# EMPLOYMENT AFTER COAL

## Creating New Jobs in Eastern Kentucky

LABOR NETWORK FOR SUSTAINABILITY

Synapse Energy Economics, Inc.

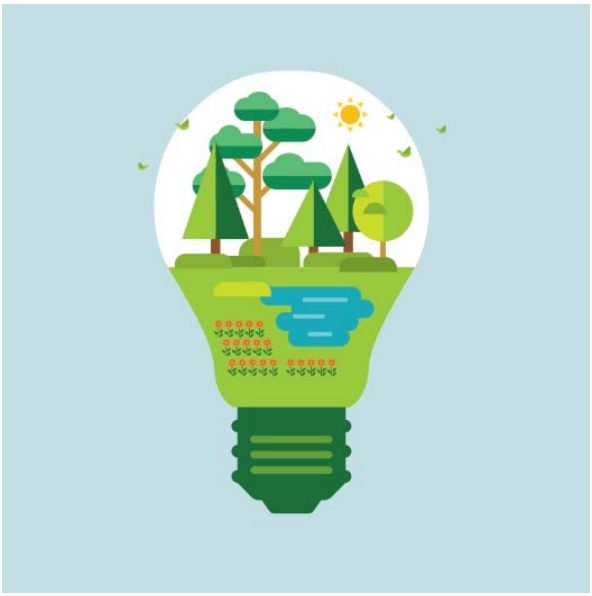
# Contents



*The core of this report was prepared for MACED[1] by Dr. Frank Ackerman and Tyler Comings at Synapse Energy Economics.[2] The introduction, conclusion and boxes were written by Labor Network for Sustainability.[3]*

[1] MACED: The Mountain Association for Community Economic Development (http://www.maced.org/index.html ) partners with local people to build upon the strengths of Kentucky and Central Appalachia to create economic alternatives and strive to make Appalachian communities better places to live.
[2] Synapse Energy Economics (http://www.synapse-energy.com) is a research and consulting firm specializing in energy, economic, and environmental topics. Since its inception in 1996, Synapse has grown to become a leader in providing rigorous analysis of the electric power sector for public interest and governmental clients.
[3] The Labor Network for Sustainability (http://www.labor4sustainabilty.org ) was founded in 2009 based on an understanding that long-term sustainability cannot be achieved without environmental protection, economic fairness, and social justice. LNS believes we all need to be able to make a living on a living planet.

# INTRODUCTION



In 2015, The Labor Network for Sustainability released its "Clean Energy Future" report showing that the US could reduce its greenhouse gas emissions 80% by 2050 – and increase jobs and save money in the process.[4] It showed this will benefit the US economy, US workers, and US consumers. But some areas and some industries may be economically threatened by the transition from fossil fuels to clean energy. While the number of jobs created by the clean energy transition is likely to be as much as ten times the number eliminated, that is little comfort to the workers and communities it may harm.

Eastern Kentucky in the Appalachian coal belt is a case in point. Long a center of coal mining and a stronghold of the United Mineworkers of America, the region has been economically devastated by the shift of the coal industry to Wyoming and other western states; the falling cost of natural gas and other competing fuels; the exhaustion of accessible coal deposits; and the growing opposition to the negative health and environmental effects of mining, transporting, and burning coal. In 2013 the 54 counties of Appalachian Kentucky had only 8,614 remaining coal miners, and the remaining coal jobs were expected to steadily diminish over the coming years. Eastern Kentucky had 50,953 unemployed workers, many of them formerly coal miners. Its unemployment rate was 10.3% compared to 7.4% for the country as a whole.

Is there anything the hard-hit workers of Eastern Kentucky can do to provide an alternative to its dying coal industry? This report, "Employment After coal: Creating new jobs in Eastern Kentucky," answers with a resounding yes. Produced by economist Dr. Frank Ackerman of Synapse Energy Economics for the Labor Network for Sustainability, it develops a plan that will replace half of Eastern Kentucky's remaining coal jobs and bring its unemployment rate down to the national average by 2030.

When economists analyze developing countries, they often identify three potential sources of job growth. First is "import substitution," in which jobs are created by doing work locally instead of buying products abroad. Second is "export promotion," in which jobs are created by producing goods and services that are sold abroad. Third is "foreign aid," in which assistance from outside helps create jobs in the country. To identify the potential for new jobs, Dr. Ackerman applied a similar approach to Eastern Kentucky. He identified two "import substitution" sectors, three "export" sectors, and one "foreign aid" sector and estimated the potential for growth in each.

The first "import substitution" measure is to stop buying so much electricity from outside the region by expanding energy efficiency measures, with the creation of 1220 jobs and with a net saving of more than

[4] Labor Network for Sustainability, "The Clean Energy Future: Protecting the Climate, Creating Jobs, and Saving Money" http://www.labor4sustainability.org/wp-content/uploads/2015/10/cleanenergy_10212015_main.pdf

$100 million by 2030 to residential consumers. The second is to create an estimated 2,681 jobs by growing locally some of the food that is currently imported from outside the region. The third is to create 4,733 jobs by expanding medical facilities so that residents won't have to leave the region so often for healthcare.

