



The Economic and Fiscal Impacts of a Potential Pumped-Storage Hydroelectricity (PHS) Station in Southwest Virginia

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About Chmura Economics & Analytics

We have a data-driven culture. We are a group of published scientists contributing to innovations with big data analytics on the forefront of applied economics and technology solutions. We have a very diverse team of people with backgrounds such as PhD economists, statisticians, computer scientists, and transformation strategists. We serve a cross section of decision makers from the defense, government, public, and private sectors.

As data scientists, we help our clients quickly answer big data questions. We provide a reliable picture of economic trends on both a macro and micro level. Our clients rely on the historical, current, and predictive market reports we provide to cut through the confusing information they receive on a daily basis from the media, politicians, and industry resources.

Our clients view us as trusted economic advisors because we help them mitigate risk and prepare for growth by understanding the why, the how, and the what about their local economy. As the nation's preferred provider of labor market data, we help our clients understand both the demand for and the supply of available data. Our clients benefit from our expertise by better understanding their own bottom line costs, sustainability issues, and associated risks.

Summary

Dominion Energy Virginia (Dominion Energy) is evaluating the potential development of a pumped-storage hydroelectricity (PHS) generation station in Southwest Virginia.¹ While the location of the proposed station is still being reviewed by Dominion Energy, the potential station would generate significant economic benefits for both Southwest Virginia and the entire Commonwealth. In this report, Chmura Economics & Analytics estimates the potential economic and employment impacts from construction and operation of the facility. These benefits include direct impacts from construction and operation, as well as indirect and induced impacts that occur as the effects of project expenditures and operation spread throughout the economy.

The preliminary estimate of the total capital expenditures for the potential station is \$2.0 billion, which is expected to be spent from 2017 through 2027. The development and construction of the potential station are estimated to:

- Generate approximately \$576.3 million in total economic impact in Virginia, including \$319.5 million in Southwest Virginia.
- Support a total of 2,980 jobs in the state, including 1,644 directly supported by construction activities. Of the 2,980 jobs supported in the state, a total of 2,083 positions would be supported in Southwest Virginia, including 1,376 directly supported by construction activities.

The ongoing operation of the facility would also produce economic and employment benefits in the Commonwealth, particularly in Southwest Virginia. From 2028 onward, ongoing operation of the potential station is estimated to:

- Generate an annual economic impact (including direct, indirect, and induced) of \$38.6 million (in 2028 dollars) in the Commonwealth, with the vast majority (\$36.9 million) occurring in Southwest Virginia.
- Support a total of 86 jobs annually in the state, again with the overwhelming majority (76) in Southwest Virginia. The station is expected to employ about 50 permanent workers.

Additionally, the potential station, once it begins operation, would generate annual tax revenue estimated at \$12.1 million for local governments in Southwest Virginia, and \$257,102 in income tax revenue for the Commonwealth of Virginia. Development and construction of the project would also produce additional individual and corporate income tax revenues for the state, estimated at \$7.7 million during the period from 2017 through 2027.

Study Background

In 2017, the Virginia General Assembly approved legislation (Senate Bill 1418, House Bill 1760) authorizing a utility to petition the Virginia State Corporation Commission for implementation of a rate adjustment clause to recover cost for “one or more pumped hydroelectricity generation and storage facilities that

¹ The exact location of the project has not been determined. The following localities are included in Southwest Virginia: Counties of Lee, Wise, Scott, Russell, Dickenson, Tazewell, Buchanan, and the City of Norton.

utilize on-site or off-site renewable energy sources as all or a portion of their power source and such facilities and associated resources are located in the coalfield region of the Commonwealth as described in §56.2-6002, regardless of whether such facility is located within or without the utility's service territory." The legislation was signed by Governor Terry McAuliffe and will become law on July 1, 2017.

Dominion Energy Virginia is evaluating the development potential of a pumped-storage hydroelectricity generation station in the coalfield region of Southwest Virginia. The economic benefit of a potential power station in state and regional economies occurs in two phases. The first takes place during the development and construction period of the station, which can potentially last from 2017 to 2027 if the project is approved.² The second phase is the ongoing operation of the generating station, which is expected to commence in May 2027; the first full year of operation will be 2028. For both cases, the direct, indirect, and induced impacts³ in spending and job creation are estimated through the application of the IMPLAN Pro® model. In addition, tax revenue is estimated for both the local governments and the state of Virginia.⁴

Economic Impact in Southwest Virginia

One-time Economic Impact of Capital Expenditure

The preliminary estimate of the total project cost is \$2.0 billion in 2017 dollars. Data from Dominion Energy indicate that of the total project cost, 19% is estimated to be spent on soft costs such as architecture, engineering, and other professional services; 46% is projected to be spent on equipment; and the remaining 35% is expected to be spent on construction of the generating facility.⁵

Although Dominion Energy will use state and regional firms as suppliers whenever possible, not every product and service needed for construction of the PHS station is available in Southwest Virginia or in Virginia. Consequently, some of the services and products will be purchased from firms located outside the region and the state. Chmura used information from Dominion Energy to estimate the percentage of project spending that is expected to go to firms within the region and the state.

