AppalachianVoices

Save Energy, Grow Jobs in the Tennessee Valley

How investments in renewable and efficient resources could bring thousands of jobs to the TVA region.

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Executive Summary

With the Tennessee Valley Authority's (TVA) plans to close its remaining coal plants by 2035, this is a moment of potentially enormous change in the Valley's energy system. The goal of this study is to understand how investments in energy efficiency — a key resource that has been undervalued by TVA — can bolster jobs growth across the TVA footprint while reducing energy demand. Energy efficiency is often the lowest-cost resource available to utilities and in addition to creating jobs, it improves grid reliability, reduces utility operation costs, improves comfort, and often lowers cost for building users, putting money back in the pockets of Tennessee Valley residents and businesses. Importantly, residential energy efficiency programs are among the best practices to reduce energy burden for low-income communities. This study also examines how energy efficiency could be deployed alongside renewable energy sources and battery storage as Clean Energy Portfolios that could create jobs and replace capacity from the Cumberland Fossil Plant that is scheduled to ramp down beginning in 2026 and fully close by 2033.

This combined analysis of energy efficiency job creation potential and application to replace capacity at the Cumberland Fossil Plant demonstrates the importance of energy efficiency and renewable energy in resource planning for the TVA region. We provide multiple pathways whereby efficient, reliable, and renewable energy resources can be implemented to create jobs while potentially lowering energy bills and attracting business and economic development in the Tennessee Valley.

Key findings:

We offer an analysis of the jobs and energy savings outputs that would result from moderate to substantial investments in energy efficiency across the TVA footprint between 2022 and 2035 based on two scenarios where TVA achieves a 1 percent annual reduction in electricity sales compared to prior year sales through energy efficiency investments as well as a 3 percent scenario. For both scenarios our model calculates the annual and cumulative electricity savings by sector (residential, commercial and industrial), the annual investment required to achieve those savings for each sector, and the number of net direct, indirect, and induced jobs created on an annual basis as a result of those investments.[1]

As shown in Table ES-1, if TVA committed to either a 1 percent or 3 percent annual reduction in electricity sales from energy efficiency investments through 2035, a substantial amount of energy savings could be achieved, reducing costs for customers while also potentially avoiding the need for a significant amount of new generation. In the 1 percent scenario, sales in 2025 would be four percent lower than in 2021, and 13 percent lower by 2035. In the 3 percent scenario sales would be 11 and 35 percent lower in 2025 and 2035, respectively.[2]

Table ES-1: Cumulative electricity savings from a 1 percent and 3 percent energy efficiency target

	2025		2035	
	1% target	3% target	1% target	3% target
Cumulative MWh saved	5,742,262	16,716,041	19,127,401	50,591,450
Percent of 2021 sales	4%	11%	13%	35%

Achieving both the 1 percent and 3 percent scenarios would require a substantial amount of investment, much of which would benefit the local workforce. To calculate the value of the annual and total energy efficiency investment by sector, this study relied on comprehensive research conducted by the Lawrence Berkeley National Laboratory (LBNL), which has produced nationwide averages for program administrator and customer costs, per kilowatt-hour saved, from utility residential, commercial, and industrial energy efficiency programs.[3] As detailed in Table ES-2, the amount of investment required to achieve a 1 percent annual savings would be approximately $70.8 million in 2022, dropping to $62.1 million by 2035 (as "prior year sales" declines due to prior year energy efficiency investments), for an annual average of $66.4 million over the modeling period. Under the 3 percent scenario, investment in 2022 would total $212.4 million, dropping to $142.9 million in 2035, for an annual average of $175.5 million. Total investment over the modeling period would be $929.1 million for the 1 percent scenario, and nearly $2.5 billion for the 3 percent scenario.

Table ES-2: Annual investment required in select years for a 1 percent and 3 percent energy efficiency scenario (in million dollars)

	2022	2025	2030	2035	14-year average	14-year total
1% target	$70.8	$68.7	$65.3	$62.1	$66.4	$929.1
3% target	$212.4	$193.8	$166.4	$142.9	$175.5	$2,457.5

To evaluate the macroeconomic impacts of the policies and investments studied in this analysis, we used the IMPLAN model. IMPLAN is an input-output (I/O) model available at multiple regional scales. For our analysis, we created a region consisting of the states in which TVA has a substantial presence: Tennessee, Alabama, Georgia, Kentucky, and Mississippi. Our analysis and results treat the region as a single entity, and we report our results in terms of impacts on the region as a whole. All job impact values presented in this report are specific to the region and represent annual full-time equivalent jobs.

Using IMPLAN, we find that energy efficiency investments that achieve either a 1 percent or 3 percent annual electricity savings would create and/or support thousands of jobs between 2022 and 2035. Taking both the positive jobs impacts (direct implementation investments and expenditure of customer savings on lower bills) and the negative impacts (program costs and utility revenue losses) together, a 1 percent scenario would create or support an average of 1,816 net annual direct jobs over the 14-year modeling period, while a 3 percent scenario would create an average of 4,993 net direct jobs. Total jobs created and/or supported would amount to 5,419 and 14,939, respectively.

Table ES-3: Comparison of net direct, indirect and induced annual jobs resulting from a 1 percent and 3 percent annual energy savings target at TVA

	2022		2035		14-year average	
	1% scenario	3% scenario	1% scenario	3% scenario	1% scenario	3% scenario
Direct	389	1,168	3,186	8,380	1,816	4,993
Indirect	179	538	1,636	4,310	922	2,539
Induced	293	879	4,975	13,187	2,681	7,407
Total	**862**	**2,585**	**9,798**	**25,877**	**5,419**	**14,939**

In 2022, TVA released a Draft Environmental Impact Statement for replacing the Cumberland Fossil Plant for public review and comment. TVA's Draft Environmental Impact Statement includes three alternatives the utility is considering and shows its preferred option for replacing Cumberland is Alternative A, a 1,450 MW combined cycle fracked-gas plant with 32 miles of new pipeline. TVA did not generate any job estimates for its Alternative C, which is the only clean energy alternative studied by TVA with 3,000 MW of utility-scale solar and 1,700 MW of battery storage.

In this analysis, Appalachian Voices compared the jobs outputs of three Clean Energy Portfolios not considered by TVA to TVA's Alternative A and C. Each of the Clean Energy Portfolios studied include a unique mix of resources including energy efficiency, solar and battery storage and other clean energy options, each of which provide a reasonable alternative to TVA's preferred approach for replacing the generation from TVA's Cumberland Fossil Plant. These Clean Energy Portfolios were modeled and provided to Appalachian Voices by the Southern Alliance for Clean Energy, the Rocky Mountain Institute (RMI), and the Sierra Club.

The summary results of our job impacts analysis are provided in Table ES-4 below. The three Clean Energy Portfolio alternatives could create and/or support an average of 4,489 direct short-term jobs and 739 long-term jobs, which is 4.5 times more short-term direct jobs and 20 to 30 times more long-term jobs than what TVA has estimated for the gas combined cycle plant and associated pipeline in its preferred Alternative A. In total, including indirect and induced impacts, the Clean Energy Portfolios would create and/or support an average of more than 8,500 short-term jobs and nearly 1,400 long-term jobs. TVA does not provide estimates of indirect and induced job impacts from the proposed Alternative A.

