
Swan Lake North Pumped Storage Project

Economic and Fiscal Impacts from Operations and Construction



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1 Introduction

EDF Renewable Energy commissioned ECONorthwest to conduct an analysis of the economic impacts resulting from the construction and operations of the proposed Swan Lake North Pumped Storage Project (Swan Lake North), in Klamath County, Oregon, approximately 12 miles northeast of Klamath Falls. The Swan Lake North facility will have the capacity to deliver a proposed 400 megawatts of electricity for up to ten hours a day, using a closed-loop pump-turbine system that connects two newly-constructed reservoirs.¹

Hydroelectric pumped storage works as an energy storage system. A pipe connects two dedicated reservoirs, and reversible pump-turbines use electricity to pump water from the lower reservoir to the upper reservoir. When power is needed, the water can be released back to the lower reservoir through the turbines to generate on-demand electricity. This creates a reliable way to integrate energy into the system when it is needed.

Pumped storage helps stabilize the transmission grid, reduces the need for costly transmission upgrades, and supports the development of variable renewable such as wind and solar. As development of renewable resources continues to grow, a reliable method for integration and storage becomes more important.

¹ A 400 MW project was used as the base case for this analysis. Subsequent market analyses will refine actual project size, and related economic impacts. Ultimately, customer requirements will determine the project size, which could range from 300-450 MW.

EDF Renewable Energy expects the Swan Lake North construction project to occur over approximately six calendar years, after the multi-year pre-construction design phase. This analysis relies on operating and construction cost data provided by EDF Renewable Energy, as well as additional research by ECONorthwest about pumped storage projects throughout the United States.

ECONorthwest uses IMPLAN (for IMpact Analysis for PLANning) economic impact modeling software to measure economic and fiscal impacts. IMPLAN is widely respected and used by over 1,500 public and private agencies. The United States Department of Agriculture (USDA) recognizes the IMPLAN modeling framework as *“one of the most credible regional impact models used for regional economic impact analysis.”* It selected IMPLAN as its analysis framework to monitor job creation associated with the American Recovery and Reinvestment Act of 2009.

In this analysis, ECONorthwest measured the economic and fiscal impacts of the facility’s construction phase, as well as the impacts associated with a typical year of operations. The analysis considers impacts for Klamath County and for the state of Oregon as a whole. All monetary impacts are shown in 2014 dollars.

1.1 Input-Output Modeling Terms

Direct Impacts. Economic impact analysis employs specific terminology to identify the different types of economic impacts. Using a project-oriented perspective, the *direct impacts* consist of the economic output, income, and jobs generated by the companies, contractors, and workers that are:

- Building or operating the Swan Lake North facility;
- Providing specialized engineering, management, and testing services;
- Manufacturing equipment to be installed on site; and
- Selling retail goods and services, such as lodging and restaurant food, to non-local workers who spend their *per diem* allowances in the local community.

Indirect Impacts. Contractors, service providers, and manufacturers will purchase a range of goods and services, including construction materials, spare parts and equipment, repair services, electricity, water and sewer, etc. This spending generates the first round of *indirect impacts*. Their suppliers and vendors for the project will also have to purchase goods and services. This spending leads to additional rounds of indirect impacts. Because they represent interactions among businesses, these indirect effects are often referred to as “supply-chain” impacts.

Induced Impacts. The direct and indirect increases in employment and income enhance the overall purchasing power in the economy, thereby inducing further consumption and investment spending. Workers on Swan Lake North, for example, will use their income to purchase groceries or take their children to the doctor. If these workers are from Oregon, then this spending benefits the Oregon economy. If these workers are from out of state, then their income is repatriated and their spending benefits their home states. Spending by workers whose incomes are directly or indirectly tied to Swan Lake North will generate *induced impacts* for workers and businesses in other sectors of the economy. These induced impacts are often referred to as “consumption-driven” impacts.

Secondary Impacts. This is the sum of indirect and induced impacts or, simply, the economic effects on sectors outside of direct work on the project.

