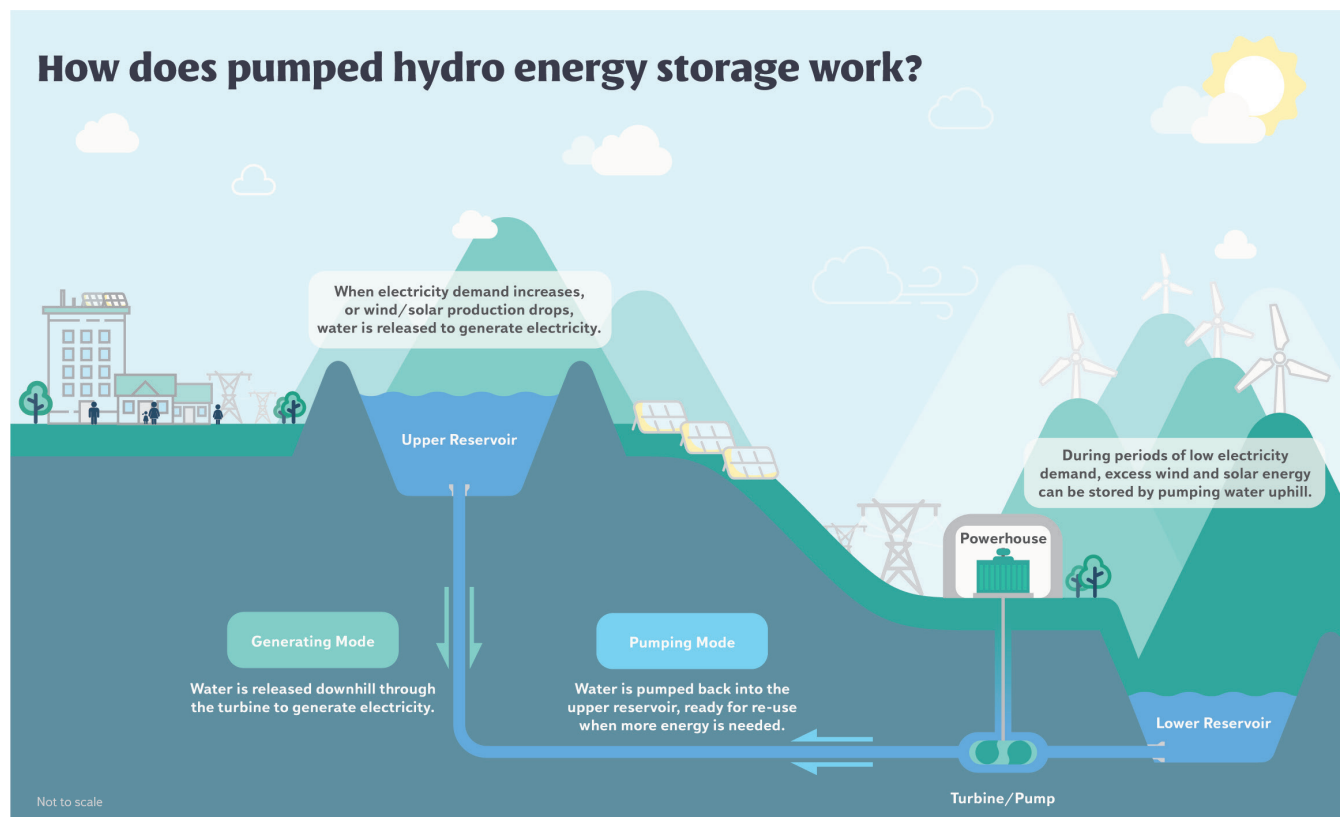
HOW PUMPED HYDRO WORKS

Pumped hydro facilities are like a huge, infinitely rechargeable battery. In the "charging" phase, they use electricity to pump water uphill through a big pipe to an upper reservoir. In the "discharge" phase, they release the water back through the pipe to the lower reservoir, and in the process, use the water to run turbines and generate new electricity.

The advantage of using pumped hydro is that it makes it possible to store excess renewable energy for times when it's needed, a feature that is becoming increasingly important as Oregon moves away from polluting fossil fuels.

When wind farms and solar panels produce excess energy, it can be stored in the pumped hydro facility by pumping water uphill. When demand for electricity increases, if there isn't enough wind and solar power being produced to meet the demand, the water gets released, and new electricity is generated.