For purposes of comparison, we applied the same methodology used to calculate job impacts of the three Clean Energy Portfolios to estimate the potential job impact of TVA's Alternative C. As shown in the table, Alternative C would produce 6,957 direct short-term jobs and 1,146 direct long-term jobs, and nearly 13,000 total short-term and 2,125 total long-term jobs. While this represents a much greater impact than TVA's preferred Alternative A and is more than any of the three Clean Energy Portfolios, there is concern that the amount of battery storage included in Alternative C is excessive and unnecessary. Thus, the job impacts of Alternative C are likely to be inflated. Regardless, it is clear that Alternative C would have a far greater employment effect than Alternative A.

Table ES-4: Jobs impact of three Clean Energy Portfolio (CEP) alternatives as compared to TVA Alternatives A and C

	SACE	RMI	Sierra	CEP Average	TVA Alt. A	TVA Alt. C
Direct jobs						
Short-term	4,642	5,117	3,708	**4,489**	1,000	6,957
Long-term	850	758	610	**739**	25-35	1,146
Total jobs						
Short-term	8,814	9,863	6,921	**8,533**	n/a	12,979
Long-term	1,602	1,439	1,150	**1,397**	n/a	2,125

We demonstrate how modest, but sustained energy efficiency investments can bolster local economies across the TVA footprint and create long-term jobs. TVA should give serious consideration to how investments in energy efficiency could reduce overall electricity demand and the need for additional gas resources, even while supporting the expansion of building electrification and electric vehicle use in the region. Further, the Clean Energy Portfolio scenarios we have analyzed show how energy efficiency resources can be deployed alongside renewable energy sources and battery storage to replace capacity from the Cumberland Fossil Plant, while also creating a significant number of both short- and long-term jobs in the process.

While our report anticipates net significant job creation that could result from energy efficiency, renewable energy, and energy storage in the region, we are also concerned about job quality, security, and access to new positions that could potentially be created. If TVA invests in EE, we urge TVA to ensure that all positions are high-quality jobs that offer family-supporting wages and benefits and create robust partnerships and targets to improve workforce diversity. The local employment effects of changes in generation at existing fossil plant sites also require greater study and attention. Labor, community, and workforce development partners working across the TVA region must be at the table in resource planning.

Prioritizing clean energy resources can meet TVA's needs while creating jobs, potentially lowering energy bills and reducing energy burden for residents and businesses, attracting investment, advancing economic development in the Tennessee Valley, and achieving a central pillar of TVA's mission to steward the region's land and water.

In light of these findings, Appalachian Voices recommends the following:

1. TVA should set a minimum energy savings target of **1 percent reduction in energy sales per year from now until 2035** and invest in robust energy efficiency programs to reach that goal.
2. TVA should partner with building and construction trades unions, TVA Diversity Alliance Program members, community colleges, local and regional economic development agencies, workforce training agencies, and other existing community organizations offering energy bill assistance or working in energy efficiency and renewable energy across the Tennessee Valley to design and implement energy efficiency programs that serve low-income households and create high-quality career pathways.
3. TVA's next Integrated Resource Plan should thoroughly examine the ability of energy efficiency and demand response to reduce the amount of replacement generation needed at its closing coal plants and to maximize the beneficial employment and economic development impact on the Tennessee Valley region as a whole.
4. TVA should conduct a full environmental review under the National Environmental Policy Act at Cumberland and other closing coal plants by including robust and diversified Clean Energy Portfolio alternatives with complete socio-economic impacts.
5. TVA should select a Clean Energy Portfolio alternative for replacing the capacity at the Cumberland Fossil Plant to maximize jobs benefits to the Tennessee Valley region and meet federal goals for climate, equity, and clean energy.

Background

The Tennessee Valley Authority (TVA) produces electricity for more than 10 million people and businesses in Tennessee and parts of six surrounding states.[4] When TVA was established as a public corporation in 1933, it was tasked with a clear mandate to support the public good by providing affordable "electricity for all" to advance social and economic development while also stewarding the Valley's environmental assets.[5]

Today, TVA employs more than 10,000 annual workers as well as thousands of contract workers each year. Approximately 60 percent of TVA employees are represented by unions who advocate for their members' safety and ensure that members receive adequate compensation and benefits for their work.[6] These workers manage an energy portfolio that generates 57 percent of TVA's energy production from low- to no-carbon energy sources like hydro, solar, and nuclear.[7]

TVA still has more work to do to address environmental injustice linked to pollution from fossil plants and to mitigate the effects of climate change, which is already causing concern in the region as changing precipitation patterns exacerbate extreme weather events. Also, despite its commitment to serve the public good, TVA has yet to develop a strategy to reach federal targets of a 100 percent carbon-emission free power sector by 2035.[8]

TVA did announce that it would close its four remaining coal plants by 2035. Unfortunately, TVA plans to build fracked gas plants to replace that generation. According to a study by the Sierra Club, TVA's plans to build 4,950 MW of new gas capacity would be the second largest gas buildout of any utility in the country, just behind Duke Energy.[9] Meanwhile, surges in natural gas prices led TVA to increase its Fuel Cost Adjustment charges in 2022, leading to increased rates for residential customers served by TVA's local power companies (LPCs).[10]

A Draft Environmental Impact Statement (DEIS) for replacement capacity for the largest coal-fired power plant in its fleet, the Cumberland Fossil Plant, was released in 2022. In the DEIS, three alternatives A, B, and C were considered. Alternatives A and B incorporate fracked gas — a greenhouse gas emitting fossil fuel. TVA's own analysis of its preferred Alternative A showed that a combined cycle gas plant and pipeline would create only 1,000 temporary construction jobs and just 25-35 permanent jobs for the

Cumberland Fossil Plant, Cumberland City, Tennessee. Photo credit: Gabi Lichtenstein

Cumberland City area.[11] TVA failed to consider energy efficiency (EE) resources, or provide jobs impacts for the solar and storage option, Alternative C. This analysis fills a crucial gap in asking how energy efficiency and renewable energy resources could meet these generation needs and create jobs in the Tennessee Valley.