An obvious "export" opportunity is to use Eastern Kentucky's abundant forests to expand jobs in logging, sawmills, and other wood products occupations. The report proposes such an expansion on a scale that will not conflict with sustainable forest growth, producing 7,706 jobs. Another is to create 7,904 jobs by attracting tourists. "Eco-tourism" and "agri-tourism" would be particularly compatible with plans to sustainably develop the region's forests and farms.

Finally, remediating the environmental damage done by the coal industry is a national responsibility. Some funding has already come into Eastern Kentucky for this purpose, and more would result from the Power Plus plan in the Obama administrations 2016 budget. Expansion of such "foreign aid" would create at least 426 jobs in Eastern Kentucky.

Together the proposals for these six sectors would produce 24,671 jobs in Appalachian Kentucky by 2030. That's more than enough to replace half of current jobs in coal mining and to reduce the unemployment rate to the national average.

# 1. ARE THERE JOBS AFTER COAL?

The steep, ongoing decline of coal mining has caused the loss of 30,000 coal jobs in eastern Kentucky in the last 30 years.[5] Trends in energy markets and public policy make it clear that a coal-based economy is not coming back. A successful response to this crisis, replacing the lost kingdom of coal with a sustainable, community-controlled economy, is crucial to the hopes for forward-looking economic development in the region.

The issue reverberates far beyond the coalfields, as the national search for clean energy alternatives confronts impassioned claims about the need to protect coal mining jobs. In Kentucky and in the nation, a common but misleading frame on the debate suggests that there is no alternative, that "real" jobs can only be created by traditional industries, even if they are environmentally damaging.

In fact, the narrow, coal-centered vision of "real" jobs is fading away, and discussion of newer, cleaner alternatives is already underway. Community organizations such as the Mountain Association for Community Economic Development (MACED) and Kentuckians for the Commonwealth (KFTC) have sponsored grassroots job creation initiatives, and have identified key sectors where employment growth should be possible. Both MACED and KFTC advocate for a Just Transition, a bigger picture that combines existing initiatives into a single vision of a working economy, mapping the sustainable occupations and industries that will fill the void left by coal.

Our analysis describes a new pattern of employment that Appalachian Kentucky could aspire to reach by 2030. It is a more challenging and longer-term goal than is usually found in immediate grass-roots campaigns. At the same time, it is more limited, detailed and practical than a grand statement of ultimate objectives. It occupies an intermediate level of abstraction, a mid-range strategic vision of what the regional economy could look like in ten to twenty years.

## a. Industries and targets

How many jobs are needed? In 2013 Appalachian Kentucky had 50,953 unemployed workers and 8,614 coal miners. (All of our data and calculations are for the 54 counties of Appalachian Kentucky, as defined by the Appalachian Regional Commission.) The large number of people out of work results from the long-

[5] Calculated from *Kentucky Coal Facts*, 15th edition (2015), http://energy.ky.gov/Coal%20Facts%20Library/Kentucky%20Coal%20Facts%20-%2015th%20Edition%20%282015%29.pdf

term decline in coal mining jobs, combined with limited growth of other employment in the region. The unemployment rate in 2013 was 10.3% for the region, compared to 8.3% for all of Kentucky and 7.4% for the country as a whole.[6] To create a robust regional economy by 2030, many of the coal miners and currently unemployed workers will need new jobs. Our target for new job creation is summarized in Table 1-1.

For coal miners, we assume that from now to 2030, employment will continue to decline but will not vanish. Specifically, we assume the loss of half of 2013 employment, or 4,307 coal mining jobs by 2030. As explained below, coal mining creates an average of a little more than one additional job in the region for every miner; thus a total of 9,088 new jobs will be needed to replace the loss of half of the region's jobs related to mining.

To bring Appalachian Kentucky down to the unemployment rate of the United States as a whole, 14,382 new jobs would have been needed in 2013, enough to absorb more than one-fourth of total regional unemployment. That number of additional jobs would not have eliminated joblessness in 2013, but would have allowed eastern Kentucky to catch up with the partial recovery of nationwide employment following the 2008-2009 economic crisis.

| | 2013<br>Coal Jobs & Jobless Workers | 2030<br>Replacement Jobs Target |
|---|---|---|
| Coal Mining (Direct Employment) | 8,614 | 4,307 |
| Coal Mining (Total Impact on Region) | 18,176 | 9,088 |
| Unemployed Workers | 50,953 | 14,382 |
| **Total** | **69,129** | **23,470** |

Table 1-1. Mining jobs and unemployment in Appalachian Kentucky: 2013 actual data and 2030 replacement targets

Notes: Total is sum of last two lines. Total jobs impact of coal mining is based on data in Table 3-1 below, which imply that total job creation due to coal mining is 2.11 times the number of direct jobs in mining. Replacement jobs target is 50% of (total) coal jobs plus reduction of regional unemployment to match the national unemployment rate in 2013.