The Swan Lake Energy Storage facility will use a closed-loop system that reuses and recycles the same water over and over, with no impact to rivers or ecosystems.



THE BENEFITS OF PUMPED HYDRO



Pumped hydro energy storage offers a wide range of benefits, especially when compared to other energy storage options like batteries. Pumped hydro has minimal environmental impacts and can be used to balance out the natural ebb and flow of renewable energy by storing excess wind and solar power and releasing it when it is needed. It's also the most efficient energy storage technology available!



ECO-FRIENDLY DESIGN

The Swan Lake Energy Storage project underwent dozens of studies over a rigorous, 10-year-long permitting process to ensure it minimizes impacts to the environment. The development team conducted environmental surveys, hosted open houses, and participated in local events, all to encourage open discussion with community members, landowners, and public agencies about the design of the proposed project. These additional steps, which go beyond the typical permitting process for wind or solar projects, have shown this is the right kind of energy storage project for Oregon. The facility's 50-year construction and operational license was issued in 2019 and requires the operator to restore, protect, mitigate and/or enhance lands impacted by the project.



A NATURAL PARTNER FOR WIND AND SOLAR

The Pacific Northwest's abundant wind and solar resources can amply meet our energy needs, but their production naturally fluctuates day-to-day and even hour-to-hour, and may not coincide with the electricity usage patterns of homes and businesses. Pumped hydro facilities provide large-scale energy storage, ensuring that at times when the electricity generated from renewable energy exceeds demand, it can be saved for use later when it's needed. By supplying stored electricity during periods of high demand, pumped hydro can also help stabilize electricity prices, which is good for consumers and businesses alike.

DID YOU KNOW?

The electric grid has to maintain a perfect balance between supply and demand. If a renewable energy facility is producing more electricity than is needed, and there's no way to store the excess, the facility has to curtail its production, resulting in a loss of clean energy.



COST-EFFECTIVE AND EFFICIENT

Pumped hydro storage is the most cost-effective solution for storing large amounts of energy, both today and in the long run. It can be used to absorb over-generation from renewables, meet peak demand during times of high electricity, and help reduce costly congestion on transmission lines.



BETTER THAN BATTERIES ALONE

Energy storage makes it possible to save electricity for use at a later time, which is critical as we get more of our energy from wind and solar. Batteries aren't well-suited to cost-effectively storing large amounts of renewable energy because they wear out and have to be replaced every 15 years, but they can be a great complement to bulk energy storage solutions like pumped hydro.

DID YOU KNOW?

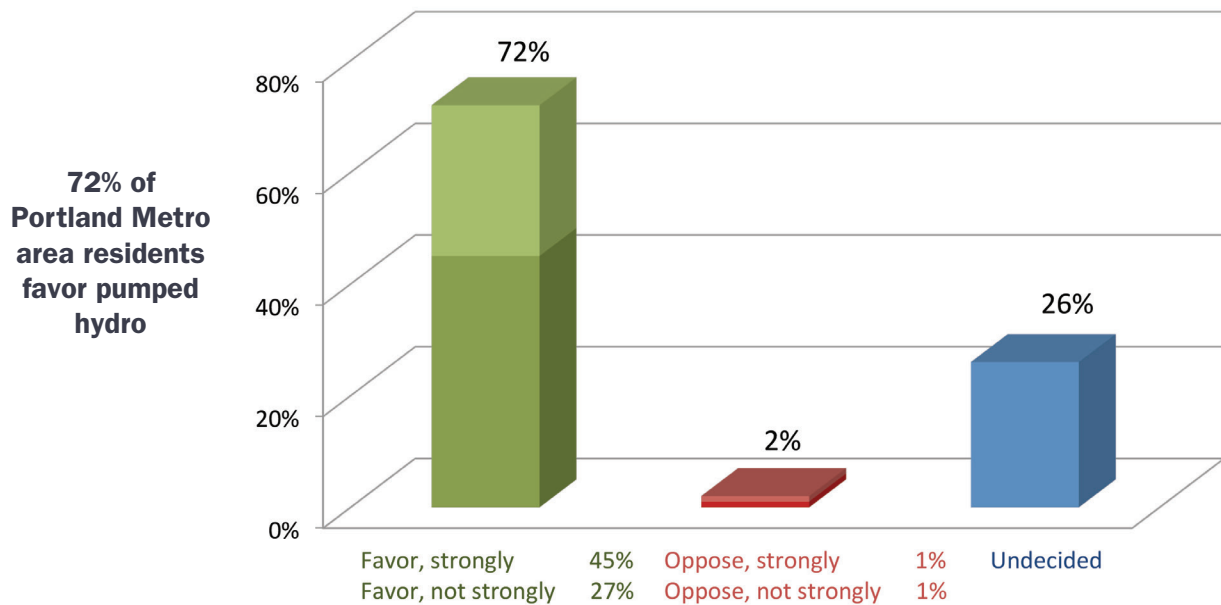
It would take 833 football fields' worth of lithium batteries to store the same amount of renewable energy as the Swan Lake Energy Storage facility, and pumped hydro storage facilities have lifespans of 50 or even 100 years!