The Valley Stands to Gain from Energy Efficiency and Renewables

Photo Credit: JM Davidson

The Tennessee Valley stands to gain from low- or no-carbon investment. For instance, General Motors, Jack Daniels, and Facebook have signed long-term procurement agreements to purchase solar and solar+storage energy from TVA. Between 2018 and 2021, TVA's Green Invest program has garnered more than $2.7 billion in solar investment to build 2,100 MW in the TVA footprint.[12] TVA also helped to negotiate Ford Motor Company's $5.6 billion investment in Blue Oval City in Haywood County, TN — the largest investment in state history — to build an electric vehicle manufacturing plant that aspires to be powered with 100 percent renewable energy and will provide close to 6,000 full time jobs to the area.[13] However, *the benefits of clean energy should not be restricted to large purchasers who are able to negotiate with their utility.*

TVA was an early leader in solar and energy conservation programs and made the Southeast region a leader in heat pump installation.[14] Since 2014, investment in these programs has declined and TVA has eliminated all efficiency rebate programs after 2018. Home Energy Uplift, which provides whole home retrofit for low-income customers, is the only program TVA continues to fund.[15] This program has outstanding benefits, registering annual customer savings of $350 a year on household energy bills, which is a substantial savings for low- and fixed-income households. However, the total budget was only $11 million in 2020.[16] In 2021, the Tennessee Department of Conservation Office of Energy Programs provided an additional $1.25 million in grant funding to EPB of Chattanooga, Knoxville Utilities Board, Memphis Light, Gas, and Water, and Nashville Electric Service, contributing to 137 home renovations.[17]

TVA requires local power companies and other community partners to provide matching funds for Home Uplift, presenting a barrier to participation for smaller, rural communities and LPCs.[18] This program provides a vitally important service, and yet, the funding amount and model is inadequate to serve the utility's four million residential customers, including hundreds of thousands of low-income households.[19] TVA should work with community partners, local governments, and LPCs to ensure participation of low-income households in EE programs and provide funding, insurance, technical expertise, and other services to encourage diverse and small business participation.

Energy Efficiency Means Jobs and Savings

EE jobs cannot be outsourced and are among the largest sources of energy sector jobs in the Tennessee Valley.[20] The need for continual upgrades to buildings, appliances, and heating and cooling systems as building practices and technology improves means EE can also be a continual source of employment with sustained investment from utilities and coordinated program design. TVA has signaled a commitment to expand EE investment to help customers save a total of $200 million on their energy bills,[21] yet provided little information about what this investment will look like. Customers and advocates across the region have long urged TVA to restore EE programs to grow jobs, reduce carbon emissions and energy waste, and make utility bills more affordable. In 2021, local environmental organizations and labor groups issued a joint letter to support more EE investments at TVA in preparation for the Biden Administration transition.[22]

EE is an important resource for utilities given that energy saved reduces demand that would otherwise have to be met through additional generation. EE is often the lowest-cost resource available to a utility that improves grid reliability and reduces operation costs while also generating added benefits.[23] EE improves comfort and lowers cost for building users. Importantly, residential energy efficiency programs are among the best practices to reduce energy burden, the ratio of household income spent on energy costs, for low-income communities.[24] Tennessee Valley residents suffer from some of the highest energy burdens in the country, which are particularly severe for low-income and rural residents and communities of color.[25]

Utilities across the U.S. have implemented robust energy efficiency programs that provide reliable savings and generate benefits for customers while reducing needed investment in generation. TVA could bring similar programs to the Tennessee Valley.[26] However, In their fourth annual study of Energy Efficiency in the Southeast, the Southern Alliance for Clean Energy finds that TVA continues to fall behind the Southeast just as the Southeast falls behind the rest of the country on EE. In comparison to neighboring investor-owned utilities in the Southeast — including Duke Energy, Dominion, Southern Company, and NextEra — TVA achieved among the least amount of efficiency savings as percentage of prior year retail sales in 2019 and 2020, attaining a savings of only 0.02 percent and 0.06 percent, respectively.[27] As a result, Tennessee, Alabama, Mississippi, and Kentucky — where a significant number of counties are served by TVA — have among the lowest energy efficiency savings and program spending in the U.S.[28]

Clean Energy is a Reliable and Cost-Effective Replacement for the Cumberland Fossil Plant

Energy efficiency is only one part of a sustainable, carbon-free energy mix that TVA could implement. In the second half of this report, we consider how TVA could invest in EE alongside a range of renewable energy resources to replace capacity from the Cumberland Fossil Plant that TVA intends to close in the coming years. The DEIS released in 2022 includes three alternatives that TVA is currently considering for replacing capacity at the Cumberland Fossil Plant. TVA's preferred option is Alternative A, a 1,450 MW combined cycle fracked-gas plant at the Cumberland site with 32 miles of new pipeline. Alternative B includes simple cycle combustion turbine gas plants at two alternate locations. The only carbon-free option studied by TVA is Alternative C, which includes 3,000 MW of utility-scale solar and 1,700 MW of battery storage. This option omits many cost-effective renewable resources that would ensure reliability and flexibility in addition to addressing environmental concerns and creating jobs.

In this analysis Appalachian Voices compared the jobs outputs of three Clean Energy Portfolios (CEPs) not considered by TVA to TVA's Alternative A and C. These three CEP scenarios were provided by the Southern Alliance for Clean Energy (SACE), the Rocky Mountain Institute (RMI), and the Sierra Club. Each of the three CEPs include a unique mix of resources including EE, solar, wind, battery storage, and other clean energy options, which together provide a reasonable alternative to TVA's preferred approach for replacing capacity at Cumberland. Additionally, two of the portfolios (RMI and the Sierra Club) represent cost-effective portfolios that are less expensive than the cost of a new gas combined cycle plant, especially if that plant also requires the construction of a new 32-mile pipeline, as proposed in TVA's preferred Alternative A.

TVA has also not publicly provided details about a transition plan for workers at the Cumberland Plant whose jobs will be disrupted as a result of the changes at the site. As of June 2021, there were 265 people employed at the Cumberland Plant in addition to many contract workers who have regular work in TVA's Cumberland City facilities. This analysis is focused on the employment impacts of new energy capacity. A complete analysis of the current Cumberland Plant workforce is outside the scope of the report. We would urge TVA to work with affected workers and their representatives in the TVA Trades and Labor Council and any other unions whose members are affected by these changes to devise a transition plan to provide workers with a pathway to new employment or retirement. TVA should also work with local governments to ensure new investment in the community where possible to replace any difference in payment-in-lieu-of-taxes, which could include building renewable generation on site and/or working to attract new businesses to the location.

Clean Energy Jobs Must Offer Family-Supporting Wages and Benefits and Job Security

This report details enormous potential growth in renewable energy and energy efficiency jobs in the Tennessee Valley that could result from TVA's investment decisions. However, ensuring that these positions are high-quality jobs that offer family supporting wages and benefits requires that TVA partner with building and construction trades unions, TVA Diversity Alliance Program members,[29] community and technical colleges, local and regional economic development agencies, workforce training agencies, and other existing community organizations offering energy bill assistance or working in energy efficiency and renewable energy across the Tennessee Valley. These organizations have been working on the ground for years and often in partnership with TVA to train workers in green construction, implement energy efficiency programs, and ensure high-quality career pathways.

TVA offers competitive wages and benefits and is a driver of economic development in the region, especially in rural communities. The closure of fossil plants will have a significant impact on workers and the communities where they live and work because these are good jobs. Across the U.S., jobs in the energy sector offer higher wages than the median wage. However, fossil fuel positions remain better paid than renewable energy positions, and workers are more likely to be represented by a union.[30] TVA must take EE and RE program design seriously to create high-quality jobs that offer family-supporting wages and benefits and ensure opportunities for women and people of color historically under-represented in the energy sector, and currently under-represented in TVA's workforce relative to the population of the TVA region.[31] Workers and their representatives should be at the table in discussions that will result in major job changes. The current model of TVA contracting through power purchase agreements for renewable energy does not guarantee that the collectively bargained wages, benefits, and conditions negotiated for trades and labor work will apply.[32] Rather than procuring labor for projects in a piecemeal fashion or hiring contractors with no job security or benefits,[33] TVA should work with labor and community partners to ensure that the negotiated wage rates are available on utility efficiency and renewable projects. TVA can also follow the lead of other utilities to provide funding, technical expertise, and other services to encourage diverse and small business participation in EE and RE programs.