As Table 1-1 shows, the combined replacement target is 23,470 new jobs in the region by 2030. Past work by MACED has identified six areas as having potential for sustainable job growth:

- Energy efficiency
- Local food production
- Health care
- Sustainable forestry and wood products
- Tourism

[6] Unemployment in Appalachian Kentucky is reported by the Appalachian Regional Commission (ARC); see http://www.arc.gov/reports/custom_report.asp?REPORT_ID=30. The number of coal miners in "Kentucky (East)" is reported by the Energy Information Administration; see Table 18 in http://www.eia.gov/coal/annual/

- Environmental remediation

These are far from being the only opportunities for job creation in the region. Renewable energy production, affordable housing, arts and culture, elder care and child care, and infrastructure improvements, among others, could also be areas of job growth that would address urgent social needs. Our analysis narrows the field by focusing on areas that have emerged as priorities in MACED's organizing and reports, where there is an obvious potential or immediate need for increased employment.
In each of the six areas, we have developed scenarios for growth, based on the regional potential for expansion and the estimated costs and potential of each industry. For technical calculations we have relied on IMPLAN, a well-known model which is widely used to project employment impacts of policies and expenditures.

## A just transition for coal miners

The principle that workers should be compensated for the adverse effects of public policies was recognized in the Trade Act of 1974 and subsequent programs for "trade adjustment assistance," which provides compensatory benefits to working people who lose their jobs as a result of U.S. trade policies. The eligibility requirements, benefits, and administration of trade adjustment programs, however, have been inadequate to provide displaced workers with a new start in life.

Indeed, transition assistance in the past has often meant little more than an economic hospice for working people and communities suffering from the side effects of globalization. Without a clear program to protect working people from the effects of climate protection policies such as phasing out of the use of coal, the struggle for clean energy can all too easily come to be perceived as a struggle against American workers.

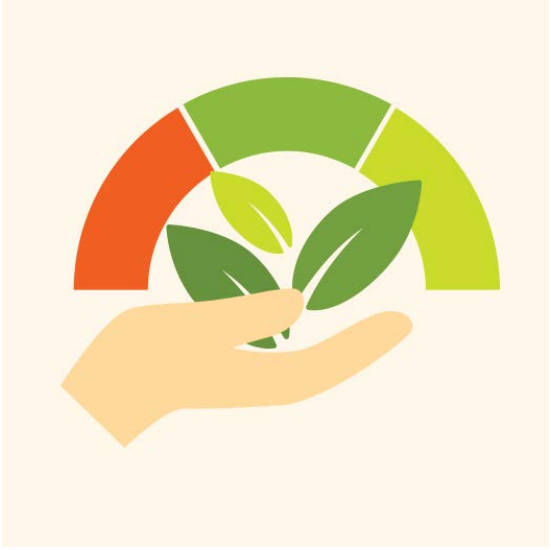
A program similar to, but better than trade adjustment assistance can be developed for workers affected by energy-transition policies. Specifically, people who lose their jobs because of transition to a climate-safe economy should be eligible for:

- Full wages and benefits for at least three years.
- Up to four years of education or training, including tuition and living expenses.
- Decent pensions with healthcare for those ready to retire.

Such a program, despite differences in details, would in many ways resemble the "GI Bill of Rights" that provided education and training, loan guarantees for homes, farms, and businesses, and unemployment pay for veterans returning from war. The program was first established in 1944 for returning veterans of World War II and has been revamped repeatedly since. It was critical for the economic boom that followed World War II and for the ability of returning veterans to integrate back into American society. A similar program is needed today for those who, like Appalachian Kentucky's coal miners, are displaced from their jobs through no fault of their own.

The opportunity for individuals to access higher education and advanced training will also mesh with the need to develop new labor-force capabilities for the emerging "new power" economy.

## b. Three paths to economic development



If Appalachian Kentucky was a developing country, what advice would it get about economic development? In order to create more jobs, someone has to spend more money in the region. Broadly speaking, there are three ways to accomplish this. One is what economists have called import substitution: local enterprises can sell more to the region's households and businesses, replacing purchases from outside. Another is export promotion: local enterprises can sell more to customers outside the region. A third option is analogous to foreign aid: outside agencies can spend more money in the region.[7] Each of these strategies makes an appearance in our analysis.

Energy efficiency measures are a form of import substitution. When a household spends more on better insulation and less on electricity or heat, more of their spending stays in the region, paying the workers who install the insulation. When energy efficiency saves money for households, they will typically spend the savings on other consumer goods and services, creating additional local jobs.

Spending more on local food and less on food from outside has a similar effect. At present, eastern Kentucky grows very little of what it eats; local food production can create jobs in agriculture and food processing. In health care, likewise, a significant fraction of the region's spending currently flows to outside medical experts and facilities. Expansion of local health care options could create more jobs in the region, as well as improving access to medical care.