The IMPLAN model reports the following measures of economic impacts:

- **Output** represents the value of goods and services produced, and is the broadest measure of *economic activity*.
- **Labor income** consists of employee compensation and proprietary income.
 - **Employee Compensation** includes workers' wages and salaries, as well as benefits such as health, disability, and life insurance; retirement payments; employer paid payroll taxes; and non-cash compensation.
 - **Proprietary Income** is earnings by small-business owners, family farmers, and the self-employed.
- **Jobs**, according to IMPLAN's methodology, are measured in terms of full-year-equivalents (FYE). One FYE job, as defined by the U.S. Bureau of Labor Statistics (BLS), equals work over twelve months in a given industry. For example, two jobs that last six months each in 2014 count as one FYE job in 2014. A job can be full- or part-time, seasonal or permanent; IMPLAN counts jobs based on the duration of employment, not the number of hours a week worked. For impact analysis, one construction project job is twelve monthly paychecks. It may be a mix of several individuals holding a position one at a time throughout one year. More common, it is a mix of positions. A carpenter working for five months, followed by an electrician working six months, and a painter working one month would equal one FYE job, according to the BLS and IMPLAN.
- **State and local taxes and fees** include production business taxes; personal income taxes; social insurance (employer and employee contributions) taxes; and various other taxes, fines, licenses, and fees paid by businesses and households.

1.2 Limitations of this Analysis

The goal of this research is to assess how construction of Swan Lake North will contribute to the state and national economies. The analysis relies on EDF Renewable Energy's construction and operating cost estimates, and uses economic impact modeling techniques to measure the linkages between this spending and other industry sectors in the state and national economies.

This analysis does not measure the potential impacts of counterfactual scenarios. A counterfactual considers how scarce resources would have been allocated had the Swan Lake North project not occurred, or how funding Swan Lake North could potentially divert spending away from other businesses (referred to as a "substitution effect" in economics).

In addition, this analysis does not measure the potential economic development impacts of Swan Lake North. Large investments in infrastructure can start a cycle of economic expansion. Economists call this impact an expansion of the "production possibilities frontier" of the economy. Although it is difficult to quantify this effect, it could be an important dimension to Swan Lake North.

2 Economic Impacts from Construction

The cumulative economic impacts for Oregon over the construction cycle are estimated at \$523 million in output, which includes \$167 million in labor income, and 3,360 jobs.

This analysis includes the impacts from both capital and operational expenditures. We report these impacts separately because capital expenditures will occur unevenly over the construction timeframe, while operating expenditures will be relatively stable from year to year. We report the total impacts of construction for the duration of the construction period. We report the impacts of operations for one representative year.

2.1 Construction Timing

EDF Renewable Energy estimates that pre-construction planning for the Swan Lake North project will take approximately nine years. Construction will likely begin in the late 2010s, and will take approximately five calendar years.² In this section, we report the total impacts for the pre-construction and construction phases together. We report the construction jobs impacts for each year of construction to show how the jobs impacts will be spread out over time.

² Construction begins in the summer of the first calendar year of the construction phase.

2.2 Estimated Construction and Project Costs

EDF Renewable Energy will spend approximately \$1.1 billion on the Swan Lake North project for engineering, equipment procurement, permitting, and construction (this also includes contingencies) over the nine-year pre-construction phase and the five-calendar-year construction phase.³ Pre-construction spending will go primarily to licensing, marketing and design services. We report cumulative construction impacts for both phases of construction, and for Klamath County and the rest of Oregon, in Table 1.

Table 1: Swan Lake North Construction and Project Costs (2014 Dollars)

Major Expenditure Component	Klamath County	Rest of Oregon	Outside of Oregon	Total All
Construction labor	\$20,456,718	\$54,710,059	\$17,297,937	\$95,341,014
Other labor	\$1,051,729	\$37,140,474	\$10,311,070	\$50,012,065
Materials & equipment	\$617,633	\$162,419,930	\$571,432,582	\$757,317,308
Construction Costs	\$22,126,080	\$254,270,463	\$599,041,589	\$902,670,387
Transfers	\$27,839,889	\$0	\$35,764,297	\$65,582,722
Contingency	\$5,152,026	\$26,218,005	\$65,455,279	\$93,904,232
Total Project Costs	\$55,117,995	\$280,488,469	\$700,261,166	\$1,062,157,340

We do not include spending on contingencies in our calculation of economic impacts. The contingency allowance buffers against spending overages on project construction; this spending will not necessarily occur. For the remainder of this report, we do not include transfers or contingencies in our construction cost figures.

Klamath County will benefit from approximately \$22.1 million of construction spending. Labor spending comprises the majority of this impact.

³ Contingencies are not included in the construction costs for purposes of impact analysis. This is a conservative assumption.

Most of the construction spending will benefit other parts Oregon and the United States. EDF Renewable Energy will spend approximately \$254 million on goods and services from sources inside Oregon but outside of Klamath County, for the construction of this project. This spending includes wages and benefits for workers who reside outside the county.