There are many examples of successful programs in the Tennessee Valley that are already established to support workers accessing careers in the energy sector at multiple scales, including programs that also aim to increase diversity in the workforce. TVA could further build on these initiatives with local power companies and ensure employment for trainees by committing to consistent and sustained investment in EE and a diversified CEP.

Photo Credit: green|spaces

The **Greenspaces Build it Green** program prepares young adults for careers in construction and energy service through 6-12 month paid training programs that combine technical training in weatherization and sustainability with other industry certifications and wrap-around services. Participants work with other nonprofits and community members and organizations in Chattanooga to implement home improvements. The program was modeled in part on SEEED's work in Knoxville.

East Tennessee Apprenticeship Readiness Program (ETARP) uses the Multi-Craft Core Curriculum and a recruitment process designed through partnerships with labor unions, construction contractors, local government, and non-profit workforce development agencies to introduce new entrants to the construction field to the building and construction trades. Participants receive a stipend to cover transportation costs and are connected to apprenticeship programs that provide paid, on-the-job training with the Knoxville Oak Ridge Building and Construction Trades upon graduation.

Socially Equal Energy Efficient Development (SEEED) works to provide pathways out of poverty from its base in Knoxville's Morningside neighborhood through career readiness training, environmental education, and community engagement. SEEED has trained and employed young people to implement energy efficiency programs that reduce energy use and lower utility bills. Participants in SEEED's green construction program also completed the organization's first solar home in 2022. SEEED plans to build ten solar homes in the next three years to provide opportunities for families to build generational wealth through homeownership.

Music City Construction Careers provides pathways to construction careers through a robust, debt-free training program that also uses the Multi-Craft Core Curriculum, combining training in workplace safety, construction skills — including green construction — diversity, sexual harassment prevention, and financial literacy skills among others with wrap-around services such as mentorship and career placement support, interview coaching, resume and test preparation, and case management. This program is designed to serve women, people of color, transitioning veterans, and other Nashvillians historically underserved by workforce development programs.

We now turn to our quantitative analysis of the employment impacts associated with expanding EE investment and implementing a CEP to replace the Cumberland Fossil Plant.

Methodology

To evaluate the macroeconomic impacts of the policies and investments examined in this analysis, we used the IMPLAN model. IMPLAN is an input-output (I/O) model available at multiple regional scales. For this analysis, we created a region consisting of the states in which TVA has a substantial presence: Alabama, Georgia, Kentucky, Mississippi, and Tennessee. Our analysis and results treat the region as a single entity, and we report our results in terms of impacts on the region as a whole. All changes in jobs are specific to this region. The geographic distribution of jobs within the region would depend on resource allocation, program design, and LPC participation.

IMPLAN assesses the relationships between the various sectors of the economy, as well as household and government institutions, using the linkages between them to determine the impacts of changes in any one of them. Input-output analyses generally begin with a change in final demand for a commodity, or an increase in output from a specific industry which creates ripple effects through the entire economy as a result of supply chain purchases and payments to labor and other factors of production. All job impact values presented in this report represent full-time equivalent (FTE) jobs.[34]

It is important to note that like most input-output models, IMPLAN is static, in the sense that it relies on the economic structure of an economy and its interrelations as they exist in a particular year. IMPLAN makes no attempt to project how those interrelationships might change over time. For this analysis, we used the 2019 model, avoiding 2020 data which are likely to be highly specific to conditions under the COVID-19 pandemic, and the resulting economic upheaval. 2020 data is likely to be a less accurate representation of the economy over the long run, and data for 2021 is not yet available. Our model thus represents what the impacts on the regional economy would be if the economy remained similar to what it was in 2019. This is obviously a simplification as the economy is likely to change over time, and it represents a shortcoming common to input-output analyses. However, we feel the timeframe is sufficiently short and the economic data sufficiently robust to provide meaningful results at a level of regional aggregation not available in other, more dynamic, modeling platforms.

Energy Efficiency Analysis

To model the impacts on energy efficiency investments, we began by modeling two future scenarios to calculate the annual energy savings that would be achieved through increasing EE investments for the years 2022 through 2035. The first scenario envisions new EE investments achieving an annual 1 percent reduction in energy demand compared to prior year retail sales, while the second envisions a 3 percent annual reduction. The baseline year used was 2021 but reflects 2020 data reported by TVA to the federal Energy Information Administration.[35] Annual energy saved was then calculated for each year from 2022 to 2035 based on either the 1 percent or 3 percent reduction from prior year sales. Because the job impacts per million dollars of those investments will vary depending on whether the investments are made in the residential, commercial, or industrial sector, the energy savings calculation was applied individually to these three sectors.

To calculate the value of the annual and total energy efficiency investment by sector, this study relied on comprehensive research conducted by the Lawrence Berkeley National Laboratory (LBNL), which has produced nationwide averages for program administrator and customer costs, per kilowatt-hour saved, from utility residential, commercial, and industrial energy efficiency programs. Modeling the total job impacts from such investments required using the total of those two values, as reflected in Table 1 below.

Table 1: Cost of utility energy efficiency programs per kilowatt-hour saved, by sector[36]

Sector/Cost	Program admin	Customer	Total
Residential	$0.022	$0.017	$0.039
Commercial	$0.027	$0.028	$0.055
Industrial	$0.027	$0.028	$0.055

Note: Commercial and industrial values are the same as a result of utilities typically combining these two sectors in their programming and associated reporting.

For the purposes of generating more accurate job impacts, the annual values for residential energy efficiency investment were disaggregated by specific building improvements and lighting and appliance upgrades. This was made possible through the use of reported averages for specific improvements from the Knoxville Extreme Energy Makeover, Knoxville Weatherization Assistance Program, and Knoxville Operation Round-Up programs.[37] Table 2 details the percent of total investment for specific improvements resulting from these three programs combined.

Table 2: Percent of residential program investment for specific improvements and upgrades

Air sealing	Insulation	HVAC repair/seal	Hot water replace	Windows & doors	Other appliances
4%	18%	17%	41%	9%	8%

We then incorporated our sector-specific annual investment values into IMPLAN to build a model of the TVA region. Within IMPLAN we modeled four main vectors of economic activity and traced their impacts throughout the region. We call these four vectors **implementation**, **gross savings**, **consumer costs**, and **utility losses**.

Implementation represents the gross impacts of purchases of materials and the labor required to install them. The gross savings vector represents the gross impacts of reduced energy costs for energy consumers. The consumer costs vector represents the costs of the efficiency measures paid both by participants as well as non-participants through the rate base. The utility losses vector represents the reduced revenue for utilities (and generators) resulting from increased efficiency. Taken together these four vectors represent the net impact on final demand in the economy, as applied to purchases of the relevant commodities and output by the relevant industrial sectors. IMPLAN uses these final demand calculations to determine the overall impact on the regional economy, taking into account issues such as regional production and imports and exports.