Sustainable forestry and wood product industries represent export sectors, aimed largely at selling local products outside the region. Tourism is another export industry that could bring outside spending to eastern Kentucky, potentially including eco-tourism based on forests, parks and mountains, and agri-tourism activities such as farm stays, petting zoos, horse riding, and other farm-based recreation. (Local food production could eventually become another export sector, selling food to nearby urban areas.)

Finally, remediation of environmental damages at abandoned coal mine sites is comparable to foreign aid. National and state-level decisions determine how much money is available for remediation, and how much of that will be spent in eastern Kentucky. The region has no shortage of appropriate sites for remediation efforts. Other arguments, as well, could be made for aid from outside to promote economic development in the region.

None of these approaches alone is sufficient. A successful strategy for employment after coal will have to make use of all the paths to economic development. The next section provides a more detailed

[7] Yet another option, recruitment of retirees to the region, is analogous to immigration. Retirees bring new funds (their retirement incomes and assets) to the region, and spend money on local goods and services. While potentially important to the region, this option is not included in our analysis.

description of the six sectors in which we have analyzed the potential for job growth.

# 2. SIX DIRECTIONS FOR JOB CREATION

## a. Energy efficiency

Throughout the country, energy efficiency is frequently a cost-effective method for reducing energy consumption. Measures as simple as installing more efficient light bulbs and better insulation can pay for themselves quickly, reducing energy bills and leaving more money available for everything else. As an added bonus, installing efficiency measures creates more local employment than spending the same amount on electricity.

### Energy Efficiency for Eastern Kentucky Homes and Businesses

Five rural utility cooperatives in Eastern Kentucky are teaming up with Mountain Association for Community Economic Development (MACED) to provide energy retrofits as part of utility service under the KY Energy Retrofit Rider. The program, called How$martKY, addresses the primary barrier households and small businesses face when they want to save energy and save money – finding the upfront cash to pay for improvements such as insulation, air-sealing and HVAC upgrades.[8]

The program is not a loan or a subsidy, but an extension of the utility services that households or businesses are already receiving. After completing an energy assessment of the property and estimating the potential savings, the utility will oversee the contractor installing the energy efficiency upgrades and provide assurance that the improvements have been correctly installed.

After installation, the program allows customers to make installment payments as part of their monthly utility bills, gradually paying for the efficiency upgrades by using part of the energy savings generated by the retrofit. Immediately, customers will see savings on their typical utility bill. Because the charges remain with the property and not the customer, this approach workers for all classes of utility customers – renters, homeowners or business owners.

Kentucky Power Company, which provides electricity to much of the region, examined the potential for increased energy efficiency among its customers in July 2015.[9] The study found that most KPCO residential customers used electric heat, and that incandescent light bulbs were more common than compact fluorescents or LEDs. Among industrial customers most electricity use was for motors, which were frequently older and less efficient than newer motors.

We rely on the KPCO study, scaled up to apply to all of the region.[10] That is, we assume the same potential for energy efficiency throughout the region as KPCO found in its service territory. (This is a conservative assumption, since some parts of the region currently have higher electric rates than KPCO, and therefore

[8] MACED, "How$martKY overview", http://maced.org/howsmart-overview.htm
[9] Applied Energy Group, "Kentucky Power Company (KPCO) Market Potential Assessment", July 30, 2015, filed by KPCO in Kentucky Public Service Commission case no. 2014-00271.
[10] For regional totals we multiplied KPCO residential sales by 2.74, commercial sales by 1.74, and industrial sales by 1.44, reflecting the KPCO share of the regional market in each class of electricity consumers.

have even greater potential for cost-effective energy conservation.) KPCO's "achievable potential – high" scenario (despite the name, only the third-highest of five efficiency scenarios) projected that 17 percent of current electricity use could be saved by efficiency measures by 2035. We assume a slight acceleration, reaching that level of savings by 2030.

The result is that by 2030, we project that the region could be saving 2,154 GWh of electricity per year. The cost of efficiency measures reaches $97 million in that year, and the net savings to electricity customers are $108 million, almost all of it going to residential customers.[11] Of the money spent on efficiency measures, we estimate that one-third goes to workers who install the measures, and the remainder pays for the materials and supplies that they install. In addition, consumers will spend the net savings on a variety of goods and services, creating other jobs. The loss of jobs at utilities due to the reduction in electricity sales is quite small by comparison.

## b. Local food production

Agriculture is important throughout most of eastern Kentucky. However, the region's agriculture has historically been dominated by beef and tobacco farming, so it has supplied relatively little of the region's food. As a result, there are ample opportunities to increase production of food for local consumption. This is especially important for farmers in light of the collapse in tobacco sales. The elimination of tobacco quotas in 2004 and the end of tobacco buyout payments to former quota holders in 2014 have forced many Appalachian tobacco growers out of the market.

