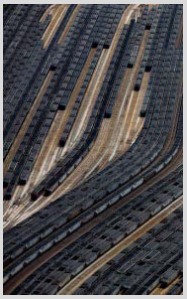
Access vs. Isolation
Preserving Appalachia's Rail Connectivity in the 21st Century: Part Two

Prepared for the Appalachian Regional Commission March 2017



THE UNIVERSITY OF TENNESSEE KNOXVILLE
CENTER FOR TRANSPORTATION RESEARCH

ABOUT THIS DOCUMENT

The report provided here is an outgrowth of discussions and activities originally undertaken by a volunteer group of policy-makers, scholars, and transportation professionals during the fall of 2015. Participants have freely contributed their time, energy, and considerable talents toward the preservation of freight transportation capacity in Appalachia. Nonetheless, the report's content does not necessarily reflect the opinions of participants or the organizations they represent. A partial list of group members and their affiliations includes:

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Access vs. Isolation: Preserving Appalachia's Railway Connectivity in the 21st Century

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One INTRODUCTION

Beginning in roughly 2015, an accelerated transition of electricity generation from coal to alternative fuels combined with severe cyclical market disruptions to produce what has been a precipitous decline in domestic U.S. coal production and corresponding financial ills for U.S. coal concerns. The nation's largest coal producers were quickly drawn into bankruptcy, many mining operations ceased, and, for a time, the flow of coal from many mining regions slowed to a comparative trickle. The resulting economic upheaval has spanned much of the coal-producing United States, but the effects have been greatest in Appalachia.

As Appalachian coal producers staggered under rapidly declining demands, the number of unanswered questions grew quickly. How far, how fast, and for how long will the slump in coal production go? Which of the changes are transient and which are lasting? What portion of coal-related commerce will survive? And specifically within the transportation sector, how will an ongoing reduction in coal activity affect the future availability and affordability of freight transport for other goods to and from Appalachian communities?

In the fall of 2015, a concerned group of transportation and economic development professionals voluntarily began to gather and process the small amount of information then available to address the freight-related questions. In January of 2016, the results of this initial freight inquiry were presented to the Appalachian Regional Commission (ARC).[1] This early work helped to carefully frame relevant issues but answered few long-run questions.

Since the initial assessment, the coal-related transportation landscape has continued to change. Class I railroads have begun to respond to diminished coal traffic by idling or downgrading specific coal-dependent facilities and routes and by curtailing a measurable amount of coal-related train operations.[2] At the same time, coal

[1] Mark L. Burton, *et al*, "Access vs. Isolation: Preserving Appalachia's Railway Connectivity in the 21st Century," unpublished monograph, Center for Transportation Research, the University of Tennessee, January 2016.

[2] "Class I" refers to a federal distinction that divides common carrier railroads into three classes based on annual revenues. There are currently seven Class I railroads operating in the U.S. These include, BNSF, Canadian National, Canadian Pacific, CSXT, Kansas City Southern, Norfolk Southern, and Union Pacific. Short-line and terminal railroads are classified as Class II and Class III. There are currently approximately 550 Class II and III railroads in the U.S.

producers have reorganized under bankruptcy protection, coal stockpiles have diminished, and a small but important share of lost coal production has returned to the Region.

As 2016 draws to a close, more information is available. The reorganization of domestic U.S. coal production makes it increasingly possible to distinguish between the long-run utility sector transition away from coal and the more temporary effects of cyclical disruptions. At the same time, the Region's Class I and short-line railroads seem to have developed response strategies that reveal a concern for capacity preservation even as they work to cut short-run costs. Finally, through its *Partnerships for Opportunity and Workforce and Economic Revitalization* (POWER) initiative, the Appalachian Regional Commission is supporting dozens of local regional efforts that, when combined with individual state activities, represent a meaningful first step toward broader regional economic stabilization.

The current document has two purposes. The first is to update, catalogue, and describe ongoing changes in Appalachian coal production and the corresponding responses of the Region's freight providers. As we evaluate current events, we will distinguish (as much as possible) between temporary and lasting outcomes and offer qualitative forecasts of future conditions.

Our second purpose is to explore potential local, state, and regional strategies that might effectively promote continued access to affordable freight transportation services. This portion of the work includes a summary of existing freight programs in Appalachian communities, a discussion of freight strategies used in other parts of the U.S., and a purposed focus on past, freight-related success stories within the Appalachian Region.

We have organized the remainder of this report as follows: Section 2 provides an overview of coal production, coal industry restructuring, and production outlooks. Section 3 describes where eastern coal is produced, where it is consumed, and how it is currently moved. In Section 4, we explore the implications of changing coal volumes on freight transport in Appalachia, including the railroad industry's response so far and what this response reveals about likely future railroad actions. We also consider the implications of reduced coal volumes on other surface freight modes. Section 5 summarizes state-level freight programs currently available in Appalachia and an overview of additional program strategies in use outside the Region. Final thoughts are provided in Section 6.

Two COAL: PRESENT AND FUTURE

Energy markets are global, complicated, and fickle. Therefore, understanding the long-run outlook for the movement of Appalachian coal requires a focus on market basics and a stubborn insensitivity to headline-grabbing, short-run disturbances. In that light, we first attempt to summarize the long-run basics that will continue to define the markets for Appalachian coal. Once this is done, we will turn to descriptions of the market disruptions that have further perturbed production and transportation activities, albeit *temporarily*.

A SUMMARY OF COAL MARKET BASICS

Distilling complex international fuel and energy markets to arrive at a few basics requires many simplifications. Our intent here is to provide readers with a workable foundation for understanding current and foreseeable trends in the transportation of Appalachian coal.

BASIC NO. 1 *For two or more generations, the majority of coal consumed in the U.S. has been "steam coal" used to generate electricity.*

Historically, the U.S. has used coal for a variety of industrial purposes, including but not limited to electricity generation.[3] As recently as 1965, barely half of the coal consumed in the U.S. was used for generation. However, since then, the electric utility share of domestic coal consumption has climbed consistently. By 1980, the utility share had reached 81 percent nationally; by 2000, this share was 91 percent; and in 2009, at the same time that coal's contribution to electricity generation peaked, nearly 94 percent of all coal consumed in the U.S. was burned to produce electricity.[4] Of all the major coal-producing regions, Appalachia is the least dependent on domestic utility consumption, but this consumption still accounts for roughly 70 percent of Appalachian coal output.

[3] In 1949, the year in which the EIA series begins, nearly 15 percent of all U.S. coal consumption was by the Transportation Sector, presumably as fuel for steam locomotives.

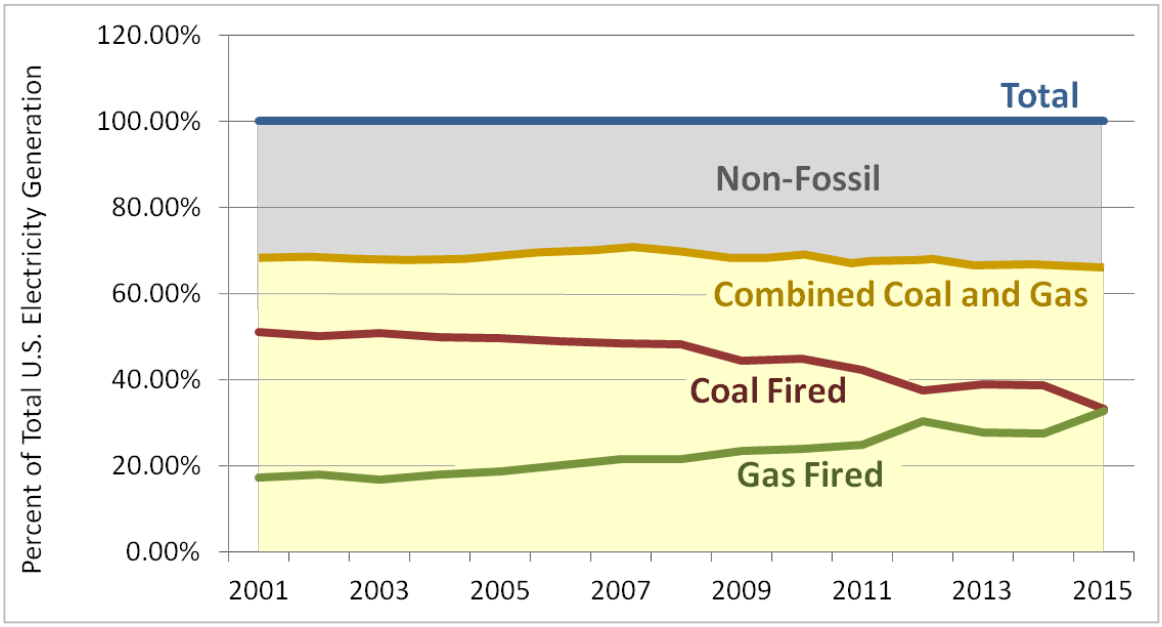
[4] While the numbers reported in the text are national in nature, similar values emerge when the analysis included only those states that are most likely to burn Appalachian coal. For 2014, the national utility share of coal was roughly 93 percent. In those regions most likely to consume Appalachian coal the utility total represented 91 percent of total consumption. All data were obtained from the U.S. Energy Information Administration. See http://www.eia.gov/coal/data.php#consumption

BASIC NO. 2 *Both the absolute quantity of coal used in electricity production and coal-fired generation's share of total production have continued to fall since 2001. For the most part, reduced coal-fired generation has been replaced with power generated through the consumption of natural gas.*

Since 2001, coal's share of total domestic electricity production has fallen from 51 percent t0 33 percent in 2015. The actual amount of electricity produced from coal peaked in 2007 at just over 2 billion megawatts.