We modeled each of these four vectors for residential, consumer, and industrial efficiency programs, each with two separate efficiency targets (1% and 3% annual reductions) for a total of 24 separate impact analyses. We modeled the impacts of efficiency investments over the 14-year window from 2022-2035.

IMPLAN also captures three levels of cascading economic impact beginning with the **direct effects** that come from changes in employment and spending. In our model, these are the benefits from initial energy efficiency or renewable energy investment and the costs of energy savings that lead to lost revenue for the utility over time as less electricity is demanded for the same processes. The industries that might be directly impacted include energy generation and construction. These investments spur ripple effects due to linkages with other industries and processes in the supply chain. In this study, we report these as **indirect effects** of changes in the energy portfolio. This captures shifts in demand for supplies like fuel, solar panels, or caulk, which stem from the initial change in energy investment.

Finally, it is important to consider the multiplier effects that shifting the balance of energy resources has for the wider economy. Energy is connected to every part of our daily lives at home and work. Our study reports the **induced effects** of a changing energy portfolio in industries not directly related to the initial investment as the income and spending of households, employees, and businesses change. Some of these effects are negative as certain areas witness changes in localized investment. On net, we see that the primary effects for both employment and economic output are positive as customers might be able to save on their bills each month to spend on other things.

Cumberland Analysis

The analysis for replacing the Cumberland fossil plant with any of three selected CEP portfolios is focused on the job implications of installing a wide range of clean energy and energy efficiency measures to offset the electricity supply represented by the closing of the

Cumberland plant. It does not attempt to assess the broader economic impacts of energy savings, the benefits of reduced pollution, or other impacts associated with a shift away from Cumberland electricity generation to renewable and efficiency resources. Rather, it looks only at the economic impacts of installing wind, solar, and energy efficiency resources. The energy resource mixes were compiled by our partners at SACE, RMI, and the Sierra Club. The SACE scenario was based on research compiled for their 2021 report, *Achieving 100% Clean Electricity in the Southeast: Enacting a Federal Clean Electricity Standard*.[38] The RMI and Sierra Club portfolios were produced using RMI's Clean Energy Portfolios Model,[39] which was also used to generate cost estimates for all three Clean Energy Portfolios.

For that analysis we begin by using the inputs for capacity and associated cost provided by SACE, RMI, and the Sierra Club as detailed in Tables 11 and 12 in the next section and incorporating the cost values for each selected energy resource into IMPLAN to generate results for the number of direct, indirect, and induced jobs per million dollars of investment for that resource. These values are disaggregated into capital expenditures (CapEx) and operational expenditures (OpEx) for the purpose of calculating short- and long-term job impacts, respectively, in Table 14 and 15.

Portfolios we analyzed include:

1. A 4,740 megawatt (MW) CEP portfolio modeled and provided to Appalachian Voices by the Southern Alliance for Clean Energy (SACE) that reflects a diverse resource mix including energy efficiency, winter demand response, solar distributed energy resources, onshore wind, midwest wind, utility-scale solar, and four-hour battery storage.
2. A 3,194 MW CEP portfolio modeled and provided to Appalachian Voices by the Rocky Mountain Institute (RMI) that was produced using RMI's Clean Energy Portfolios Model (CEPM) and includes energy efficiency, utility-scale solar, and both one-hour and two-hour battery storage.
3. A 3,302 MW Sierra Club portfolio, also produced using RMI's CEPM, that includes energy efficiency, winter demand response, midwest wind, utility-scale solar, and one-hour and two-hour battery storage.[40]

Given that our report focuses strictly on the net job creation benefits of CEP alternatives, we do not conclude or assert that any of the above portfolios is preferred in any way in comparison to the other two, whether based on cost, resources included in the respective portfolios, or job impacts. Each of the three portfolios was provided to us as a reasonable portfolio serving as a sufficient replacement of the capacity and energy generation of the Cumberland coal plant. Again, the RMI and Sierra Club portfolios were each presented as serving as a lower-cost alternative to TVA's preferred Alternative A.

Results of the TVA Energy Efficiency Analysis

Overview

As described, the purpose of the region-wide analysis is to estimate the number of direct, indirect, and induced jobs that would be created or sustained on an annual basis by utility and utility-supported customer investments in residential, commercial, and industrial energy efficiency in the TVA footprint under two scenarios: (1) an annual energy efficiency target of 1 percent of prior-year retail sales, and (2) an annual target of 3 percent of prior year retail sales. The time period of analysis runs from 2022 through 2035, to coincide with President Biden's goal of 100 percent carbon-free energy nationwide by 2035.

The analysis consists of three steps for each of the two scenarios: (1) estimate the annual energy savings required to achieve the target, for each sector; (2) Use LBNL's total cost of saved energy values for each sector to generate sector-specific annual energy efficiency investments; and, (3) input those investment models into IMPLAN to generate the estimated annual direct, indirect, and induced job impacts that would result.

Energy Savings

The baseline (2021) value for retail electricity sales from TVA is 145,727,929 megawatt-hours (MWh). As shown in Table 3, an annual target of 1 percent electricity savings below prior year retail sales would save nearly 1.4 million MWh, on average from 2022 through 2035. The residential sector would account for, and benefit from, approximately 40 percent of those annual savings, followed by the commercial sector at 32 percent and the industrial sector at 28 percent. Over the 14-year period, total electricity savings would amount to more than 19.1 million MWh.

Table 3: Annual electricity savings in select years from a 1% energy efficiency target (in MWh)

1% savings per year	2022	2025	2030	2035	14-year average
Residential	585,063	567,686	513,405	513,405	548,514
Commercial	471,179	457,184	413,469	441,744	441,744
Industrial	401,038	389,127	351,919	375,985	375,985
Total	**1,457,279**	**1,413,997**	**1,344,697**	**1,278,793**	**1,366,243**

Table 4 shows the annual savings in select years that would be achieved with an annual target of 3 percent electricity savings below prior year retail sales. This scenario would achieve an average annual savings of more than 3.6 million MWh. The percent of total savings by sector would be the same as for the 1 percent scenario. Over the 14-year period, total electricity savings would amount to nearly 50.6 million MWh.

Table 4: Annual electricity savings in select years from a 3% energy efficiency target (in MWh)

3% savings per year	2022	2025	2030	2035	14-year average
Residential	1,755,188	1,601,913	1,375,617	1,181,289	1,450,804
Commercial	1,413,536	1,290,096	1,107,850	951,348	1,168,401
Industrial	1,203,113	1,098,049	942,932	809,728	994,470
Total	**4,371,838**	**3,990,058**	**3,426,399**	**2,942,365**	**3,613,675**

Annual Energy Efficiency Investments

To generate an annual total utility and customer investment value required to achieve the 1 percent and 3 percent annual savings goals we multiplied the annual energy savings for each sector by the total cost of saved energy (for each sector) as reported by LBNL and provided in Table 1.

The results for total annual energy efficiency investments for the 1 percent scenario are provided in Table 5. As shown, this scenario would require an average annual investment of approximately $66.4 million dollars, with 32 percent of that investment being in the residential sector, 37 percent in the commercial sector and 31 percent in the industrial sector. Over the 14-year period total investment would amount to nearly $930 million.