A number of community initiatives are attempting to diversify and strengthen local food production.[12] In 2014, Barbourville and Hazard were among the 26 winners of EPA's nationwide "Local Foods, Local Places" grant competition, winning support for food distribution facilities that serve nearby communities. Yet such efforts remain rare, according to the county agricultural development plans filed with the Governor's Office of Agricultural Policy.[13]

One county plan after another tells a similar story: the leading agricultural products are cattle, hay and silage, and in some counties, tobacco. Steep slopes, moderately high elevation and land recently reclaimed from mining all favor pasture and livestock rather than crops. Options for diversification, generally described as speculative future possibilities, include fruits and vegetables, poultry, and beekeeping. High tunnels – low-cost greenhouses built with plastic sheeting – could extend the growing season and improve growing conditions.

Another recent agricultural initiative is also worth noting. Hemp, an industrial fiber formerly grown in Kentucky, is now being reintroduced, following a 2014 change in federal law that allowed states to sponsor and license hemp production.[14] (A close relative of marijuana, hemp was banned for years under

[11] This calculation is based on levelized costs, over the lifetime of the efficiency measures, of $0.034/kwh saved for residential customers and $0.057/kwh for commercial and industrial customers. All dollar amounts are in 2014 dollars.
[12] See the "Kentucky synopsis" section of Jean Haskell, "Assessing the landscape of local food in Appalachia", 2012, http://www.arc.gov/assets/research_reports/AssessingLandscapeofLocalFoodinAppalachia.pdf.
[13] The county agricultural plans are available at http://agpolicy.ky.gov/funds/Pages/county-info.aspx. As of September 2015, 42 of the Appalachian counties had filed agricultural plans with the state.
[14] Jessica Firger, "The great Kentucky hemp experiment", *Newsweek*, October 11, 2015, http://www.newsweek.com/2015/10/23/great-kentucky-hemp-experiment-381870.html.

drug laws, even though it is not psychoactive.) It is too early to assess the long-term potential of hemp in Kentucky, and we have not attempted to project hemp-related employment.

According to the IMPLAN model, Appalachian Kentucky spends $1.13 billion on food, of which $436 million, or 39 percent, is supplied from within the region. The value of food imported from outside the region amounts to $694 million a year. While it would be impossible to produce all of that locally, it should be feasible to produce a noticeable share of it, creating jobs through import substitution and strengthening local communities and the environment. Recognizing that many foods cannot be produced in eastern Kentucky, we consider a scenario in which 25 percent of food from outside the region is replaced by locally grown food.

## c. Health care

Demographic trends – above all, the aging of the population – imply that health services will be a growth industry for some time to come, in Kentucky and across the nation. Public health initiatives aimed at reducing and preventing illness are important to pursue, and are frequently the least expensive responses.[15] Yet the market for medical care will not vanish. Billions of dollars will continue to be spent, and jobs will continue to be created, meeting health care needs. A recent statewide analysis identifies health care occupations as among the most rapidly growing in Kentucky, and highlights potential shortages of particular skills and the need for additional training.[16]

According to IMPLAN, Appalachian Kentucky spends $6.75 billion a year on health care, 81 percent of it supplied locally. The remainder of the region's healthcare, with a price tag of $1.25 billion, is provided elsewhere, perhaps at larger medical institutions in nearby metropolitan areas. As with food production, it is hard to imagine 100 percent regional self-sufficiency in medical care. But it should be possible to bring some of that $1.25 billion of outside medical expenditure back inside the region, creating valuable jobs, skills and institutions in the process.

Existing examples of local success in health care point the way to a strategy for the region. Pikeville Medical Center, an extensive complex of medical institutions with multiple specialties, has played an important role in strengthening the economy of Pike County and attracting other employers. Rockcastle Regional Hospital is known for its specialization in long-term respiratory care, and draws patients from across the state and beyond. Similar strategies for growth could be pursued in other communities. We consider a scenario in which 25 percent of spending on outside medical care is replaced by spending within the region.

## d. Sustainable forestry and wood products

Eastern Kentucky is heavily forested, and wood is the region's most abundant sustainable natural resource. A substantial forestry and wood products industry (combining logging, sawmills, and many varieties of wood products) already employs close to 4,000 workers in the region. According to IMPLAN, the industry's

[15] See, e.g., the discussion of health policy in SOAR, "2014 Regional Working Group Priorities", http://www.soar-ky.org/pdf/SOAR-Rupri-FullReport-092314.pdf.
[16] Kentucky Center for Economic Policy, "Developing the Healthcare Workforce: Growing Need is an Opportunity for Kentucky", January 2015, http://kypolicy.org/dash/wp-content/uploads/2015/01/Developing-the-Healthcare-Workforce-Final.pdf.

sales are worth just over $1 billion per year, of which about $300 million is used within the region. The region's wood and wood product exports to outside customers amount to $761 million per year.[17]

We explore the possibility of doubling of the region's current wood product exports; that is, adding another $761 million of sales outside the region. One recent study has proposed an even larger expansion of the forest products industry, based on harvesting half of the region's annual sustainable forest growth and promoting industries such as container and pallet manufacturing that can use low-quality timber.[18] That study effectively proposes twice as large an expansion of the wood products industry as we do.[19] The idea of committing half of the region's annual forest growth to an expanded wood products industry could be risky, although it deserves further examination. Since our scenario is about half as ambitious, it effectively commits one-quarter of the region's sustainable forest growth to the wood products industry.