During this same period the natural gas share of domestic electricity production has nearly doubled from 17.1 percent in 2001 to 33 percent in 2015. Indeed, early estimates suggest that natural gas has overtaken coal as a source of electricity generation. The contribution from other fuel sources (both renewable and non-renewable) has grown only slightly, increasing from 32 percent in 2001 to 34 percent in 2015. Fuel shares are shown in Figure 1.

Figure 1 – Shares of Coal and Natural Gas in Electricity Generation



Source: Energy Information Administration

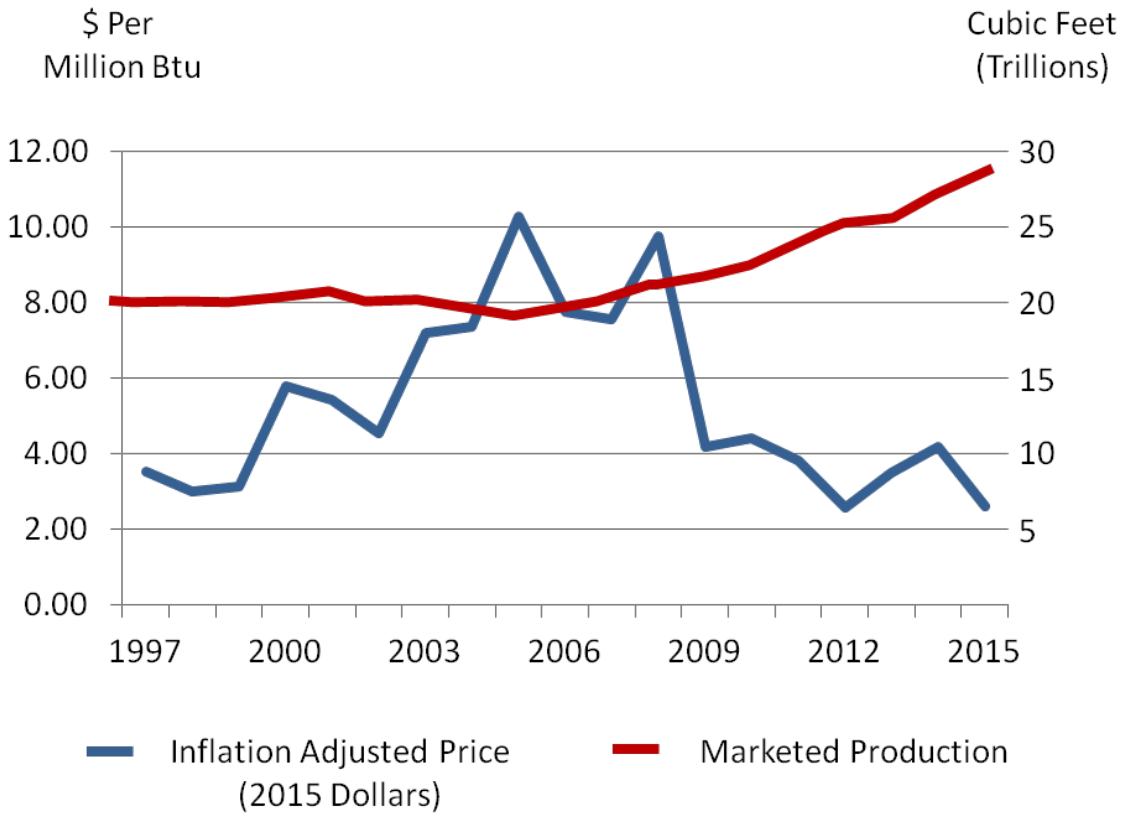
BASIC NO. 3 *While attributable to many factors, the transition from coal-fired to gas-fired electricity generation has been facilitated by increased domestic natural gas production that has helped keep both natural gas and down-stream electricity prices stable.*

Perhaps the single biggest energy story of the new century is the emergence of hydraulic fracturing (fracking) as a prominent means of affordably recovering

natural gas and petroleum reserves that were previously deemed unrecoverable.[5] In the northern prairie states and in western Canada, fracking has been used to unlock vast crude petroleum reserves. However, in the Southwest and, particularly, in the eastern U.S., fracking's energy contributions are primarily in the form of natural gas. In combination, these additional supplies have created what some are calling an *energy renaissance*.

Within the current context, increased (and still expandable) supplies of natural gas have allowed electricity producers to move relatively quickly toward the replacement of coal without causing a lasting increase in natural gas prices or in the downstream price of electricity. Figure 2 depicts domestic natural gas prices and output between 1997 and 2015.

Figure 2 – Inflation Adjusted Natural Gas Prices and Marketed Annual Gas Production



Source: Energy Information Administration. Price=Average Henry Hub Spot Price

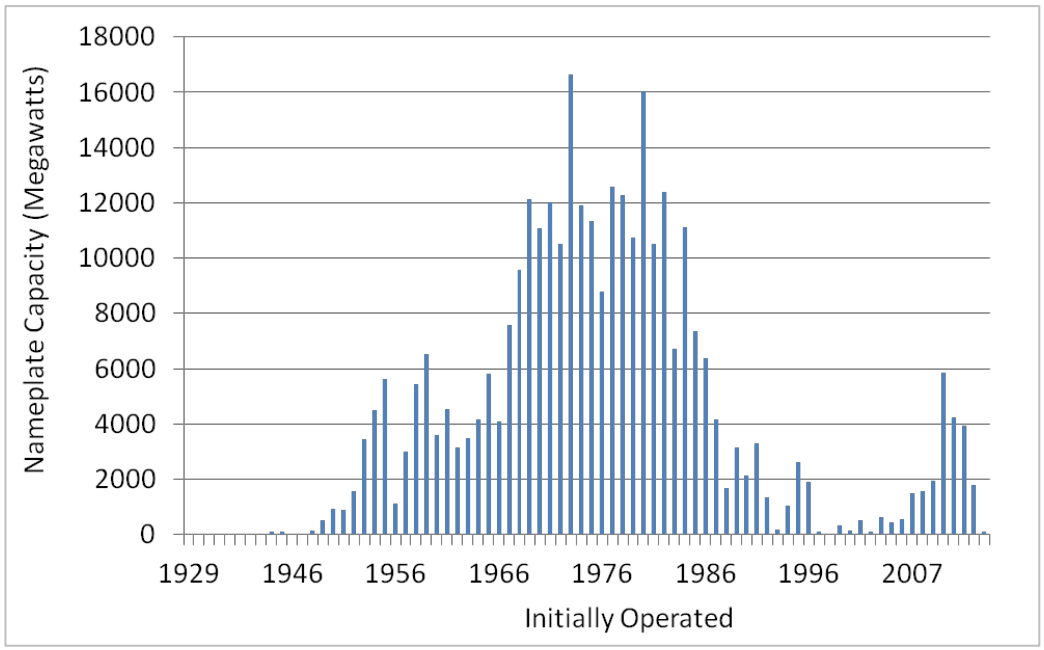
[5] Hydraulic fracturing has been practiced in the U.S. for more than a century. However, the combination of "slick water" fracking and horizontal drilling emerged in West Texas in the late 1990s.

BASIC NO. 4 *The pace of the ongoing transition from coal-fired electricity generation is largely dictated by the asset lives of existing coal-fired facilities, how quickly these facilities can be affordably retired, and the extent to which federal policies further encourage a reduced dependence on coal.*

Coal-fired generating plants represent billions of dollars of utility firm investments. Accordingly, utility owners will be reluctant to retire these plants prematurely. Thus, information describing the design lives of the existing coal-fired facilities could, to some degree, help predict when, where, and how much coal will be needed in coming decades.

Figure 3 depicts the startup dates of the coal-fired generating capacity currently available for operation. Nearly two-thirds of this capacity entered service between 1965 and 1984—and is now between 30 and 50 years old. If we undertake casual calculations that assume an average 50–70 year facility life (without substantial reinvestment), assume coal consumption rates that mirror electricity outputs, and assume no new coal-fired facilities will be built, then these data suggest that steam coal could account for as little as 17 percent of electricity production by 2036.[6]

Figure 3 – Vintage of Operational Coal-Fired Generating Capacity



Source: Energy Information Administration

[6] This is, by every measure, a gross calculation. It does not consider past or potential investments that may extend the lives or improve the efficiency of existing facilities; it does not consider adjustments to the frequency or extent of coal-fired facility dispatch; and it ignores the effects of future regulation or changing input prices on potential retirements.

BASIC NO. 5 *Appalachian coal is less dependent on domestic electricity production and more dependent on export markets than coal produced elsewhere in the U.S. This export dependence is expected to increase with or without implantation of the EPA's Clean Power Plan (CPP).*

The characteristics of the high-grade, bituminous coal produced in Central Appalachia make it suitable for both electricity generation and for metallurgical applications. This versatility, combined with proximity to eastern deep-draft ports has allowed Appalachian producers to substitute export opportunities for declining domestic demands. This pattern is expected to grow in its importance to regional production. Indeed, within its forecasts, the most recent release of the U.S. Department of Energy's *Annual Energy Outlook* suggests:

> Production of coal in the Appalachian region declined sharply before 2015 as domestic coal buyers shifted from Appalachian steam coal toward other coal sources or to other fuels for economic reasons. The Appalachian region remains a major source of metallurgical coal, whose markets are not directly affected by the CPP. With or without the CPP, Appalachia's producers depend on sales of both metallurgical and steam coal in international markets.[7]

As discussed below, this dependence on international markets affects coal-related vulnerabilities for Appalachia.