Table 1 summarizes the estimated one-time economic impact from Dominion Energy's capital expenditure on the potential PHS station in Southwest Virginia. From 2017 to 2027, it is estimated that the

² The project cannot proceed without the approval of the State Corporation Commission (SCC) and Federal Energy Regulatory Commission (FERC). If approved by the SCC and FERC, the project would start construction in 2022 with a commercial operation date anticipated in May 2027. But some development efforts will be supported from 2017 to 2022, including permitting, design, and other preparation work. As a result, the total development phase of the project will last from 2017 to 2027.

³ Direct impact is defined as the economic activity generated by the project under consideration. Indirect impact is secondary economic activity generated by the project due to suppliers to the development, construction, or ongoing operations. Induced impact is economic activity generated when workers at the power station and their suppliers spend their income at retail stores, restaurants, and professional offices.

⁴ Since the exact location of the station has not been determined, Chmura will use an average tax rate to estimate tax revenue to local governments in Southwest Virginia.

⁵ Source: Dominion Energy.

development and construction of the station will generate a cumulative \$230.2 million direct economic impact in the region. This will directly create a cumulative total of 1,376 jobs during the development period, with the majority of them in construction trades.⁶ The total indirect impact in Southwest Virginia is estimated to total \$35.6 million and can support 301 cumulative jobs. Beneficiaries of this impact will be businesses such as site preparation and transportation. The total induced impact is estimated to produce \$53.7 million in spending that will support 406 cumulative jobs in the region from 2017 to 2027. The induced jobs are concentrated in consumer service-related industries such as restaurants, healthcare offices, and retail stores. On an annual average basis, the development and construction of the potential station is expected to inject \$29.0 million into the Southwest Virginia economy and support 189 jobs per year from 2017 to 2027.

Table 1: One-time Economic Impact of Capital Expenditure in Southwest Virginia

		Direct	Indirect	Induced	Total
Total (2017-2027)	Spending (\$Million)	\$230.2	\$35.6	\$53.7	\$319.5
	Employment	1,376	301	406	2,083
Annual Average (2017-2027)	Spending (\$Million)	\$20.9	\$3.2	\$4.9	\$29.0
	Employment	125	27	37	189

Note: Impacts are measured in the year when they occur. Numbers may not sum due to rounding

Source: IMPLAN Pro 2015, Dominion Energy, and Chmura Economics & Analytics

Ongoing Economic Impact of the Station Operation

The sustained economic impact of the potential PHS station will come from its ongoing operation. In this study, the operational impact is estimated for 2028, the first full year of operation. The station is expected to hire 50 permanent employees with a generation capacity of 1,000 megawatts.⁷ The total annual economic impact (direct, indirect, and induced) of the ongoing operation of the station in Southwest Virginia is estimated to be \$36.9 million (measured in 2028 dollars), which can support 76 regional jobs (Table 2). In terms of direct impact, the potential PHS station is estimated to have an annual direct spending impact of \$33.3 million,⁸ while employing 50 permanent workers. An additional indirect impact of \$2.0 million and 12 jobs will benefit other Southwest Virginia businesses that support the station operation. The number of jobs created due to the induced impact amounts to 14, with associated annual spending of \$1.6 million per year.⁹

⁶ The definition of cumulative jobs is the sum of annual jobs during the development and construction phase. For example, if one person works on the project for the entire 11 years, the cumulative jobs will be 11.

⁷ Source: Dominion Energy.

⁸ The direct spending figure is representative of the gross sales of the generating station estimated by the IMPLAN Pro model. The model treats the facility as a stand-alone business. As a result, the \$33.3 million includes spending on labor, materials, equipment, capital depreciation, and profits.

⁹ The indirect and induced jobs include both full-time and part-time jobs in those industries.

Table 2: Annual Impact of Station Operation in Southwest Virginia (2028 Onward)

	Direct	Indirect	Induced	Total
Spending (\$Million)	\$33.3	\$2.0	\$1.6	\$36.9
Employment	50	12	14	76

Source: IMPLAN Pro 2015, Dominion Energy, and Chmura Economics & Analytics

Economic Impact in Virginia

One-time Economic Impact of Capital Expenditure

The economic impact of the potential PHS station in Virginia is larger than the impact in Southwest Virginia, because many Virginia businesses outside the region can also benefit from Dominion Energy's capital expenditure on the station. For example, while 20% of construction labor comes from Southwest Virginia, 25% will be hired within the state. Similarly, while no equipment is likely to be purchased in Southwest Virginia, 5% is estimated to be purchased in Virginia.

Table 3 summarizes the one-time economic impact of Dominion Energy's capital expenditure on the station in Virginia. It is estimated that development and construction of the potential PHS station will inject \$52.4 million into Virginia's economy and support 271 jobs per year from 2017 to 2027. Of the total impact, the annual average direct impact is estimated to be \$30.6 million which can support 149 jobs in the state. The annual average indirect impact is estimated to be \$9.1 million which can support 48 jobs, while the annual average induced impact is estimated to be \$12.7 million which can support 74 jobs in the state.