A number of factors could impede the attempt to develop the region's forest resources in an ecologically sound manner. Much of the timber resources are owned by out-of-state energy and land-holding companies; unsustainable logging and forest management practices have been unfortunately common, especially on steep slopes; timber theft remains a problem; and most of the resource is still exported as raw timber rather than as value-added wood products. It is of great importance to address these problems, since the timber and wood products industry will be central to the future economy of Appalachian Kentucky.

## e. Tourism

Despite some efforts at promotion of local attractions, it seems safe to say that eastern Kentucky has not yet become a major tourist destination. However, the favorable location, relatively close to major East Coast and Midwestern urban areas, suggests that the area could become better known and more widely visited, especially as coal mining becomes less widespread. Proposals for "eco-tourism", based on the region's forested mountain landscape, are easily compatible with sustainable forestry. In addition, many county agricultural plans mention the possibility of "agri-tourism", which could include farm stays or bed and breakfast accommodations, petting zoos, horse ranches and riding opportunities, hunting, and other activities.

Industries in Appalachian Kentucky that are associated with tourism currently have annual sales of $366 million to customers from outside the region.[20] We assume it might be possible to double these sales, bringing another $366 million per year into the region.

[17] These are gross exports; the region also imports some wood products, so that net exports are somewhat smaller. However, gross exports to outside customers is the relevant category for our analysis.
[18] University of Kentucky, Department of Forestry, "SOAR – Analysis of the Forest Industry's Potential in Eastern Kentucky", 2015, http://www2.ca.uky.edu/forestryextension/PDF/SOAR_Forest_Industry_Analysis_2015.pdf.
[19] It projects an increase in direct spending (industry sales) of $1,497 million; adding this amount of new sales would roughly triple the industry's current exports from the region of $760 million. Their $1,497 million is roughly twice our maximum expansion of $760 million. The University of Kentucky study is also based on IMPLAN, and uses estimates of jobs per million dollars that are similar to ours.
[20] The IMPLAN industries that we associate with tourism are: transit and ground passenger transportation; scenic and sightseeing transportation; auto renting and leasing; travel arrangement and reservations; museums, historical sites, zoos and parks; hotels and motels (including casinos); other accommodations; restaurants and other food and drinking places. Eastern Kentucky is a net importer of these services – that is, spending on these services outside the region by residents of Eastern Kentucky is greater than spending on these services in eastern Kentucky by outside customers. However, we focus on gross exports of these services as the driver of local economic development and job creation.

### f. Environmental remediation

Eastern Kentucky has an unfortunate abundance of abandoned coal mine sites that are in need of remediation. The federal Office of Surface Mining Reclamation and Enforcement (OSMRE), a branch of the Department of the Interior, maintains a database of mines that were abandoned before 1990. It shows that a total of $208 million of still-unfunded remediation is needed at pre-1990 mine sites in the 54 counties of Appalachian Kentucky.[21]

Since 1977, coal mines have been subject to the Surface Mining Control and Reclamation Act (SMCRA), which sets standards for reclamation. Nonetheless, anecdotal evidence suggests that closure and abandonment of coal mines without reclamation did not entirely cease after 1977, or even after 1990, so the regional need is undoubtedly greater than $208 million. Systematic data are not available on the true extent of remediation needs. Since the adoption of the SMCRA, thousands of square miles of Appalachia have been mined for coal.[22] A large fraction of that area is in eastern Kentucky; an uncertain, perhaps large fraction of that area is in need of remediation. Thus it seems likely that the real needs for remediation are larger, perhaps several times larger, than the OSMRE estimate for pre-1990 mines.

The Obama administration's 2016 budget includes the "Power Plus" plan for assistance to coal communities and workers. In addition to a number of smaller proposals, it includes $1 billion, to be spent over five years, on remediation of pre-1990 abandoned mines. The OSMRE database, however, shows more than $5 billion of unfunded remediation needs in six Appalachian states. Thus even if the Power Plus plan were fully funded at the requested level, it would meet only a part of the identified need. Much greater funding would be needed for full remediation of the damage from past coal mining.

## 3. MODELING EMPLOYMENT IMPACTS

Our analysis relies on IMPLAN, a widely used model of employment impacts. IMPLAN is an input-output model, ultimately based on data about the links between industries as collected by the Commerce Department. It calculates the indirect implications of each purchase: when consumers buy cars, the auto manufacturers buy steel, glass, tires and electronics from other companies, each of which buys supplies from other industries, and so on. IMPLAN can calculate the effects of these cascades of purchases, at the national, state, or county level, or for any combination of counties. All of our calculations for this report are IMPLAN results for the 54 counties of Appalachian Kentucky.