A CYCLICAL BUST THAT DOOMED AGGRESSIVE STRATEGIES

The seemingly sudden collapse of coal that made headlines in 2015 and that extended through much of 2016 has its roots in the long-run trends described above, but the downturn was more rapid and more daunting because of a coincident turn in international markets and failed strategies by U.S. producers.

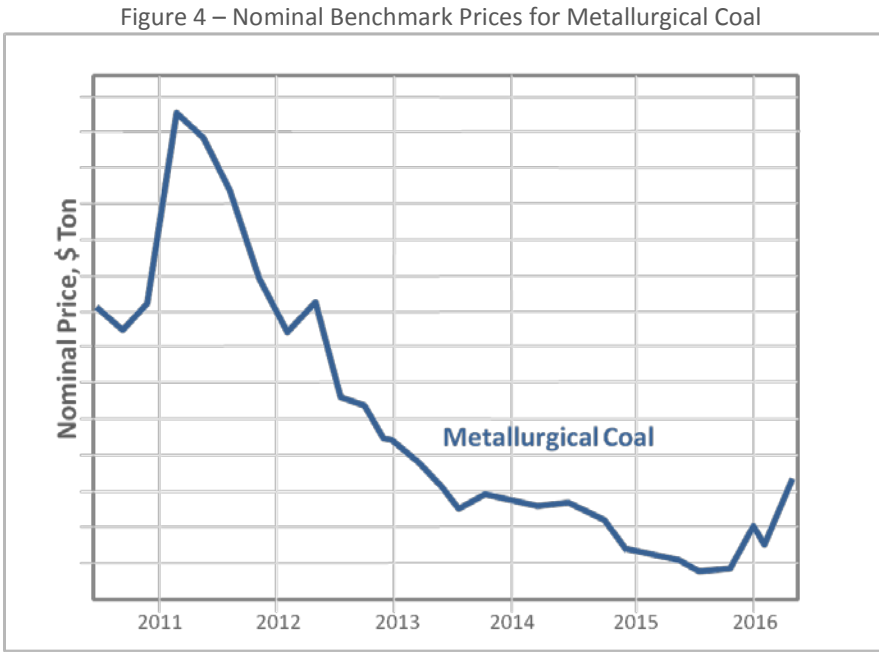
As the U.S. economy waddled and wobbled toward economic recovery in the late 2000s, renewed growth was not accompanied by a rebound in steam coal volumes. At the same time, however, the international market for metallurgical coal was booming. In response to this perceived opportunity, large U.S. coal producers leveraged existing assets and invested heavily in additional metallurgical coal capacity.[8]

Unfortunately, these investments were ill-timed. The international price for metallurgical coal peaked in 2011—the same year as many of the U.S. firm investments—and began the precipitous and prolonged five-year slide depicted in

[7] See, U.S. Department of Energy, *Annual Energy Outlook: 2016*, Released August 2015, p. ES-3.

[8] In 2011, Alpha Natural Resources spent $7 billion to acquire Massey Energy, Arch Coal purchased the International Coal Group for $3.4 billion, and Peabody Energy acquired Australian producer MacArthur Coal for $5.2 billion.

Figure 4. While not quite so dramatic, the decline in U.S. export coal followed essentially the same pattern.



By 2015, the heavy debt incurred to acquire new metallurgical coal capacity combined with a tumble in international metallurgical coal prices and volumes—and the steady, ongoing decline in domestic steam coal markets—placed nearly every major U.S. coal producer in an untenable financial position.

Alpha Natural Resources filed for Chapter 11 bankruptcy protection in August of 2015; Arch Coal filed for similar protection in January of 2016; and finally, Peabody Energy—the world's largest coal producer—filed for bankruptcy protection in April of 2016. In total, the aggregate share value of U.S. coal producers fell from a 2011 high of $78 billion to a 2016 total of just over $12 billion.[9]

THE FUTURE OF APPALACHIAN COAL: A SUMMARY

Since mid-2016, the spot price of metallurgical coal has rebounded to more than $200 per ton, carried higher by increases in global steel production. At the same time, U.S. coal producers have emerged from reorganization, largely intact, and

[9] To review the recent financial troubles of domestic coal producers, see: "Coal Miner Alpha Natural Resources Files for Bankruptcy," *Bloomberg*, August 3, 2015, http://www.bloomberg.com/news/articles/20150803/coalmineralphanaturalresourcesfilesforbankruptcy; Arch Coal Files for Bankruptcy in Latest Blow to U.S. Miners *Bloomberg*, January 16, 2016, http://www.bloomberg.com/news/articles/20160111/archcoalfilesforbankruptcyreaches45billiondebtdeal; and Coal Slump Sends Mining Giant Peabody Energy Into Bankruptcy, Bloomberg, April 13, 2016, http://www.bloomberg.com/news/articles/20160413/peabodymajorityofitsusentitiesfileforchapter11

existing inventories of steam coal have been reduced to more typical levels. By most appearances, the sharp, cyclical downturn that plunged coal producers into financial peril is easing. However, the passing of the immediate crisis does little to change the underlying trends or their long-run implications for the transportation of Appalachian coal.

For more than two generations, Americans have supported measures to improve air quality. The consumption of coal has been and remains a key target in those efforts. More recently, the ability to substitute natural gas for coal in the generation of electricity has made the fight against coal more affordable. Unless natural gas prices increase, coal volumes will continue to fall as fast as coal-fired generating capacity can be exhausted and retired. Surges in international demands may occasionally blunt this decline, but the overall outcome will change little. Coal's role as a freight staple, particularly in the eastern U.S., is fading.

Three FREIGHT IMPLICATIONS

The consumption of coal and the evolution of freight transportation in the U.S. have been inexorably linked for three centuries. In America's colonial period, coal imports and exports often moved as ballast aboard sailing vessels. By the early 19th century, a desire to move coal and grain motivated the development of canal systems throughout the northeast and old Midwest. Later, particularly in eastern Pennsylvania and other parts of the Mid-Atlantic, the growing industrial use of coal and its value as an export fed the development of the earliest U.S. railroads.[10]

The commercial codependence of coal and freight transport survived throughout the 20th century and, until very recently, seemed destined to endure indefinitely. Indeed, as recently as 2014, coal accounted for 39 percent of all U.S. railroad tonnage and 19 percent of Class I railroad freight revenues.[11] Similarly, in 2014, coal constituted roughly 32 percent of all inland waterway traffic and on the Ohio River represented nearly half (47 percent) of all commercial 2014 traffic passing through system locks.[12]

However, based on the long-run trends described in the previous section, the nature and extent of the commercial relationship between coal and freight transportation is almost certain to change. These changes will affect the freight carriers' operations in every region of the U.S. and, in turn, affect the availability and pricing of freight services for non-coal freight customers. In the remainder of the current section, we focus on freight in Appalachia, beginning with a description of the status quo.

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[10] For a thorough discussion of early freight traffic in the U.S., see, Albert J. Churella, *The Pennsylvania Railroad, Volume 1: Building an Empire, 1846-1917 (American Business, Politics, and Society)*, University of Pennsylvania Press, 2012.

[11] See Association of American Railroads, *Analysis of Class I Railroads* (various years).

[12] For system tonnage, see, U.S. Army Corps of Engineers, *Waterborne Commerce of the United States 2014*, Part 2, p. 223. For lock statistics see, U.S. Army Corps of Engineers, *Lock Use Performance and Characteristics,* Public Lock Commodity Report (Calendar Years 1999-2015).

APPALACHIAN COAL: WHERE IT'S MINED, WHERE IT'S CONSUMED

Again, markets for fuel and energy are global. Thus, constructing and relying on more limited geographic boundaries to simplify our analysis must be done carefully. Nonetheless, we confine our current review to coal produced and consumed in the United States, east of the Mississippi River. Even so, it will sometimes be necessary to include descriptions of other domestic and international influences. Table 1 summarizes 2014 coal production in 11 eastern states. Counties within nine of these 11 states lie within the Appalachian Region. Active coal mines and the more general coal-producing areas are depicted in Figure 5.

Within the region considered here, coal production is dominated by West Virginia, Kentucky, Pennsylvania, Illinois, Indiana, and Ohio. All of the West Virginia and Pennsylvania output and most of the coal produced in Kentucky are associated with the Appalachian Region, while Illinois, Indiana, and western Kentucky coal is from the Illinois basin. In total, the coal shown here represented roughly 40 percent of all domestic U.S. production in 2014.