Swan Lake North construction spending outside of Oregon totals \$599 million. Much of it is on equipment not made in the state. The project's out-of-state workers will benefit area businesses by spending some of their income and nearly all of their *per diems* in Klamath County. Although local businesses will experience some impact from non-resident labor spending, these workers will remit the majority of their earnings back to their home states.

2.3 Methodology for Modeling Construction Impacts

The Swan Lake North project involves major purchases of specialized equipment manufactured elsewhere in the U.S. and overseas, as well as some out-of-state labor. Such non-local inputs have smaller impacts on the state and county economies. To account for these factors, we need to adjust the modeling assumptions in IMPLAN.

ECONorthwest used data from EDF Renewable Energy on the location of contractors, craftspeople, service providers, and manufacturers for the project, to determine the share of spending on materials and labor in Klamath County.

Using this information, ECONorthwest constructed an expenditure function, which tracks direct inputs by source for IMPLAN, specific to the Swan Lake North project. This function allows us to report direct impacts based on the location of vendors where purchases occur, and residencies of workers.

Without adjustment, Swan Lake North’s direct economic output in Klamath County would equal the total value of construction — the sum of spending on labor, capital, materials, and other inputs— which amounts to approximately \$903 million.⁴

With adjustment, Klamath County will capture \$22.1 million of the project’s direct output – or total construction cost of \$903 million. The rest of Oregon captures \$254 million. Most of the direct construction output (\$599 million, or 68 percent) accrues to places outside the state.

2.4 Direct Employment at Swan Lake North

By definition, all on-site jobs associated with construction are *direct jobs* in Klamath County. These workers include craftspeople, engineers, project managers, and others who provide on-site support services. Direct jobs at Swan Lake North will also benefit employees in other parts of Oregon and elsewhere in the U.S.

As described in the previous section, our analytical approach categorizes job impacts according to where workers reside. Of the 1,440 total direct FYE jobs supported by construction spending, current residents of Klamath County would hold 170. We allocate only those jobs, and their associated labor income, as directly occurring in the county. Workers from elsewhere in Oregon, who would either commute or occupy temporary housing in the county, would fill an additional 1,270 FYE jobs.

⁴ Spending excluding asset transfers and budget contingencies.

Table 2 summarizes the direct employment associated with the Swan Lake North by geographic perspective.

Table 2: Swan Lake North Direct Employment

Geographic Perspective	Direct Jobs (Full-Year Equivalents)	Types of Jobs
Klamath County	170	These are direct jobs for Klamath County workers. This figure includes construction jobs and other jobs supported by spending in Klamath County.
Rest of Oregon	1,270	Jobs for workers from the rest of Oregon. This figure includes construction jobs accruing to rest of Oregon workers and other jobs for vendors in rest of Oregon.
Total for Oregon	1,440	These are direct jobs for Oregonians. All construction jobs are in Oregon. Other jobs include manufacturing, engineering, management, and other services in Oregon.

Given Klamath County's relatively small non-residential construction sector (464 jobs, \$11.6 million in income, and \$54.2 million in output in 2013), we allocated only basic construction services labor to the county. We assumed all technical construction services would come largely from elsewhere in Oregon (between 60 and 80 percent, depending on the year). Residents from outside of Oregon would hold the remaining jobs.

2.5 Economic Impacts from Construction Spending

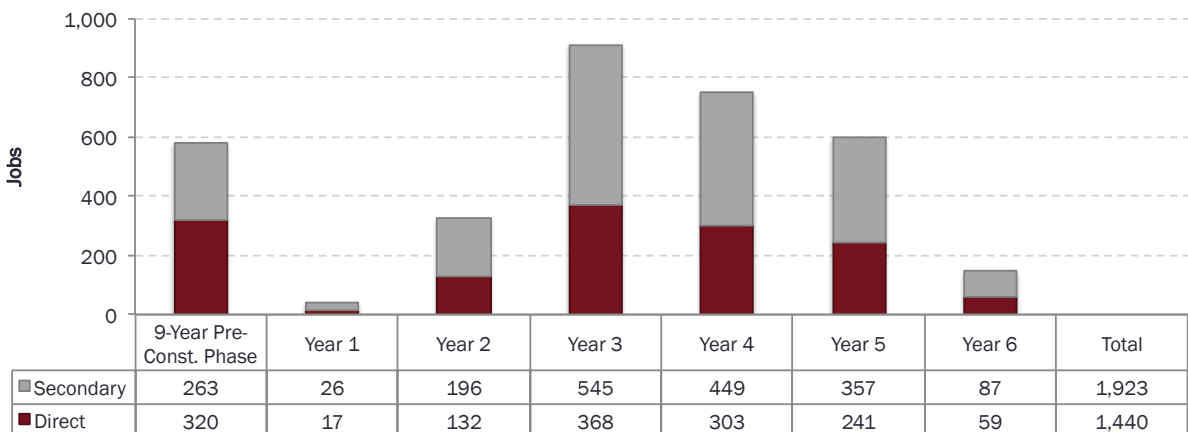
Swan Lake North spending will produce significant direct impacts in the Oregon economy that benefit businesses and employees in this state. The cumulative economic impacts for Oregon over the construction cycle are estimated at \$523 million in output, which includes \$167 million in labor income, and 3,360 job-years of employment (see Figure 1 for allocation of job impacts over construction schedule). Table 4 shows the economic impacts by location and type.