IMPLAN distinguishes three categories of jobs – direct, indirect and induced employment – that result from a purchase. When consumers buy cars, direct jobs are created in auto factories. Indirect jobs are created in auto parts companies and other suppliers to the auto industry. Induced jobs are created when auto workers and auto parts workers spend their wages, thereby increasing employment in many

[21] Our calculation from OSMRE data, downloaded from http://amlis.osmre.gov/Summaries.aspx.
[22] C.E. Zipper, J.A. Burger, J.M. McGrath, J.A. Rodrigue and G.I. Holtzman (2011), "Forest Restoration Potentials of Coal-Mined Lands in the Eastern United States", *Journal of Environmental Quality* 40:1567-1577, citing OSMRE data.

consumer goods and services industries.

Table 3-1 presents our estimates of the jobs created in the region per million dollars of spending in each of the six areas. (These are only intermediate results, and will be used to produce overall job creation estimates in a moment.) "Total" jobs is the sum of direct, indirect and induced jobs. For energy efficiency, there are separate job impacts for the costs of efficiency measures and for the energy savings, which customers will spend on other purchases.

Job creation per $1 million is highest in tourism industries, which tend to have lower wages than other industries shown here. Job creation per $1 million of spending is lowest in coal mining, because it is a capital-intensive, high-wage industry, and in energy efficiency costs, since two-thirds of those costs are spent on materials that are produced outside the region. Aside from these extremes, other activities shown in the table create about 5-10 direct jobs, and 7-15 total jobs, per $1 million of spending.

| | Jobs per $1 Million of Spending (2014 Dollars) | |
|---|---|---|
| | **Direct Jobs** | **Total Jobs** |
| Coal Mining | 1.6 | 3.4 |
| Energy Efficiency Costs | 2.1 | 4.7 |
| Energy Efficiency Savings | 4.7 | 7.1 |
| Food Production | 9.7 | 15.5 |
| Health Care | 9.9 | 15.1 |
| Wood Products | 5.6 | 10.1 |
| Tourism | 17.3 | 21.6 |
| Environmental Remediation | 4.8 | 8.7 |

*Table 3-1. Jobs created in Appalachian Kentucky by $1 million of spending.*
*Source: IMPLAN defaults and authors' calculations. "Total" is the sum of direct, indirect and induced jobs*

# 4. SCENARIOS FOR JOB CREATION

## a. Import substitution

Our job creation calculations include three activities that replace imports: energy efficiency, local food production, and expanded local health care services.

For energy efficiency, we project costs of $97 million and savings to customers of $108 million as of 2030, as explained above. (Here, and elsewhere, we multiply expenditures by the jobs per $1 million shown in Table 3-1 to calculate job creation.) The combined result, as shown in Table 4-1 (adding the results in the first two rows), is about 700 direct jobs and more than 1,200 total jobs created in the region by energy efficiency.

| | Expenditure (Millions) | Direct Jobs | Total Jobs |
|---|---|---|---|
| Energy Efficiency Costs | $97 | 207 | 458 |
| Energy Efficiency Savings | $108 | 508 | 762 |
| Food Production | $173 | 1,685 | 2,681 |
| Health Care | $313 | 3,099 | 4,733 |
| **Total** | **$691** | **5,499** | **8,634** |

*Table 4-1. Job creation in 2030 from import substitution strategies.*
*Source: Authors' calculations. Food production and health care both assume that production in the region replaces one-fourth of current imports from outside the region.*

For food production and health care, Table 4-1 shows the effects of local production replacing one-fourth of the region's food and health care purchases from other regions. The result, for the import substitution strategies as a group, is about 5,500 direct jobs and 8,600 total jobs.

## b. Export promotion and remediation

For the export industries, wood products and tourism, we assume that current "exports" (sales by businesses in the region to customers outside the region) might be doubled. The effects of that assumption are shown in Table 4-2.
For environmental remediation, we assume that the true need for remediation is twice the amount shown in the OSMRE database, or $416 million, and that it will be funded over the ten-year period from 2021 through 2030. This implies funding of $41.6 million per year, creating 218 direct jobs and 426 total jobs.
The export industries plus remediation could create a combined total of about 10,800 direct jobs and 16,000 total jobs.

| | Expenditure (Millions) | Direct Jobs | Total Jobs |
|---|---|---|---|
| Forestry, Wood Products | $761 | 4,263 | 7,706 |
| Tourism | $366 | 6,335 | 7,904 |
| Remediation | $42 | 218 | 426 |
| **Total** | **$1,169** | **10,816** | **16,036** |

*Table 4-2. Job creation in 2030 from export promotion and remediation strategies.*

## c. Job creation: summary

The results of the calculations for the six sectors are combined in Table 4-3. The result is a projection of 24,671 total new jobs in 2030 – which is about 1,200 jobs, or 5 percent, more than our target for replacing coal mining jobs and reducing unemployment (see Table 1-1).

| | Expenditure (Millions) | Direct Jobs | Total Jobs |
|---|---|---|---|
| Energy Efficiency Costs | $97 | 207 | 458 |
| Energy Efficiency Savings | $108 | 508 | 762 |
| Food Production | $173 | 1,685 | 2,681 |
| Health Care | $313 | 3,099 | 4,733 |
| Forestry, Wood Products | $761 | 4,263 | 7,706 |
| Tourism | $365 | 6,335 | 7,904 |
| Remediation | $42 | 218 | 426 |
| **Total** | **$1,859** | **16,314** | **24,671** |

*Table 4-3. Job creation in 2030: Summary.*

In other words, the level of effort and ambition we have assumed in these sectors is roughly what is needed to meet the targets of replacing half of coal jobs, and bringing regional unemployment down to the national level.