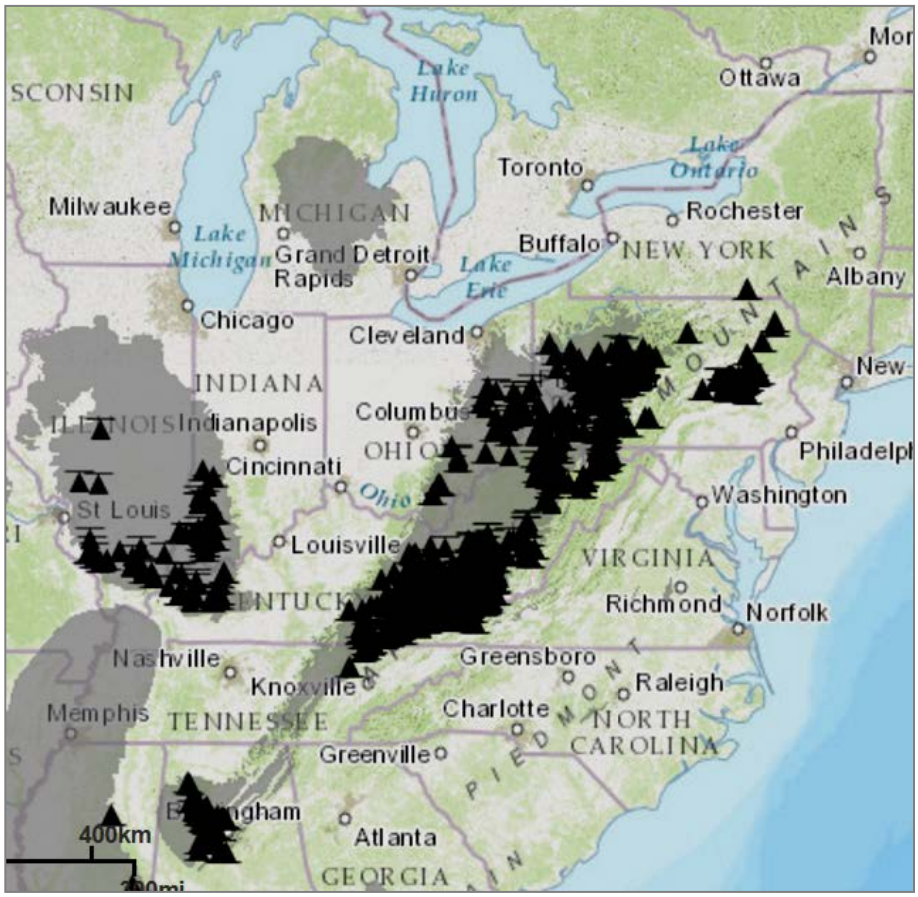
Table 1 – 2014 Coal Production in the Eastern U.S.

	PRODUCTION				
Geographic Unit	2014 Coal Production (Tons in Thousands)	2014 Share of U.S. Production	2014 Export Volume (Tons in Thousands)	Share of Total 2014 U.S. Exports	Export Share of 2014 State Total
Alabama	16,363	1.6%	12,049	12.4%	73.6%
Georgia	-	-	-	-	-
Kentucky	77,335	7.7%	3,293	3.4%	4.3%
Maryland	1,978	0.2%		0.0%	0.0%
Mississippi	2,625	0.3%	-	-	-
North Carolina	-	-	-	-	-
New York	-	-	-	-	-
Ohio	22,252	2.2%	101	0.1%	0.5%
Pennsylvania	60,910	6.1%	5,323	5.5%	8.7%
South Carolina	-	-	-	-	-
Tennessee	839	0.1%	-	-	0.0%
Virginia	15,059	1.5%	6,748	6.9%	44.8%
West Virginia	112,187	11.2%	29,250	30.1%	26.1%
ARC States	**309,548**	**30.7%**	**56,764**	**58.4%**	**18.5%**
Delaware	-	-	-	-	-
Florida	-	-	-	-	-
Illinois	*57,969*	*5.8%*	*10,170*	*10.5%*	*17.5%*
Indiana	*39,267*	*3.9%*	*85*	*0.1%*	*0.2%*
Michigan	-	-	-	-	-
New Jersey	-	-	-	-	-
Region Total	**406,784**	**40.4%**	**67,019**	**68.9%**	**16.6%**

US Total	**1,000,049**	**100.0%**	**97,257**	**100.0%**	**9.7%**

Source: Energy Information Administration

Figure 5 – 2014 Coal Production in the Eastern U.S.



Source: Energy Information Administration

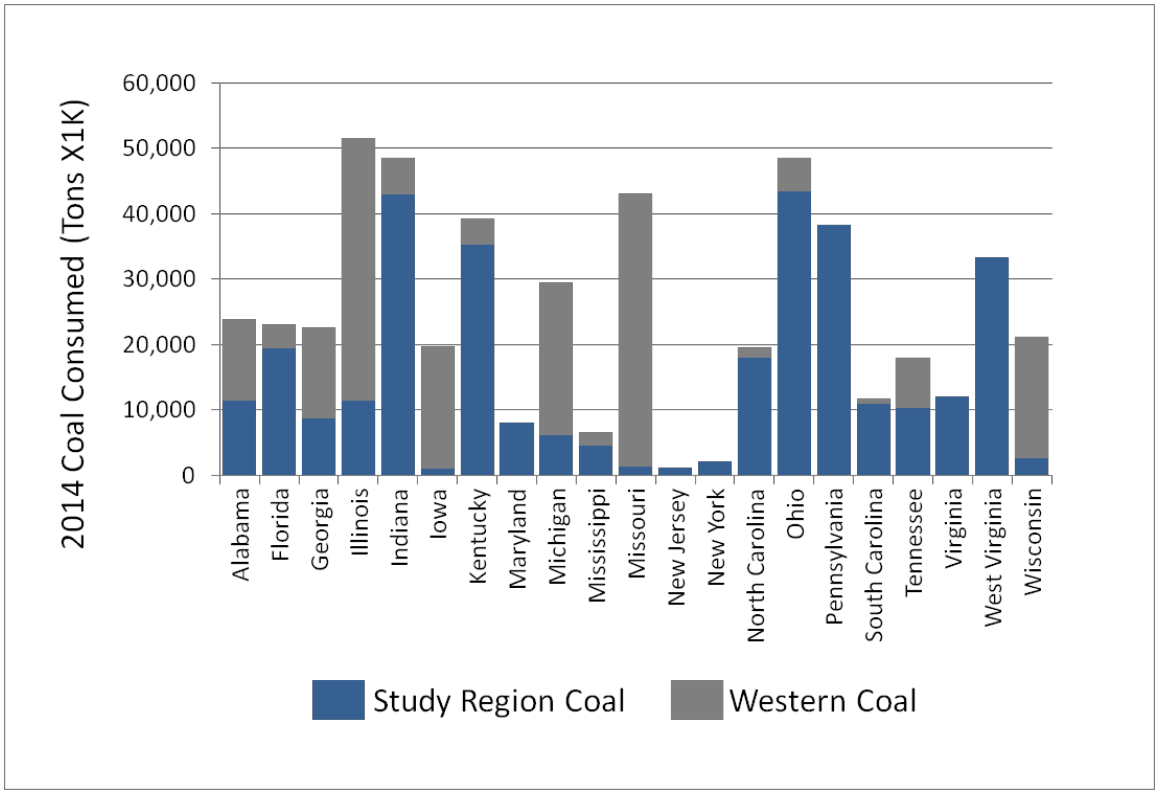
On average, roughly 90 percent of domestically produced coal is consumed within the U.S., mostly in the production of electricity. However, for Appalachian coal, exports play a more important role. Approximately 25 percent of all output from the study region moves to international markets, much of it as metallurgical coal. These exports are dominated by high-quality central Appalachian bituminous coal that moves primarily through Virginia ports and Alabama coal shipped via Mobile.

The remainder of the study region coal is shipped to consumers who are generally located in or relatively near the producing states. Figure 6 summarizes coal shipments from the study region states and also includes the volume of western coal consumed by the receiving states.

Together, these patterns of production and domestic consumption, export volumes, and port locations define the movement of coal throughout Appalachia and the

eastern U.S. The next task is to explore how coal is currently moved between where it is produced and where it is used.

Figure 6 – 2014 Consumption of Eastern Coal



Source: Energy Information Administration

HOW APPALACHIAN COAL MOVES

Much of the Region's coal is consumed relatively close to where it is mined and nearly all of (domestic) consumption is east of the Mississippi River. When distances are sufficiently short (less than 100 miles) and volumes are small, coal is moved by truck. When volumes are large and inland navigation is feasible, coal moves by barge. Most often, however, coal moves by rail in unit trains that often operate directly between "prep" plants and electric generating facilities or, in the case of exports, deep-draft ports.

Both Kentucky and West Virginia have state designated coal-haul roadway systems designed to accommodate loaded coal trucks. In addition to these systems, the general consensus is that coal truck travel is both possible and evident throughout the coal producing region wherever there are roadways of any form. Both barge and railroad transport are different.

Private sector barge owners and towing companies operate on navigable waterways as determined by the U.S. Coast Guard on a system that is designed, constructed, and

maintained by the U.S. Army Corps of Engineers (Corps). On most reaches of these waterways, maintaining adequate water depth depends on establishing navigation pools created by dams that can be transited through navigation locks.[13] With very few exceptions, railroad infrastructure is privately owned by rail carriers who create, maintain, and operate freight rail systems. A thumbnail sketch of mainline railroad trackage and main-stem waterway system components is provided in Figure 7. The extent of these systems within the Region is summarized in Table 2.

Figure 7 – Simplified Regional Waterway and Railroad Networks

Source: Center for Transportation Research

Table 3 provides a summary of the freight transportation modes used to deliver 2014 coal to final destination states. Table 4 reverses the analytical lens and depicts the importance of coal traffic as a share of overall freight activity for both rail and barge. Together, these data make clear the rigid interdependence that has historically existed between coal production and freight transportation. Focusing on West

[13] Only two major waterway segments are devoid of locks and dams. These are the Missouri River below the head of navigation near Council Bluffs, Iowa to its confluence with the Mississippi and the lower Mississippi River for its entirety below St. Louis.

Virginia, Kentucky, Pennsylvania, and Ohio, in 2014, 87 percent of all regional coal shipments were delivered by rail or barge. At the same time, coal traffic accounted for 47 percent of all locked tonnage on the Ohio River main stem and 68 of all rail shipments originating in these four states. At least historically, without the ability to move coal to where it is consumed, the Region's coal reserves would have been of far less value; without the need to move coal, much of the Region's transportation infrastructure would have been unnecessary.