Table 3: Economic Impacts from Construction Lifespan (2014 Dollars), and FYE Jobs

Study Area / Impact Measure	Direct	Indirect	Induced	Total
Klamath County				
Output	\$22,047,900	\$5,965,300	\$25,113,200	\$53,126,400
Labor Income	\$5,749,600	\$1,987,400	\$7,850,200	\$15,587,200
Jobs	170	60	250	480
Rest of Oregon				
Output	\$252,344,300	\$113,511,900	\$104,426,600	\$470,282,800
Labor Income	\$75,379,700	\$40,169,700	\$35,986,600	\$151,536,000
Jobs	1,270	730	880	2,880
Total Oregon				
Output	\$274,392,200	\$119,477,200	\$129,539,800	\$523,409,200
Labor Income	\$81,129,300	\$42,157,100	\$43,836,800	\$167,123,200
Jobs	1,440	790	1,130	3,360

Construction impacts are temporary in nature and unfold as project spending occurs, therefore, job impacts do not occur consistently throughout the construction period. Figure 1 shows how the 3,360 direct and secondary (indirect and induced) FYE jobs in Oregon occur over the project schedule.

Figure 1: Direct and Secondary (Indirect and Induced) Jobs in Oregon During the Swan Lake North Construction Project



The project pre-construction and construction phases will support 1,440 direct FYE jobs. Pre-construction will support 320 direct FYE jobs, at an annual average of 35.5 direct jobs. The actual number of jobs in each year depends on the timing and mix of construction spending.

2.6 Fiscal Impacts of Construction Spending

Together, the direct and secondary impacts of the pre-construction and construction phases of Swan Lake North will generate state and local government revenues of \$15 million in Oregon. These revenues come from a variety of sources, namely taxes, fees, licenses, and permits.

3 Economic Impacts from Operations

In one year of operations, the Swan Lake North facility will generate an estimated \$6.2 million in economic activity, including \$1.7 million in labor income, and about 35 jobs in Oregon.

This section summarizes the economic and fiscal impacts generated by one year of operations.

3.1 Annual Economic Impacts

In one year of operations, the Swan Lake North facility will generate an estimated \$6.2 million in output, \$1.7 million in labor income, and 35 jobs in Oregon (Table 4). These impacts will occur each year as long as the Swan Lake North remains in operation.

Table 4: Economic Impacts from Swan Lake North Operations (2014 Dollars)

Study Area / Impact Measure	Direct	Indirect	Induced	Total
Klamath County				
Output	\$3,370,700	\$1,486,300	\$1,110,200	\$5,967,200
Labor Income	\$874,800	\$455,800	\$341,900	\$1,672,500
Jobs	11	12	10	33
Rest of Oregon				
Output	\$0	\$47,300	\$186,700	\$234,000
Labor Income	\$0	\$15,000	\$59,600	\$74,600
Jobs	0	0.3	1.4	1.7
Total Oregon				
Output	\$3,370,700	\$1,533,600	\$1,296,900	\$6,201,200
Labor Income	\$874,800	\$470,800	\$401,500	\$1,747,100
Jobs	11	13	12	35

All of the direct impacts of operations will occur in Klamath County. Swan Lake North will provide approximately \$875,000 in labor income to 11 workers, which equates to \$80,000 per employee. The average pay (excluding benefits) will be \$60,000. Wages in Swan Lake North are very competitive. According to the Oregon Employment Department, the average annual wage in Klamath County was \$35,924 in 2014;⁵ the average wage of a Swan Lake North employee will be 80 percent higher than the average employee in Klamath County.