Table 5: Annual energy efficiency investment in select years to achieve a 1 percent energy efficiency target (in million dollars)

Sector/year	2022	2025	2030	2035	14-year average
Residential	$22.8	$22.1	$21.0	$20.0	$21.4
Commercial	$25.9	$25.1	$23.9	$22.7	$24.3
Industrial	$22.1	$21.4	$20.4	$19.4	$20.7
Total	**$70.8**	**$68.7**	**$65.3**	**$62.1**	**$66.4**

The results for total annual energy efficiency investments for the 3 percent scenario are provided in Table 6. As shown, this scenario would require an average annual investment of approximately $175.5 million dollars, again with 32 percent of that investment being in the residential sector, 37 percent in the commercial sector and 31 percent in the industrial sector. Over the 14-year period total investment would amount to nearly $2.5 billion.

Table 6: Annual energy efficiency investment in select years to achieve a 3 percent energy efficiency target (in million dollars)

Sector/year	2022	2025	2030	2035	14-year average
Residential	$68.5	$62.5	$53.6	$46.1	$56.6
Commercial	$77.7	$71.0	$60.9	$52.3	$64.3
Industrial	$66.2	$60.4	$51.9	$44.5	$54.7
Total	**$212.4**	**$193.8**	**$166.4**	**$142.9**	**$175.5**

Job Creation

As explained in the Methodology section, to generate an estimate for the number of direct, indirect and induced jobs that would result from the 1 percent and 3 percent energy efficiency scenarios, we input annual investment values for the residential, commercial and industrial sector into IMPLAN. For the residential sector, the investment input was broken out by specific improvements and upgrades to generate a more accurate jobs impact. Sufficient data were not available from utility reports to do the same for the commercial and industrial sectors.

The methodology section also defines direct, indirect, and induced effects in terms of jobs. However there is another layer underlying the results for job impacts. Energy efficiency investments create jobs in two ways: (1) through the **implementation** of the efficiency improvements, and (2) through the **expenditure of savings** on electric bills as a result of the efficiency improvements. Jobs are also lost in two ways: (1) through higher rates that create **customer costs** because utilities charge ratepayers for the efficiency programs, which offsets a portion of the bill savings from the efficiency improvements, and (2) as a result of **utility losses** in revenue due to decreased electricity sales, which could ultimately lead to reduced payrolls at those utilities. However, as the tables below show, our analysis found that the net impact on jobs from both of the efficiency scenarios is strongly positive.

Table 7 details the results of the jobs analysis for **direct jobs**, and serves as an example of how the four aspects of job impacts explained above (implementation, etc) serve to produce a net annual jobs impact. As shown in the table, the **implementation** of energy efficiency measures creates and/or supports an average of 333 annual direct jobs over the 14-year modeling period, while the expenditure of **gross bill savings** realized from the efficiency improvements results in an average of 2,355 new annual jobs. Those bill savings are offset by the cost of the efficiency measures for customers (**customer cost**), expressed through increased rates, which amounts to an average annual job "loss" of 186 jobs, while **lost utility revenue** results in an average annual loss of 686 jobs.

Overall, efficiency investments that achieve an annual 1percent reduction in electricity sales would produce a net average annual gain of 1,816 direct jobs from 2022 through 2035. In 2035 the net gain would amount to 3,186 direct jobs.

Table 7: Calculation of net impact on direct jobs created/supported by energy efficiency investments (using the 1% scenario as an example)

Direct Jobs	2022	2025	2030	2035	14-year average
Implementation	355	345	328	312	333
Gross savings	328	1,292	2,835	4,302	2,355
Customer costs	(198)	(192)	(183)	(174)	(186)
Utility costs	(96)	(376)	(826)	(1,254)	(686)
Total job gains	683	1,636	3,163	4,614	2,688
Total job losses	(294)	(569)	(1,009)	(1,428)	(872)
Net jobs impact	**389**	**1,068**	**2,153**	**3,186**	**1,816**

As shown in Table 8, this net impact is much greater when indirect and induced effects are included. The net impact on the combination of direct, indirect and induced jobs would be 862 net jobs gained in 2022, rising to 9,798 jobs for the year 2035, for an average annual net gain of 5,419 total jobs over the modeling period.

Table 8: Annual net jobs produced (total of direct, indirect and induced jobs) from achieving a 1% energy savings target from 2022 through 2035

Total Jobs	2022	2025	2030	2035	14-year average
Implementation	686	666	633	602	643
Gross savings	1,033	4,070	8,933	13,557	7,421
Customer costs	(563)	(546)	(519)	(494)	(528)
Utility costs	(295)	(1,161)	(2,548)	(3,868)	(2,117)
Total job gains	1,719	4,736	9,566	14,159	8,064
Total job losses	(857)	(1,707)	(3,068)	(4,361)	(2,645)
Net jobs impact	**862**	**3,029**	**6,498**	**9,798**	**5,419**

With a more aggressive target of 3 percent annual savings below prior year retail sales the job impacts would be much greater. As shown in Table 9, a 3 percent annual target would result in a net jobs impact of 2,585 jobs in 2022 and 25,877 jobs in 2035, for an average annual net impact of 14,939 jobs created or supported over the 14-year modeling period.

Table 9: Annual net jobs produced (total of direct, indirect and induced jobs) from achieving a 3 percent energy savings target from 2022 through 2035

Total Jobs	2022	2025	2030	2035	14-year average
Implementation	2,058	1,879	1,613	1,385	1,701
Gross savings	3,099	11,848	24,765	35,857	20,473
Customer costs	(1,688)	(1,541)	(1,323)	(1,136)	(1,395)
Utility costs	(844)	(3,380)	(7,065)	(10,230)	(5,841)
Total job gains	5,157	13,726	26,378	37,243	22,175
Total job losses	(2,572)	(4,921)	(8,388)	(11,366)	(7,236)
Net jobs impact	**2,585**	**8,806**	**17,990**	**25,877**	**14,939**

Finally, Table 10 details the number of net jobs created or supported by energy efficiency investments would nearly triple under the 3 percent scenario compared to the 1 percent scenario. Additionally, the largest category of jobs created in 2035 and on average over the modeling period would be induced jobs — those jobs resulting from people and businesses spending their energy savings on other goods and services. This is to be expected since the savings accumulate over time whereas direct efficiency investments decline. However, the direct jobs (implementation labor) and indirect jobs (jobs resulting from the purchase of products and appliances for implementation) combined represent approximately half of the net jobs created in 2035 and on average over the modeling period.

Table 10: Comparison of net direct, indirect and induced annual jobs resulting from a 1 percent and 3 percent annual energy savings target

	2022		2035		14-year average	
	1% scenario	3% scenario	1% scenario	3% scenario	1% scenario	3% scenario
Direct	389	1,168	3,186	8,380	1,816	4,993
Indirect	179	538	1,636	4,310	922	2,539
Induced	293	879	4,975	13,187	2,681	7,407
Total	**862**	**2,585**	**9,798**	**25,877**	**5,419**	**14,939**

It is important to note that the jobs created or supported from energy efficiency investments in any given year are specific to that year only. So for instance, because the annual energy savings and thus the annual investments decline each year from 2022 through 2035 — as a result of "prior year sales" declining due to efficiency improvements — the number of jobs created/supported by the implementation of energy efficiency measures thereby also declines. This is because a job a person has retrofitting a home or business is a one-time job, and further investments are required to sustain EE jobs in subsequent years.