Table 3: One-time Economic Impact of Capital Expenditure in Virginia

		Direct	Indirect	Induced	Total
Cumulative Total (2017-2027)	Spending (\$Million)	\$336.7	\$100.3	\$139.3	\$576.3
	Employment	1,644	523	812	2,980
Annual Average (2017-2027)	Spending (\$Million)	\$30.6	\$9.1	\$12.7	\$52.4
	Employment	149	48	74	271

Note: Impacts are measured in the year when they occur. Numbers may not sum due to rounding

Source: IMPLAN Pro 2015, Dominion Energy, and Chmura Economics & Analytics

Ongoing Economic Impact of Station Operation

The statewide total economic impact (direct, indirect, and induced) of the ongoing operation of the PHS station is estimated to be \$38.6 million (in 2028 dollars), which would support 86 jobs per year in the state (Table 4). The direct impact for the state is the same as that for Southwest Virginia: \$33.3 million in spending and 50 permanent employees. The indirect impact for the state is estimated to total \$3.3 million

and 19 jobs for businesses that support the plant operation. The induced impact will support 17 jobs with associated annual spending of \$2.0 million per year.¹⁰

Table 4: Annual Impact of Station Operation in Virginia (2028 Onward)

	Direct	Indirect	Induced	Total
Spending (\$Million)	\$33.3	\$3.3	\$2.0	\$38.6
Employment	50	19	17	86

Source: IMPLAN Pro 2015, Dominion Energy, and Chmura Economics & Analytics

Tax Revenue for Local and State Governments

The potential PHS station will also bring in tax revenue for local and state governments. In order to be conservative, only tax revenue from the direct impact is estimated in this section.¹¹

Tax Revenue for Southwest Virginia Local Governments

Most localities in Southwest Virginia, with the exception of the City of Norton, do not have a business, professional, and occupational license (BPOL) tax. When businesses in Norton are involved in the development and construction of the project, the city government can benefit from BPOL tax revenue. It is estimated that during the development and construction phase, the city can collect an estimated total of \$38,785 in tax revenue from Dominion Energy's capital expenditure from 2017 to 2027, averaging \$3,526 per year.

Table 5: Tax Revenue for Local Governments in Southwest Virginia

Development and Construction		
Cumulative (2017-2027)	BPOL	\$38,785
Annual Average (2017-2027)	BPOL	\$3,526
Ongoing Operation		
Annual 2028 Onward	Property	\$12,063,600

Source: Chmura Economics & Analytics

After the new power station is in operation, the government for the locality where the station is situated can receive property tax on the structure and equipment at the facility. Since the exact location of the station is unknown, Chmura applies a general property tax rate of \$0.60 per \$100 assessed value in this analysis, which reflects the average tax rate of the region.¹² In addition, it is assumed that the assessed property value is 90% of the total capital expenditure.¹³ As a result, after the station is in operation, the

¹⁰ The statewide indirect and induced impacts include those impacts in Southwest Virginia.

¹¹ This approach is recommended by Burchell and Listokin in *The Fiscal Impact Handbook*.

¹² Source: Dominion Energy.

¹³ Ibid.

annual property tax for regional governments is estimated to be approximately \$12.1 million (in 2028 dollars).

Tax Revenue for the State Government

During the development and construction phase of the potential PHS station, the state government is expected to receive individual income and corporate income taxes from businesses involved in the project. The cumulative state tax revenue is estimated to be \$7.7 million from 2017 to 2027, averaging \$703,648 per year.

Table 6: Tax Revenue for the State Government

Development and Construction		
Cumulative Total (2017-2027)	Individual Income	\$6,516,687
	Corporate Income	\$1,223,446
	Total Tax	\$7,740,133
Annual Average (2017-2027)	Total Tax	\$703,648
Ongoing Operation		
Annual 2028 Onward	Individual Income	\$257,102

Source: Chmura Economics & Analytics

After the power plant is in operation, the Virginia government is estimated to receive \$257,102 (in 2028 dollars) per year in individual income tax, based on the estimated total payroll of the PHS station employees. The estimated state tax revenue does not include Dominion Energy's corporate income tax.

Appendix: Impact Analysis Glossary

IMPLAN Professional—an economic impact assessment modeling system. It allows the user to build economic models to estimate the impacts of economic changes in states, counties, or communities. It was created in the 1970s by the Forestry Service and is widely used by economists to estimate the impact of specific events on the overall economy.

Input-Output Analysis—an examination of business-business and business-consumer economic relationships capturing all monetary transactions in a given period, allowing one to calculate the effects of a change in an economic activity on the entire economy (impact analysis).

Direct Impact—economic activity generated by a project or operation. For construction, this represents activity of the contractor; for operations, this represents activity by tenants of the property.

Overhead—construction inputs not provided by the contractor.

Indirect Impact—secondary economic activity that is generated by a project or operation. An example might be a new office building generating demand for parking garages.

Induced (Household) Impact—economic activity generated by household income resulting from direct and indirect impacts.

Ripple Effect—the sum of induced and indirect impacts. In some projects, it is more appropriate to report ripple effects than indirect and induced impacts separately.

Multiplier—the cumulative impacts of a unit change in economic activity on the entire economy.