Swan Lake North will employ Klamath County residents to operate Swan Lake North, and it will purchase most of its goods and services for operations from businesses in the county. In fact, the analysis indicates that about 96 percent of the total operations impacts on Oregon's economy will occur in Klamath County. This activity will trigger additional spending and jobs within Klamath County, thus supporting the secondary impacts of operations.

3.2 The Multiplier Effect

The direct spending attributable to Swan Lake North operations will have a multiplier spending effect, benefiting workers and business owners in all industries of the local and state economies. In essence, multipliers are a shorthand way of explaining the link between an activity and the rest of economy. In this analysis, we consider the multiplier effects for labor income and jobs.

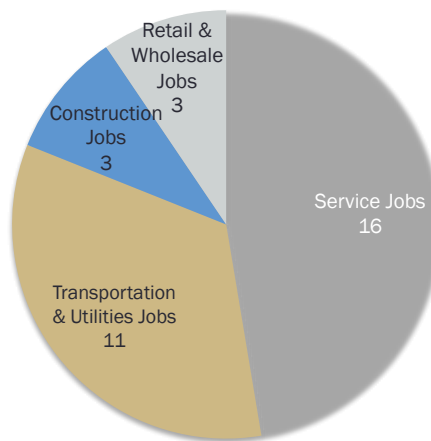
We can sum all of the impact measures described previously across direct, indirect, and induced impact categories using mathematical formulas to measure this effect. The larger the multiplier, the greater the connection is between an activity (in this case, Swan Lake North operations) and the rest of the local and state economies.

⁵ Covered employment payroll does not include employee benefits or employers' share of payroll taxes. Thus, removing benefits and payroll taxes for employees at the Swan Lake provides an apples-to-apples comparison of average wages. See www.olmis.org.

- **The labor income multiplier is 1.9.** This means every \$1.0 million in compensation to Swan Lake North employees generates another \$900,000 in income for workers in other sectors of the Klamath County economy, for a total of \$1.9 million in income.
- **The employment multiplier is 3.2.** This means, for every job at Swan Lake North, another 2.2 jobs are necessary elsewhere in the local economy, for a total of 3.2 jobs.

Figure 2 provides another perspective on the multiplier effect by showing how the direct spending associated with Swan Lake North operations generates job impacts in other industry sectors. The Swan Lake North facility will directly employ 11 workers in the transportation & utilities industry. The spending and income associated with these employees will support another 24 jobs in Klamath County, composed of approximately 16 service sector jobs, 3 construction jobs and 3 jobs in retail and wholesale trade. Therefore, Swan Lake North operations will support 33 total jobs in the county.

Figure 2: Distribution of Total Job Impacts in Klamath County by Industry



ECONorthwest estimates that Swan Lake North operations will generate \$2.1 million per year in property tax revenue for Klamath County.

3.3 Fiscal Impacts of Operations

Development of the Swan Lake North facility will result in benefits to local taxing districts beginning in the first year of operations.

Swan Lake North may be eligible for property tax abatement through the State of Oregon’s Strategic Investment Program (SIP), a tax incentive program created to encourage traded sector businesses to locate in Oregon. This is accounted for in the fiscal impact analysis.⁶

Using assumptions and inputs from SIP-approved electric generation projects in rural Oregon, ECONorthwest estimates that Swan Lake North could generate approximately \$31.5 million in property tax revenues for Klamath County over a 15-year SIP exemption period. This amounts to \$2.1 million per year.

The spending and income associated with Swan Lake North operations will add another \$200,000 in annual tax and fee revenues to state and local taxing jurisdictions.

⁶ SIP was adopted by the Oregon Legislature in 1993. It allows businesses and local governments to negotiate alternative property tax agreement if these businesses invest over \$25 million in rural and \$100 million in urban areas. The program attracts investments that provide good jobs and is used to attract capital intensive developments that set the stage for many years of employment.

4 Conclusion

ECONorthwest's analysis indicates that over its fourteen-year **pre-construction and construction phases**, the Swan Lake North project will have *cumulative* direct, indirect and induced economic impacts in Oregon of **\$523 million in output, \$167 million in labor income, and 3,360 full-year-equivalent jobs**. These impacts will be spread unevenly over time based on when spending occurs.

Once the pumped storage facility is up and running, **operating impacts** will total **\$6.2 million in output, \$1.7 million in labor income, and 35 jobs** annually. About 96 percent of the impacts would occur in Klamath County and the remainder elsewhere in Oregon. These impacts will continue into the future, providing a sustainable source of employment for the local community.