Table 2 – Summary of Regional Waterway and Railroad Infrastructures

Railroad Network		Waterway Network	
Primary Class I Carriers*	CSXT, NS	Mainstem Ohio Miles***	436
Total Freight RR Miles**	16,970	Navigable Tributary Miles***	768
Number of Short-Line Carriers	83	Mainstem Ohio Locks***	12
Total Regional Short-Line Miles	5,459	Navigable Tributary Locks***	33
Holding Co. Short-Lines	35		
Holding Co. Short-Line Miles	3,475		

Source: Center for Transportation Research

*CXX and Norfolk Southern are the primary Class I carriers in the region. However, BNSF, Canadian Pacific, and the Canadian National also operate limited regional trackage.

** Total freight railroad mileage is estimated based on the state totals for the 13 ARC states combined with the ARC land areas within each state.

***Totals only include waterway mileages and the number of locks for operating portions of the inland navigation system within the Appalachian Region. Specifically, the upper portion of the Alleghany River where locks are in "care-taker" status are excluded from the tributary total.

Table 3 – Modes Used for 2014 Regional Coal Delivery

	DOMESTIC					EXPORT	TOTAL
STATE	Other, Tons (X1K)	Rail, Tons (X1K)	Barge, Tons (X1K)	Truck, Tons (X1K)	Domestic Total (X1K)	Export Total (X1K)	Grand Total (X1K)
Alabama	-	1,603	2,514	2,088	6,205	12,049	18,254
Illinois	5,011	17,657	21,382	3,749	47,799	10,170	57,969
Indiana	-	28,828	4,592	5,762	39,182	85	39,267
Kentucky	165	41,111	22,291	10,474	74,042	3,293	77,335
Maryland	-	-	-	1,921	1,921	-	1,921
Mississippi	-	-	-	2,625	2,625	-	2,625
Ohio	-	3,515	16,527	3,997	24,039	101	24,140
Pennsylvania	1,676	35,147	8,952	9,813	55,587	5,323	60,910
Tennessee	-	757	63	19	839	-	839
Virginia	1,041	5,777	1,701	2,697	11,216	6,748	17,964
West Virginia	5,222	39,812	35,426	2,476	82,937	29,250	112,187
Regional Total	**13,115**	**174,206**	**113,449**	**45,622**	**346,392**	**67,019**	**413,411**
U.S. (All States)	**67,156**	**609,567**	**113,453**	**99,232**	**889,976**	**97,257**	**1,000,049**

Source: Energy Information Administration

Table 4 – Coal's 2014 Share of Regional Waterway and Rail Traffic

Railroad Origin State	Loaded Coal Tons (in thousands)	Total Loaded Tons (in thousands)	Coal Percentage of Total
Alabama	10,750	38,160	28.2%
Kentucky	49,292	59,157	83.3%
Ohio	15,571	66,191	23.5%
Pennsylvania	32,961	51,551	63.9%
Virginia	19,485	32,232	60.5%
West Virginia	86,139	92,328	93.3%
ARC TOTAL	214,198	430,583	49.7%
Illinois	21,322	115,899	18.4%
Indiana	22,618	54,154	41.8%
Regional Total	**258,138**	**678,863**	**38.0%**
US Total	**750,200**	**1,764,100**	**42.5%**

Ohio River Lock and Dam	2014 Coal Traffic Tons (in thousands)	2014 Total Traffic Tons (in thousands)	Coal Percentage of Total
Ohio 52	21,513	87,930	24.5%
Ohio 53	11,694	76,478	15.3%
Belleville	27,890	44,813	62.2%
Cannelton	36,545	69,895	52.3%
Meldahl	20,797	46,182	45.0%
Dashields	14,591	20,309	71.8%
Emsworth	14,294	18,616	76.8%
Greenup	16,391	41,703	39.3%
Hanibal	29,809	44,240	67.4%
Myers	23,083	64,174	36.0%
Markland	22,742	52,754	43.1%
McAlpine	35,847	69,930	51.3%
Mongomery	14,512	20,966	69.2%
Newburgh	40,845	77,995	52.4%
New Cumberland	20,540	31,208	65.8%
Pike Island	20,315	32,238	63.0%
Racine	29,022	46,287	62.7%
Robert Byrd	19,944	40,833	48.8%
Smithland	25,075	71,041	35.3%
Willow Island	26,814	41,660	64.4%
Ohio River Total	**472,265**	**999,253**	**47.3%**

Source: Association of American Railroads / U.S. Army Corps of Engineers

Four LOOKING AHEAD

Setting aside the often volatile role of coal exports, Section 2 suggests a pervasive long-run trend toward a reduced reliance on coal as a fuel for generating electricity that will continue to reduce the recovery of Appalachian coal for the foreseeable future. This changing pattern of coal use is affecting the local economies that currently depend on coal-related commerce and, from our perspective, will also measurably reduce the amount of coal-related freight activity. The questions are (1) where and by how much will coal traffic decline; (2) how will this reduced coal traffic affect the availability and pricing of remaining freight capacity; and (3) what (if anything) can and should the public sector do in response? We take up the first two questions here, while the third is discussed in Section 5.

THE FUNDAMENTAL ECONOMIC AND POLICY LANDSCAPE

Before launching into a detailed discussion of future coal activity in Appalachia, it is probably useful to revisit a few of the underlying fundamentals. These include:

- The pace of further reduced reliance on coal is likely to depend on (1) the speed with which existing coal-fired capacity can be retired and (2) the forcefulness of the domestic policies that encourage that decreased reliance.
- Both public sector transportation policy-makers and private sector freight providers will respond to a demand for less coal by altering the extent and nature of regional freight capacity.
- Appalachia's communities, states, and regional jurisdictions *can* affect the changes in freight transportation to ensure that these changes are consistent with other regional needs.

The first of these bullet points was discussed in Section 2. Coal-fired generating capacity comprises large and long-lived investments by electricity producers. These investments were made under the assumption that the corresponding facilities can generate revenues sufficient to pay for their construction, where payoff durations are measured in decades. Utilities must either operate these coal-fired facilities until they are paid for or write off the remaining value of facilities that are retired prematurely. In the latter instance, somebody (usually, rate-payers or investors) must incur a loss.

In spite of this financial reality, the pace with which the U.S. reduces its reliance on coal as a generating fuel is also a function of public policy and the speed with which voters wish to attain additional air quality improvements. Regardless of financial implications, utilities cannot ignore legal mandates.

The second point emphasizes the dynamic, interactive relationship that exists between coal producers, its users, and those who move it. Like coal-fired generating facilities, coal-reliant transportation capacity is, in many ways, long-lived, and adjusting this capacity to reflect an unforeseen decline in freight demands takes time.

Nonetheless, as described below, coal carriers have already begun to adjust operations and equipment fleets to reduced coal volumes. Changes to network infrastructure, while already somewhat evident, will come more slowly. Just as utilities hope to avoid stranding the cost of prematurely retired facilities, transportation providers would prefer to wear out coal-dependent investments rather than abandon them before they are paid for. This is particularly true for railroads that have invested private sector funds to create coal-dependent railroad networks.

Finally, while full descriptions of potential community, state, and regional responses are reserved for Section 5, we hope readers will be mindful that the long-run migration from a national reliance on coal may be inevitable, but the nature and effects of that migration's impacts on locally available freight transportation is something that communities can affect.

THE ONGOING TRANSITION AND ITS ALREADY OBSERVED EFFECTS

Figure 1 (Section 2) illustrates the decline in coal's share of total U.S. electricity generation and the corresponding increase in the share of electricity produced with natural gas. Table 5 provides similar data for total electricity output, along with estimates of the U.S. population. These data show that, not only did coal's share of production decline, but the total amount of electricity produced through coal also fell. While this reflects, to some degree, the reduced use of operable coal-fired plants, it more generally represents the full retirement of coal-fired facilities

Nationwide, nearly 21 gigawatts (GW) of coal-fired electricity generation was retired between 2009 and 2014, representing 6 percent of the U.S. coal-fired capacity. This this trend continues today, unabated.[14] In 2015, 94 coal-fired power plants closed, with the combined net summer capacity of 13,556 megawatts. Another 41 coal plants

[14] See *Union of Concerned Scientists*, "TVA Pulls the Plug on More Coal Plants; Others Will Surely Follow," November 18, 2013, http://blog.ucsusa.org/jeffdeyette/tvapullstheplugonmorecoalplantsotherswillsurelyfollow306

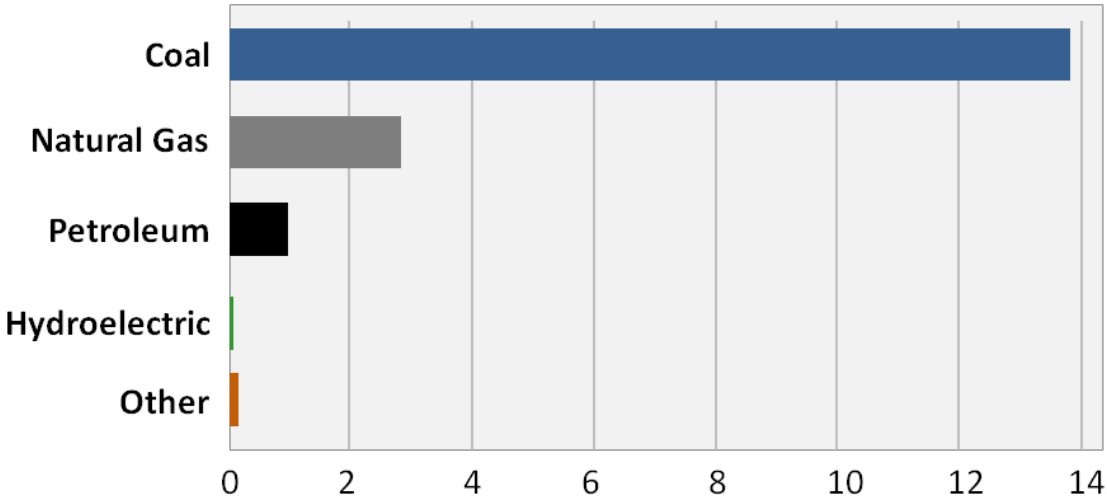
were scheduled to close in 2016, with a combined net summer capacity of 5,326 megawatts.[15] Figure 8 depicts 2015 generating facility retirements across generating sources.