To summarize the basis for Table 4-3, we have assumed that

- Energy efficiency throughout the region reaches the high end of what Kentucky Power Company considers "achievable", a few years ahead of schedule. By 2030, ratepayers divert $205 million per year away from energy purchases, spending $97 million on measures such as better insulation and lighting, and saving $108 million.
- In both food production and health care, eastern Kentucky moves closer to self-sufficiency, with expanded local production replacing one-fourth of the food and medical services that are now imported from outside the region.
- In forestry and wood products, and in tourism businesses, the region doubles its current sales to customers outside the region.
- Federal and state funding pays for remediation of eastern Kentucky's abandoned coal mine sites, spending a total of $416 million over the ten-year period from 2021 through 2030.

Money will have to be spent to create these jobs; we project that about $1.8 billion per year is needed. Of that amount, about $700 million might come from recapturing money that is currently spent by residents outside the region, through promotion of energy efficiency, local food, and local medical services. The other $1,100 million might come from outside, by doubling the sales of the wood products and tourism sectors. Remediation of abandoned coal mines, while important to the environmental health of the region, is the smallest of the sectors we examined, both in potential expenditure and in jobs.

The transition to the new economy described here will not be effortless. Profound organizational changes, and one-time startup funding for many new or expanded enterprises, will be needed. Yet the goal of remaking the region, of creating post-coal jobs, is well worth working for. The old-economy jobs that have vanished could be replaced by a combination of greater self-reliance, through energy efficiency, local food, and local medical care, alongside expanded marketing of the region's wood products and tourism opportunities, and funding for remediation of abandoned mines. Coal is not coming back – and building a

clean, sustainable economy is the best hope for the workers and communities of eastern Kentucky.

## Federal help for coal communities

How can the Federal government help the hard-hit coal mining communities of Appalachia? Transition assistance offered to former nuclear weapons industry workers could provide a model. In 1992, when the Department of Energy started eliminating 47,700 contractor personnel at 13 major sites as a result of downsizing the nation's nuclear weapons complex, the agency conducted a Worker and Community Transition Program that provided grants and other assistance for communities affected by the shutdown of nuclear facilities. The goal was to assist displaced workers and provide economic recovery and diversification assistance to the affected communities. The program was budgeted for $200 million in 1994, declining to $25 million in 2001. A nuclear test site in Nevada, for example, was repurposed to demonstrate concentrated solar power technologies. The Worker and Community Transition Program, if taken to the necessary scale, could serve as one model for the Appalachian coal region.

Another model is provided by the Obama administration's "Power+ Plan," incorporated in its fiscal year 2016 budget. The plan represents a significant breakthrough in recognizing the need for a "just transition" for workers and communities affected by climate-protecting changes in public policy. It provides more than $55 million for job training, job creation, economic diversification, and other programs for communities that have experienced layoffs due to the declining coal industry. It has been greeted enthusiastically by Appalachian social justice groups like the Mountain Association for Community Economic Development and Kentuckians For The Commonwealth. While not nearly enough to cover what is needed, this proposal for the first time puts a just transition for workers in fossil fuel-related industries on the national political agenda.

# CONCLUSION: A FUTURE AFTER COAL

The transition to a clean energy future will bring large benefits to American workers and communities. It will improve health and environmental conditions and reduce the greenhouse gases that are destroying the climate. But some jobs, particularly in the coal industry, will be lost, and the economies of some communities are likely to be harmed.

The coal mining communities of Eastern Kentucky have already been devastated by the continuing decline of the Appalachian coal industry. They will continue to lose jobs no matter what happens with climate policy. Eastern Kentucky needs an economic future that does not depend on coal.

"Employment After coal: Creating new jobs in Eastern Kentucky," lays out a practical approach to creating a new economy for Eastern Kentucky. It analyzes the potential for job growth in six sectors: energy efficiency; local food production; healthcare; forest products; tourism; and environmental remediation. The plan would produce nearly 25,000 new jobs in Appalachian Kentucky – enough to replace half of today's coal jobs and to bring the unemployment rate down to the national average.

The plan will ultimately be paid for by reduced electrical, food, and healthcare costs; money received from forest products and tourism; and Federal payment for environmental remediation. But it will take initial start-up investment to kick-start it. That modest cost must be seen as a national responsibility -- and a small cost to pay for the large gains created by the transition to the clean energy future.