On the other hand, jobs created or supported because people are saving money on their electric bills are sustained over time because those savings are realized every year, and as cumulative savings increase, so do the jobs resulting from the expenditure of those savings. Similarly, jobs lost because the utility is losing revenue are also sustained as cumulative electricity savings increases and annual utility revenue continues to decrease. However, overall, the number of net annual jobs resulting from both a 1 percent and 3 percent annual savings scenario increases over time even as annual savings and investment values decline.

Analytical Results for Three Alternative Clean Energy Portfolios

Overview of Three Clean Energy Portfolio Alternative Resource Mixes

In response to TVA's failure to examine the economic impacts of clean energy alternatives to its fracked gas alternatives, Appalachian Voices has produced an analysis and comparison of the jobs outputs of three CEPs as well as TVA's Alternative C. Unlike Alternative C, the three CEPs each include a unique mix of resources including EE, solar, battery storage, and other clean energy options, which together provide a reliable and cost-effective alternative for replacing the generation from the Cumberland Fossil Plant. Resource and capacity details for the three CEP portfolios are shown in Table 11.

Table 11: Resource mix for three Clean Energy Portfolio alternatives

	SACE	RMI	Sierra
Energy efficiency	550	854	676
Winter demand response	90	-	71
DER solar	1,450	-	-
Onshore wind	600	-	-
Midwest wind	140	-	475
Utility-scale solar	1,550	2,060	1,142
Battery storage	360	280	668
Porfolio total (MW)	**4,740**	**3,194**	**3,032**

The costs for each of these three portfolios is detailed in Table 12, with costs for energy efficiency broken out into residential, commercial and industrial sectors based on the cost calculation that we developed above.

Table 12 details the net present value (NPV) cost (investment) required to achieve each of the three CEP alternatives. Again, both the RMI and Sierra Club CEP portfolios were developed in a manner that resulted in a resource mix that is sufficient for replacing the energy generated by the Cumberland coal plant while also being cost competitive with a new gas combined cycle plant.

Table 12: Estimated cost of three Clean Energy Portfolio alternatives

	SACE	RMI	Sierra	CEP Average
NPV Cost (million $)	$2,142.1	$1,878.8	$1,640.1	$1,887.0

A detailed breakdown of the cost for individual resources is provided in Table 13, and those detailed costs are used as the inputs for modeling job impacts.

Table 13: Detailed cost calculations for three Clean Energy Portfolio alternatives (million $)

Resource	SACE	RMI	Sierra
Energy efficiency			
---Residential	$124.7	$51.3	$49.6
---Commercial	$141.3	$252.4	$98.8
---Industrial	$120.4	$190.6	$0.0
Winter DR	$26.2	$0.0	$12.3
DER Solar	$0.0	$0.0	$0.0
Onshore wind	$537.4	$0.0	$0.0
Midwest wind	$134.3	$0.0	$455.6
Utility-scale solar	$839.4	$1,115.6	$618.4
Storage	$218.3	$269.0	$405.4
Total	**$2,142.1**	**$1,878.8**	**$1,640.1**

Analytical Results for Job Impacts

As noted previously, to calculate the jobs that would be created for each of the three CEPs we input the cost values into IMPLAN, which produced results for direct, indirect, and induced jobs. However, we also calculate which of those jobs are direct short-term (e.g. construction) jobs and long-term (e.g. operations and maintenance) jobs, as well as which of the indirect and induced jobs are created and/or supported by short-term and long-term activities associated with the build-out of the resources within each portfolio. Short-term jobs are assumed to be those created/supported as a result of capital expenditures (CapEx), while long-term jobs are assumed to be those created/supported as a result of operations and maintenance expenditures (OpEx).

As an example, Table 14 details the CapEx cost for each resource within the SACE portfolio and the resulting direct, indirect and induced jobs. We treat those job impacts as short-term jobs. As shown, the SACE CEP portfolio would create and/or support 4,642 direct and 8,814 total short-term jobs. We were not able to model the employment changes associated with winter demand response given that this is about managing appliance usage and not directly linked to manufacturing or installation labor.

Table 14: Short-term job impacts of SACE's Clean Energy Plan portfolio

Resource	Capacity	CapEx ($M)	Direct	Indirect	Induced	Total Jobs
Energy efficiency	550					
---Residential	177	$124.7	576	131	326	1,034
---Commercial	201	$141.3	504	122	379	1,006
---Industrial	171	$120.4	546	328	264	1,138
Winter DR	90	$26.2	n/a	n/a	n/a	n/a
DER Solar	1,450	*	*	*	*	*
Onshore wind	600	$386.1	488	148	268	904
Midwest wind	140	$92.0	122	37	67	226
Utility-scale solar	1,550	$615.3	1,565	544	863	2,972
Storage	360	$218.3	840	317	378	1,536
Total	**4,740**	**$1,706.4**	**4,642**	**1,627**	**2,545**	**8,814**

**data was not sufficient to provide calculation*

Table 15 details the OpEx cost and job impacts of the SACE CEP portfolio, and we treat these jobs as long-term jobs. As shown, the SACE CEP would create/support 850 direct and 1,602 total long-term jobs.

Table 15: Long-term job impacts of SACE's Clean Energy Plan portfolio

Resource	Capacity	OpEx ($M)	Direct	Indirect	Induced	Total Jobs
Energy efficiency	550					
---Residential	177	$0.0	-	-	-	-
---Commercial	201	$0.0	-	-	-	-
---Industrial	171	$0.0	-	-	-	-
Winter DR	90	$0.0	n/a	n/a	n/a	n/a
DER Solar	1,450	*	*	*	*	*
Onshore wind	600	$169.3	224	68	123	416
Midwest wind	140	$42.3	56	17	31	104
Utility-scale solar	1,550	$224.1	570	198	314	1,082
Storage	360	$0.0	-	-	-	-
Total	**4,740**	**$435.7**	**850**	**283**	**468**	**1,602**

**data was not sufficient to provide calculation*

We reproduced this detailed analysis for each of the other two CEP portfolio alternatives as well as TVA Alternative C. The summary results of our job impacts analysis are provided in Table 16 below. As shown in the table the three CEP alternatives would create and/or support an average of 4,489 direct short-term FTE jobs and 739 long-term FTE jobs, which is 4.5 times more short-term direct jobs and 20 to 30 times more long-term jobs than what TVA has estimated for the NGCC plant and associated pipeline in its preferred Alternative A.

In total, including indirect and induced impacts, the CEP alternatives would create and/or support an average of more than 8,500 short-term FTE jobs and nearly 1,400 long-term FTE jobs. TVA does not provide estimates of indirect and induced job impacts from the proposed Alternative A.