Table 5 – U.S. Electricity Generation
(Thousands of Megawatts for Utility Scale Facilities)

YEAR	Coal-Fired	Natural Gas Fired	All Other Sources	Total (Utility-Scale Generation)	Estimated U.S. Population
2006	1,990,511	816,441	1,257,750	4,064,702	298,360,000
2007	2,016,456	896,590	1,243,700	4,156,746	301,230,000
2008	1,985,801	882,981	1,250,605	4,119,387	304,090,000
2009	1,755,904	920,979	1,273,448	3,950,331	306,770,000
2010	1,847,290	987,697	1,290,072	4,125,059	309,410,000
2011	1,733,430	1,013,689	1,353,021	4,100,140	311,770,000
2012	1,514,043	1,225,894	1,307,829	4,047,766	314,140,000
2013	1,581,115	1,124,836	1,360,013	4,065,964	316,540,000
2014	1,581,710	1,126,609	1,385,286	4,093,605	319,070,000
2015	1,356,057	1,335,068	1,396,255	4,087,380	321,560,000

Source: Energy Information Administration

Figure 8 – 2015 Generating Capacity Retirements
(Gigawatts)



Source: Energy Information Administration

[15] See Morning Consult, "Coal Plants Are Shutting Down, With or Without Clean Power Plan," May 3, 2016, https://morningconsult.com/author/jack/

THE OBSERVED TRANSPORTATION SECTOR RESPONSE

Transportation equipment is long-lived, but it is also mobile. Carriers can generally use equipment in other regions of the U.S. and can often use it for moving commodities other than coal. Consequently, the impacts of diminished coal traffic on equipment investments are less pronounced and of less concern here. The impacts of diminished coal volumes on the infrastructure that forms line-haul route segments and terminal facilities is far more important to long-run regional prosperity.

Further, as noted above, roadways and inland navigation infrastructures are largely provided by the public sector, where no financial return is immediately required. In this environment, policy-makers can more easily resist decisions to downgrade or abandon facilities regardless of commercial inactivity.

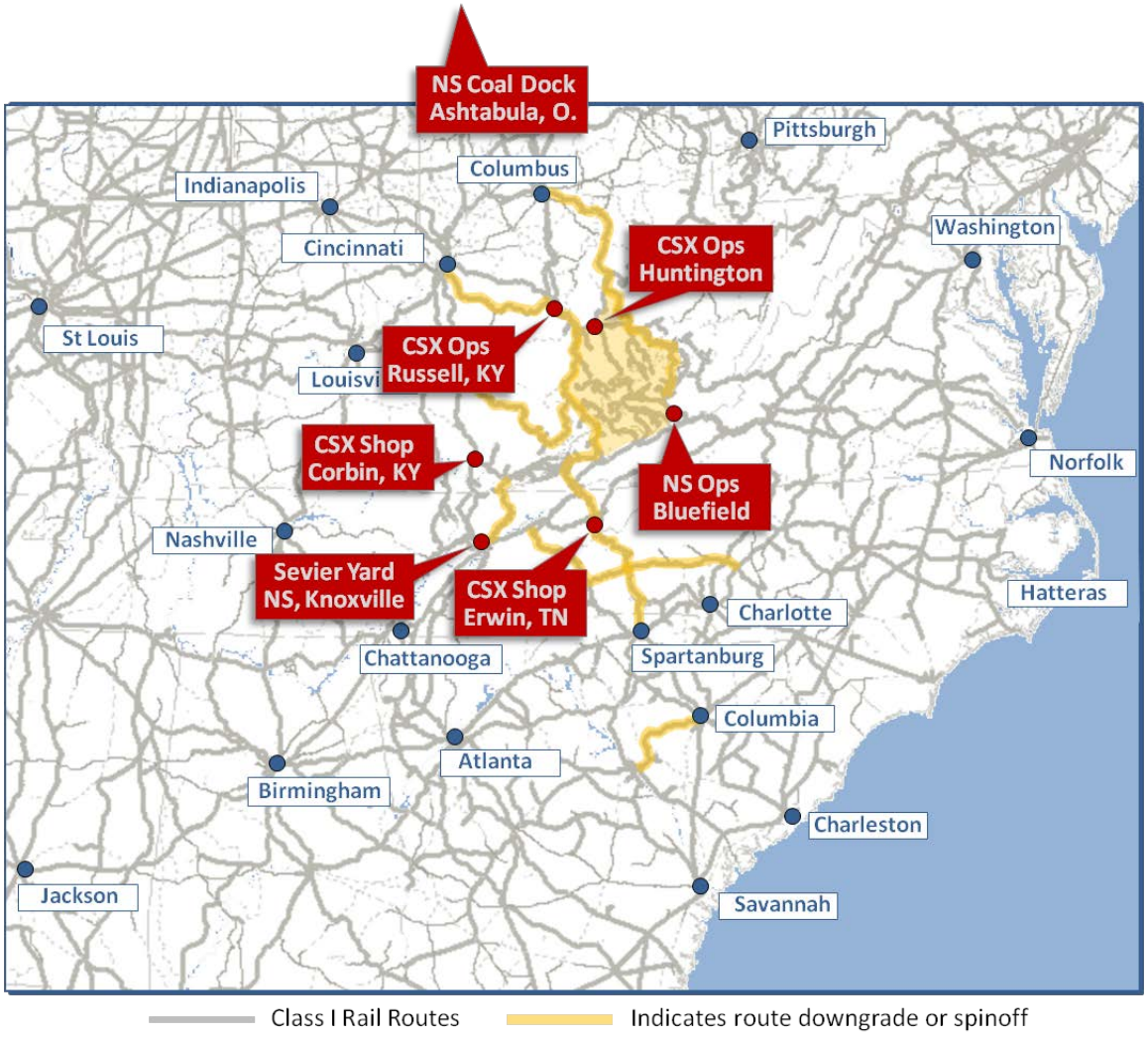
In the case of railroads, however, infrastructure is almost exclusively owned by private sector firms. Firms build, maintain, and operate both line-haul trackage and terminal facilities. These private investments must earn revenues for investors. This fundamental distinction makes railroads more sensitive to both ongoing costs and prospects for future traffic. Therefore, it is not surprising that the first evidence of diminished coal volumes emerged on Appalachia's railroads.

In the fall of 2015, seemingly without warning, both Norfolk Southern and CSX—the Region's two Class I railroads—began announcing a sequence of both operating and infrastructure changes in response to declining coal volumes. These actions included closing terminal and yard facilities in Ashtabula, Ohio; Bluefield, West Virginia; Corbin, Kentucky; Erwin, Tennessee; Huntington, West Virginia; Knoxville, Tennessee, and Russell, Kentucky. Additionally, many route segments throughout the Region were downgraded, services were curtailed, and in one case, a secondary mainline route was leased to a short-line operator (NS from Columbus to southern West Virginia). These actions are depicted graphically in Figure 9, which underscores that first-round cuts have been focused in Appalachia. In total, these changes led to the elimination or relocation of approximately 1,500 full-time positions.

Even ignoring further reductions in coal traffic, both CSX and NS are likely to undertake additional force reductions, route downgrades, and facility closures. As an example, in January 2016, NS announced its intentions to "dispose of" an additional 1,500 route miles by 2020.[16]

[16] See *Norfolk Southern*, "Norfolk Southern announces further details of its strategic plan to reduce costs, drive profitability, and accelerate growth," press release, January 27, 2016, http://www.nscorp.com/content/nscorp/en/news/norfolksouthernannouncesfurtherdetailsofitsstrategicplantoreduc.html