STRONG COMMUNITY SUPPORT



In June 2019, Rye Development retained Patinkin Research Strategies to survey Portland Metro area residents regarding their understanding of pumped hydro storage, their opinions on energy, and their feelings toward different sources of energy, including renewables and fossil fuels.

Results show Portland Metro area residents view stored renewable energy very favorably and the development of pumped storage hydropower plants in the Pacific Northwest is well-received. When given a detailed description of how a closed-loop pumped hydro system works, 72% of Portland Metro area residents favored the technology.

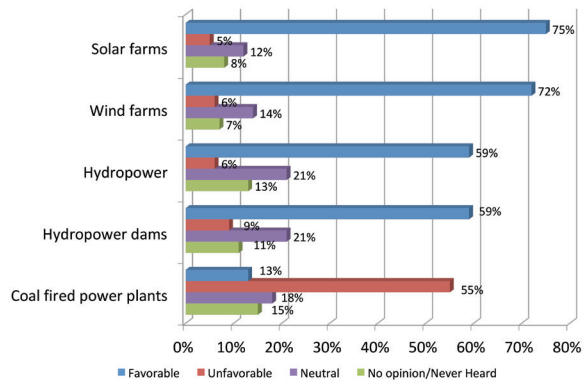


STRONG COMMUNITY SUPPORT

A SMALLER CARBON FOOTPRINT

The survey found that two-thirds of Portland Metro area residents believe the development of renewable energy should be tied to storage technologies, and nearly seven in 10 residents believe that their electric utility and Oregon as a whole ought to move to 100% renewable energy. Residents understood pumped storage can help reduce carbon emissions by helping to lessen our reliance on fracked natural gas, and by expanding our ability to use clean, renewable energy sources like wind and solar.

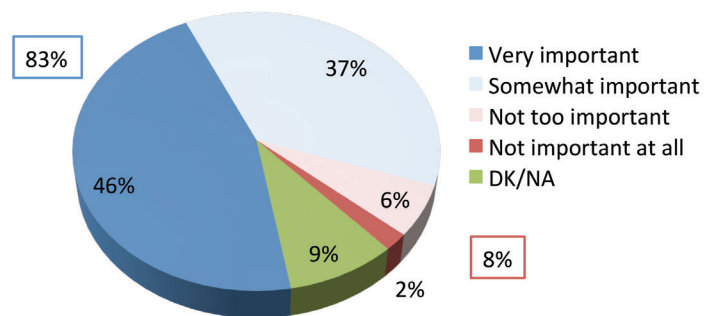
Solar and wind farms are extremely well liked while coal-fired power plants are disliked



THE PREFERRED KIND OF STORAGE

After learning the details of how pumped hydro works, three-quarters (76%) of survey respondents preferred pumped hydro as the best renewable energy storage option for Oregon's power grid. Two-thirds (66%) believe energy storage is important to avoid overbuilding renewable energy, and eight out of 10 believe it is important for energy utilities to invest in renewable energy storage.