It is notable that TVA did not generate any job estimates for its Alternative C in its DEIS. For purposes of comparison we applied the same methodology used to calculate job impacts of the three CEPs to estimate the potential job impacts of Alternative C. As shown in Table 16, Alternative C would produce 6,957 direct short-term jobs and 1,146 direct long-term jobs. When accounting for indirect and induced jobs, the total jobs impact could be nearly 13,000 total short-term and 2,125 total long-term jobs. While this represents a much greater impact than TVA's preferred Alternative A and is more than any of the three CEP portfolios, there is concern that the amount of battery storage included in Alternative C is extremely excessive and unnecessary. Thus, the job impacts of Alternative C are likely to be inflated. Regardless, it is clear that Alternative C would have a far greater economic impact than Alternative A and TVA could have easily calculated what that potential impact might be.

Table 16: Short- and long-term jobs impact of three Clean Energy Portfolio alternatives as compared to TVA Alternatives A and C

	SACE	RMI	Sierra	CEP Average	TVA Alt. A	TVA Alt. C
Direct jobs						
Short-term	4,642	5,117	3,708	**4,489**	1,000	6,957
Long-term	850	758	610	**739**	25-35	1,146
Total jobs						
Short-term	8,814	9,863	6,921	**8,533**	n/a	12,979
Long-term	1,602	1,439	1,150	**1,397**	n/a	2,125

Conclusion

This study evaluates the job creation potential from two EE scenarios that demonstrate how energy efficiency could bring enormous savings to the region. It also illustrates how three CEP scenarios utilizing renewable energy and battery storage resources can be deployed to replace capacity from the Cumberland Fossil Plant. These different scenarios would each create a significant number of both short- and long-term jobs through sustained investment in clean energy in line with the mandates of the Biden Administration. We understand TVA's commitment to fracked gas in Alternatives A and B to be a missed opportunity and an inappropriate and short-sighted use of customer funding. At least two of the three CEP scenarios detailed here are cost competitive with a new gas combined cycle plant and represent critical investments in a clean energy future. While a comprehensive assessment of the socio-economic, environmental, and climate impacts of a CEP are outside the scope of this analysis, we demonstrate net job creation across the region as a result of a CEP scenario including EE.

Achieving these outcomes that ensure a just transition for Tennessee Valley residents means that clean energy should receive equal and adequate consideration from TVA, but that was not done in the DEIS. A job creation analysis was missing from the only clean energy alternative provided (Alternative C) and low-cost resources, including EE were not included.

Based on findings from a comprehensive analysis, Appalachian Voices recommends that:

1. TVA should set a minimum energy savings target of **1 percent reduction in energy sales per year from now until 2035** and invest in robust energy efficiency programs to reach that goal.
2. TVA should partner with building and construction trades unions, TVA Diversity Alliance Program members, community colleges, local and regional economic development agencies, workforce training agencies, and other existing community organizations offering energy bill assistance or working in energy efficiency and renewable energy across the Tennessee Valley to design and implement energy efficiency programs that serve low-income households and create high-quality career pathways.
3. TVA's next Integrated Resource Plan should thoroughly examine the ability of energy efficiency and demand response to reduce the amount of replacement generation needed at its closing coal plants and to maximize the beneficial employment and economic development impact on the Tennessee Valley region as a whole.
4. TVA should conduct a full environmental review under the National Environmental Policy Act at Cumberland and other closing coal plants by including robust and diversified Clean Energy Portfolio alternatives with complete socio-economic impacts.
5. TVA should select a Clean Energy Portfolio alternative for replacing the capacity at the Cumberland Fossil Plant to maximize jobs benefits to the Tennessee Valley region and meet federal goals for climate, equity, and clean energy.

Prioritizing clean energy resources can meet TVA's generation needs to ensure reliable and cost-effective electricity supply. EE and a CEP have the added benefits of creating jobs, potentially lowering energy bills and reducing energy burden for residents and businesses, attracting investment, advancing economic development in the Tennessee Valley, and achieving a central pillar of TVA's mission to steward the region's land and water.

Endnotes

1 See the Methodology section for more detail on the calculation of net job impacts and the different positive and negative job effects included in that calculation.

2 "Energy Efficiency Jobs In America 2021" (E2 and E4theFuture, October 2021), https://e2.org/reports/energy-efficiency-jobs-in-america-2021/; Gina Coplon-Newfield, David Keyser, and Hannah Schanzer, "Energy Employment by State 2022: United States Energy & Employment Report" (Washington, D.C.: U.S. Department of Energy's Office of Policy, Office of Energy Jobs, June 2022), 295, https://www.energy.gov/sites/default/files/2022-06/USEER%202022%20State%20Report_0.pdf

3 American Council for an Energy-Efficient Economy, "Energy Efficiency as a Resource," 2022, https://www.aceee.org/topic/ee-as-a-utility-resource.

4 The Sierra Club model used for our jobs analysis is unpublished. However the Sierra Club has given Appalachian Voices approval to use its model results to calculate the job impacts from investing in the CEP resources detailed in Table 3.

5 Pat Bernard Ezzell, "Public Power Transforms Real Lives," TVA, accessed May 20, 2022, https:/www.tva.com/about-tva/our-history/public-power-transforms-real-lives

6 TVA, "Diversity, Equity, Inclusion and Accessibility Report FY 2021," 14, accessed May 20, 2022, https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/careers/diversity-inclusion/diversity-equity-inclusion-accessibility-report-fy-2021.pdf?sfvrsn=33eaea35_9

7 In total, this system comprises 5 fossil plants, 3 nuclear plants, 29 hydro plants, 1 pumped storage hydroelectric plant, 17 gas plants, 1 diesel generator station, 14 solar energy sites, 1 wind energy site as well as purchase power agreements for gas, lignite, small diesel, wind, landfill gas, hydroelectric, utility-scale solar and small solar programs contracted through different renewable procurement programs. For a complete list and map see: "Our Power System," TVA, 2020, https://www.tva.com/energy/our-power-system; TVA, "Built for the People," 2020, https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/annual-report/fy20-tva-fact-sheet.pdf?sfvrsn=13c43164_6

8 TVA has already reduced emissions 57% below 2005 levels through increased utilization of nuclear and closure of fossil plants. It currently plans further reductions to 70% below 2005 levels by 2030, and 80% by 2035. For more see: TVA, "Leadership & Innovation on a Path to Net-Zero: TVA and the Energy System of the Future," 2021, 27, https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/environment/carbon-report.pdf?sfvrsn=4971bcca_2
On the federal targets for carbon emission reductions, see: "FACT SHEET: President Biden Signs Executive Order Catalyzing America's Clean Energy Economy Through Federal Sustainability," The White House, December 8, 2021, https://www.whitehouse.gov/briefing-room/statements-releases/2021/12/08/fact-sheet-president-biden-signs-executive-order-catalyzing-americas-clean-energy-economy-through-federal-sustainability/

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10 Dave Flessner, "TVA Increasing Electric Rates in Chattanooga Due to Soaring Natural Gas Prices," Chattanooga Times Free Press, May 12, 2022, https://www.timesfreepress.com/news/business/aroundregion/story/2022/may/12/soaring-natural-gas-prices-increase-tva-electric-rates/568850/ ; Darby McCarthy, "TVA Charges Will Rise with Gas Prices," WTVF, June 11, 2022, https://www.newschannel5.com/news/tva-charges-will-rise-as-natural-gas-prices-increase

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