Figure 9 – Class I Railroad Response to Diminished Coal Traffic



Source: Center for Transportation Research

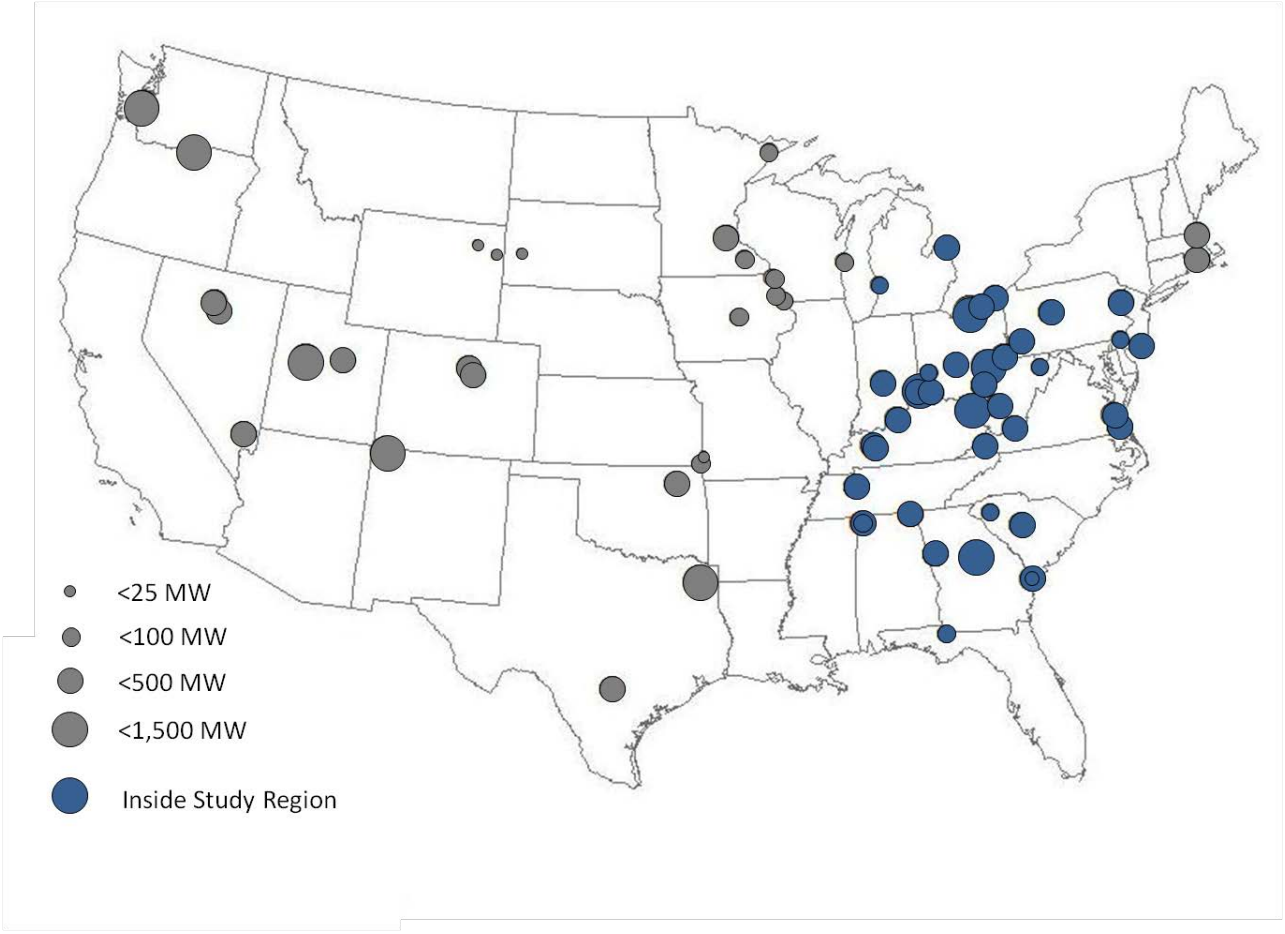
While the cuts depicted in Figure 9 imposed observable hardships on specific Appalachian communities, there is one highlight that should be noted. Both Norfolk Southern and CSX have downgraded route segments, reduced services, and closed facilities, but neither carrier has engaged in any action that cannot be reversed. More specifically, neither NS nor CSX has undertaken the abandonment of any track segment within the Region nor have they liquidated terminal facilities. This is a welcome contrast to the wholesale route abandonments evidenced in the mid-1980s in response to regulatory reforms.

PREDICTING THE FUTURE OF APPALACHIAN COAL PRODUCTION

Beginning with the Clean Air Act of 1970, Americans have shown a consistent preference for air quality improvements. Moreover, to the extent that burgeoning natural gas production makes it possible to reduce our reliance on coal-fired energy production without facing measurably higher electricity prices, the movement away from coal is likely to continue, regardless of U.S. environmental policy.

Figure 10 illustrates a sample of announced coal-fired facility retirements between now and 2036. For Appalachian coal, this tells much (but not all) of the foreseeable future story. The missing component is the volatile international demand for high-quality, bituminous metallurgical coal that, in the recent past, has consumed roughly 20 percent of Appalachian production.

Figure 10 – Announced Coal-Fired Plant Retirements (As of 2014)



Source: Energy Information Administration

Ultimately, the next two decades are likely to see a continuation of the trend in evidence since 2008 whereby domestic coal volumes fall by roughly five percent annually. In any given year, this trend may be reinforced or offset by the effects of international demands. However, there are no data with which to effect forecasts of this international activity.

Following this course and treating exports as constant at current levels, over the next 20 years, Appalachian coal production volumes drop by 55 percent (142 million tons) from their 2015 levels (252 million tons).[17] Presumably, demands for the freight movement of coal will follow this same pattern.

LONG-RUN IMPLICATIONS FOR REGIONAL FREIGHT MOBILITY

The steady decline in the demand for Appalachian coal and for its transportation will measurably diminish the total amount of freight transported to and from the Region.[18] In doing so, it also has the potential to influence the availability of freight services and the affordability of moving non-coal commodities. Evaluating this potential and exploring appropriate public sector responses is at the heart of our present work. In practice, truck, barge, and rail are often combined to move coal. However, for simplicity, we treat these modes separately here.

Motor Carriage

As noted above, when coal is to travel a modest distance and when volumes permit, it is often trucked directly between prep plants and utilities. In other cases, trucks are used extensively to move coal between mining areas and barge loading facilities.

Precise data on coal truck use are not available. However, using West Virginia as an example, the data in Table 3 suggest that roughly 35 million tons of coal moved outbound from that state by barge in 2014. Combining this figure with data describing rail movements suggests that approximately 60 percent of the West Virginia coal destined for barge transport reached the waterway by truck. This equates to 21.2 million tons annually. When the 2.4 million tons of utility-direct coal truck traffic are added, the resulting 23.6 million tons of West Virginia coal implies 1,000 loaded coal truck trips per day, six days a week, 50 weeks per year. Even so, in many parts of West Virginia, residents would argue this estimate is low.

[17] Here, we consider Appalachian coal to be all coal from Alabama, (eastern) Kentucky, Pennsylvania, Virginia, and West Virginia. Western Kentucky coal is excluded.

[18] In addition to coal traffic, the use of coal-fired plants that are scrubber-equipped also requires the inbound movement of substantial quantities of limestone. Finally, at least in some cases, rail and barge are used to move fly ash, outbound to disposal locations outside the region.

Consequently, to the extent that reduced coal volumes also reduce the use of coal trucks, Appalachia is likely to realize a net economic gain. While coal truck operations contribute fuel tax revenues to both the federal highway trust fund and to the individual states in which trucks operate, it is likely that the lost revenues from fewer coal truck miles will be less than the corresponding savings from reduced roadway and bridge spending. Moreover, because public sector provides roads and highways are shared by an array of users, it is exceedingly unlikely that reduced coal truck traffic will reduce the infrastructure available for non-coal freight transportation.

Commercial Navigation

Regionwide, Table 3 indicates that 113 million tons of (mostly) Appalachian coal used the inland waterway system to reach its destination in 2014. Even when we recognize that a portion of this total reflects the movement of Illinois basin coal, often to locations within Appalachia, it is clear that coal is the largest share of all waterway traffic in the Region. Based on lock volumes, coal's share of 2014 barge traffic exceeded 47 percent (Table 4).

Like the roadways, construction on the locks and dams that support commercial navigation is partially funded through user fees. However, the balance of construction expenditures (currently 50 percent) and all of operation and maintenance (O&M) dollars are appropriated from general funds.[19] Thus, waterway infrastructure must compete with other uses for federal resources. This means that periodically waterway-related efficiencies must be paired with corresponding federal expenditures to form benefit-cost ratios that are then compared to benefits and costs from other transportation and non-transport candidate projects.[20]

Because Ohio River and tributary infrastructure is largely complete and not generally in need of additional capacity improvements, the effects of diminished coal traffic on federal support are unlikely to come quickly. Even when a review does take place, declines in coal traffic will only threaten the viability of the Region's waterway resources if they are sufficient to make ongoing O&M expenditures unpalatable. The likelihood of this occurring on the main-stem Ohio is very small. However, system tributaries may be more vulnerable.

[19] For more information on inland waterway funding, see, Congressional Research Service, "Inland Waterways: Recent Proposals and Issues for Congress, May 3, 2013, https://www.fas.org/sgp/crs/misc/R41430.pdf

[20] For an extensive description of the waterway project evaluation process, see, Acadia Group, "Applying Benefit-Cost Analysis to Freight Project Selection: Lessons from the U.S. Army Corps of Engineers," December 2012, http://onlinepubs.trb.org/onlinepubs/ncfrp/docs/NCFRP22_FR.pdf

Table 6 provides 2014 tonnage values for Ohio system components and tributaries. These data indicate that traffic volumes on the Tennessee River is less dependent on coal traffic than the Ohio River and its

Table 6 – Coal's Share of Appalachian Navigation System Component and Tributary 2014 Traffic

Inland System Component and Tributaries	Number of Locks	2014 Coal Traffic (Tons in thousands)	2014 Non-Coal Traffic (Tons in thousands)	2014 Total Traffic (Tons in thousands)	Coal's Share of 2014 Traffic
Ohio Main-Stem	20	472,265	527,215	999,479	47.3%
Allegheny	8	3,452	1,381	4,833	71.4%
Green	2	13,558	610	14,169	95.7%
Kanawha	3	16,519	4,281	20,800	79.4%
Monongahela	9	43,422	11,493	54,914	79.1%
Cumberland	4	7,902	7,987	15,889	49.7%
Tennessee	9	16,254	53,452	69,706	23.3%
Black Warrior	4	-	82	82	-
Tenn-Tombigbee	10	281	8,818	9,099	3.1%

Source: U.S. Army Corps of Engineers

tributary waterway segments. Table 6 data indicate that between 71 percent and 96 percent of this tributary traffic is coal. However, readers should note that Green River coal traffic is almost exclusively Illinois basin (rather than Appalachian) coal.