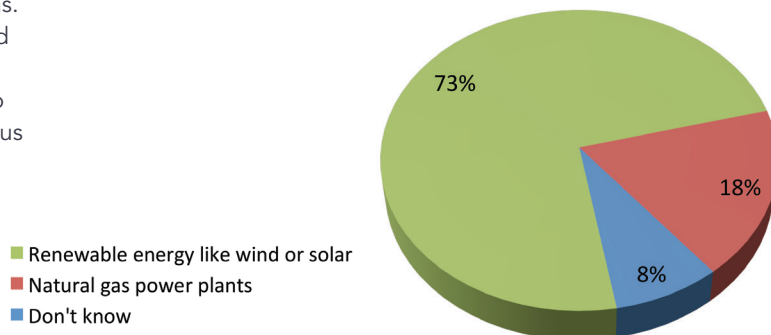
8 out of 10 survey participants believe it is important for energy utilities to invest in technologies that store renewable energy



MOVING TO 100% CLEAN ENERGY

Nearly three-quarters of Portland Metro area residents would like to power their homes with renewable energy instead of fracked natural gas. By making it possible to store energy from wind and solar farms, pumped hydro facilities like the Swan Lake Energy Storage project can help eliminate our reliance on fossil fuels and move us to 100% clean energy.

Nearly 3/4 of survey respondents would like to power their homes with renewable energy instead of natural gas.



DELIVERING ECONOMIC GROWTH

CREATING OPPORTUNITY

The Swan Lake Energy Storage project is a smart investment in Oregon's economic future. The project will generate a total of 3,363 full-year-equivalent (FYE) jobs during its 14-year construction period, according to an Economic and Fiscal Impact Analysis conducted by ECONorthwest. This significant boost to the local economy includes both an estimated 1,440 direct construction jobs as well as almost 2,000 induced jobs in supporting industries, and offers community members the assurance of a stable, years-long construction project they can feel good about building.

HERE TO STAY

Once operational, the Swan Lake Energy Storage project will provide 12 full-time, well-paying operations jobs that will be based onsite and cannot be moved offshore. In addition, ECONorthwest estimates that the financial stimulus provided by Swan Lake will indirectly create an additional 24 jobs on an ongoing basis in Klamath County while the facility is operational.

INVESTING IN THE COMMUNITY


While the Swan Lake Energy Storage project will create thousands of jobs during its construction, it will also support overall economic growth in the community. Klamath County will benefit from substantial property tax payments from the project. Analysis of the project estimates it will provide approximately \$2.1 million in additional county tax revenue annually, money that can support local governments, school districts, fire districts, park districts, vector control districts, road districts, cemetery districts, sanitary districts and special districts.

Swan Lake
will generate
1,440
FYE jobs for Oregonians
during construction

Once operational,
Swan Lake will
generate an
estimated

\$6.2
MILLION
in economic activity
annually, and

\$1.7
MILLION
in labor income
annually



Installation of state-of-the-art variable speed generators (similar to the equipment proposed for Swan Lake) at Alpiq's 900 MW Nante de Drance pumped hydro facility in Switzerland.



Concept drawing of the proposed 394 MW Swan Lake pumped hydro storage facility.

PROVEN, RELIABLE TECHNOLOGY

Pumped hydro is a well-established form of large-scale energy storage that has been used in the U.S. and Europe since the 1920s. Thanks to its simplicity and reliability, it is also the most widely used form of energy storage, representing 93% of global energy storage capacity. There are 130 pumped hydro facilities in 42 countries around the world, and more than 40 of these are located in the U.S. Several European countries consider pumped hydro an invaluable tool for reducing carbon emissions from the power sector by supporting the integration of significant amounts of wind and solar power.

ABOUT SWAN LAKE

Retiring coal plants and increasing the amount of renewable energy we use present some profound changes for the regional electrical grid. Low-cost energy storage will play a key role in ensuring a reliable and affordable supply of clean energy. A comprehensive private analysis identified Swan Lake as one of the best of potential pumped storage projects in the Western U.S. because of its ability to economically support increased renewable energy deployment.

In 2010, Rye Development began pursuing the opportunity to build and run the most economic, efficient energy storage option available in the region. In 2015, after five years of studies and discussions with resource agencies, stakeholders, and community members, Rye Development filed a formal application with the Federal Energy Regulatory Commission (FERC) for approval to build, own and operate the Swan Lake Energy Storage project. In 2017, Rye Development and National Grid Ventures entered into a joint partnership agreement to advance the development and commercialization of Swan Lake. Following diligent public and agency scoping meetings and environmental studies, in 2019 FERC issued a 50-year construction and operational license.

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