Freight Railroads

Because railroads build, maintain, and pay property taxes on the route segments over which they operate and because they are subject to ongoing financial scrutiny, they constantly monitor forecasted traffic volumes and revenues. Route segments are routinely improved or downgraded based on their roles in generating economic returns. Over an intermediate time-frame, segments that do not contribute to earnings may be taken out of service to avoid maintenance costs. However, in the long-run, under-performing lines are eventually disposed of, either through sales or leases to other railroads, or through abandonment.

As the various maps within this report illustrate, the coal producing areas of Appalachia are blanketed with Class I railroad branch-lines. However, if the future production of Appalachian coal follows the path predicted here, many of these coal-dependent branches will disappear from future maps. Moreover, in most cases, this loss will not harm regional commerce. Without coal, a branch-line built exclusively to haul coal has little value when coal traffic disappears. However, the regional access afforded by secondary and primary mainline trackage is far more vital. These routes *do* carry non-coal freight to and from the Region. More importantly, the freight access these routes provide may help attract new commerce to the Region.

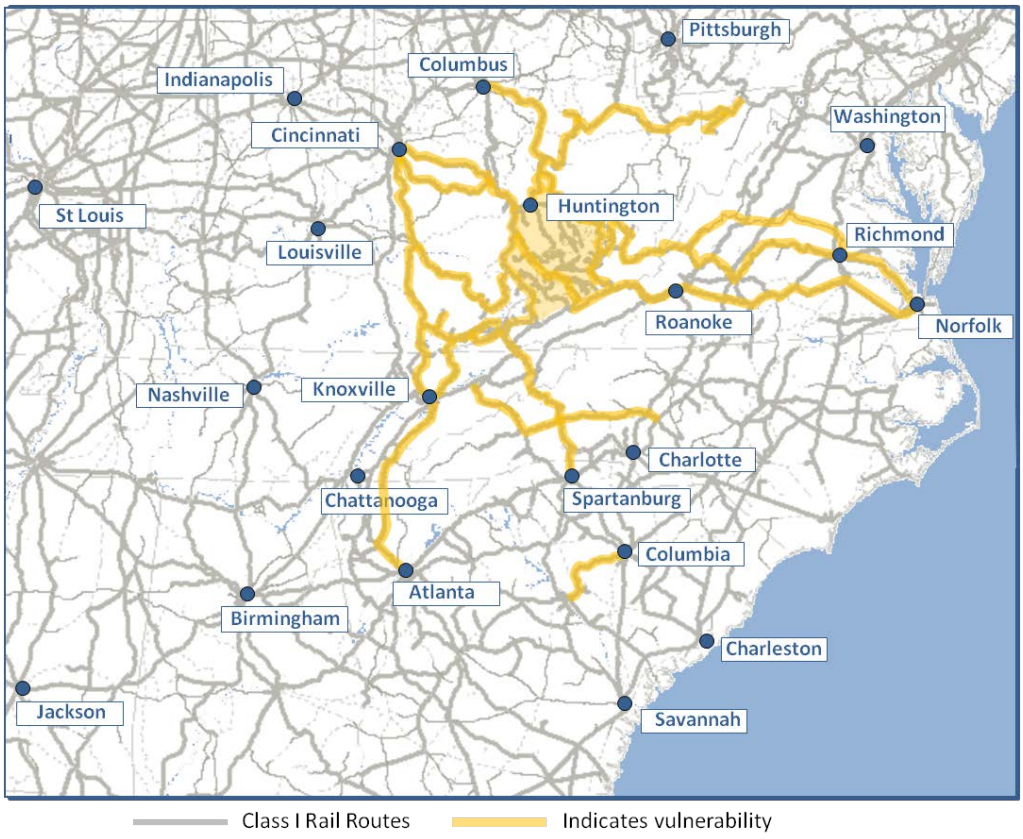
Railroad economics embody a number of unique characteristics, but the element that is most important here is referred to as "economies of density". Economies of density

suggest that unit costs – the cost per carload, car-mile, or ton-mile – decrease as larger amounts of freight traffic are concentrated onto a particular route segment. In railroading, these economies are seemingly inexhaustible.

Historically, robust coal volumes provided Appalachian rail routes with a great deal of traffic density, so that *all* traffic traveling these routes could be moved at relatively low unit costs. The loss of coal traffic and the desire to rebuild traffic densities is leading railroads to consolidate remaining traffic onto fewer routes where possible. For those routes where diverted traffic restores density, service quality and pricing may change very little. However, when network traffic is diverted *away* from routes, remaining customers are likely to observe less frequent service, diminished reliability, and (potentially) higher freight rates. It is consolidation that has prompted the system changes thus far. A desire for further consolidation will motivate further changes as coal traffic continues to decline.

When and where additional Class I trackage will be subject to downgrading or "disposal" is not entirely knowable. However, it is possible to identify route segments with futures that are, at least, vulnerable. Figure 11 includes the trackage already affected (Figure 9) and additional routes that may be subject to increasing pressure as coal traffic continues to decline. We emphasize that the inclusion of these routes is not based on any announced plans by either Norfolk Southern or CSX.

Figure 11 – Current or Potential Class I Retrenchments



Source: Center for Transportation Research

INCENTIVES FOR AND METHODS OF NETWORK "RATIONALIZATION"

"Network Rationalization" is a euphemism used for a freight provider's decisions to downgrade, sell, lease, or abandon unprofitable route segments, facilities, or operations. To evaluate possible "rationalizations," carriers must simultaneously consider large volumes of information describing the freight traffic generated locally along each candidate route segment or facility, and the role that each smaller network part plays in accommodating the whole of system-wide traffic. Generally, the ideal freight network exactly balances the benefits gained by reaching more customers in more places against the economies that result from operating smaller networks and densely packing as much traffic as possible onto fewer route-miles.[21]

Network rationalizations are essential to the management of all freight modes. However, because railroads own the networks over which they operate, the incentives and scope of possible actions are both greatest for this mode. Moreover, railroad capital is long-lived, so that railroad managers making decisions about what

[21] Not surprisingly, these economies are referred to as Economies of Density which is the spatial analogue of the more commonly known Economies of Scale.

to keep and what to relinquish must evaluate current conditions *and* also predict the *future* value of each candidate route segment or facility. The overall process is full of uncertainty. Thus, carriers across all modes have learned that there is often value in postponing decisions on route disposition or considering alternatives that can later be reversed.[22]

Among the possible carrier actions, there are at least four choices. Faced with a need for change, a Class I railroad can (1) continue service along a route, but downgrade the capacity of that route; (2) leave the route in place, but discontinue service; (3) voluntarily sell or lease the subject route segment to another Class I railroad or to a short line, or; (4) relinquish all interest in a line through abandonment. Moreover, in the event the railroad seeks to abandon a railroad line, the law provides ways for affected jurisdictions to intervene in the disposition of the abandoned route even if the owning railroad's application for abandonment is approved.

Three of these four actions are reversible by the owning railroad. A route that has been downgraded can be restored to any desired capacity. Routes taken out of service can be returned to service. And if control over a route is ceded to another railroad through lease or sale, the lease can be terminated, or the line (at least, potentially) can be repurchased. While each of these reversals entail varying degrees of expense, it is only the final option—route abandonment—that cannot be undone.

Downgrading a Rail Route

Railroads can appreciably reduce maintenance costs by downgrading the level of performance expected from lesser-used routes. At least as an interim measure, this strategy can be an effective way of trimming costs without sacrificing long-run alternatives.

A rail route's capacity is determined by the nature and extent of its physical characteristics – the number, alignment, and quality of mainline tracks; the length and spacing of sidings; the severity and frequencies of curves and grades; and the signal system(s) used to control train operations. In addition to designing and constructing track that will support a specific level of intended use, railroads must also maintain route segments based on prescribed federal standards that are (partially, at least) correlated to that planned use.

Specifically, the Federal Railroad Administration (FRA) divides rail infrastructure into six classes.[23] When a railroad designates an intended class for a particular piece

[22] In the world of economics and finance, integrating the value of retained flexibility into decision-making processes is rooted in Real-Options theory. For an application of this construct in a railroad setting see, Mark Burton and Charles Sims, "Understanding Railroad Investment Behaviors, Regulatory Processes, and Related Implications for Efficient Industry Oversight," *Review of Industrial Organization*, September 2016.

[23] There are actually five track classes, plus a category known as "exempted" track. For a full description see, *Track and Rail and Infrastructure Integrity Compliance Manual*, Volume II Track Safety Standards, Chapter 1: Track Safety Standards Classes 1 through 5, Federal Railroad Administration, January 2014.

of track, it becomes responsible for ensuring the track and supporting structures meet the FRA standards associated with that designated class. It follows that, if a railroad wants to reduce maintenance-of-way expenditures for a route segment, it must sometimes reclassify that segment to reflect a reduced level of expected performance. In the current setting, the most likely reclassification is from Class 3, where the maximum allowed freight trains is 40 m.p.h., to Class 2, where the maximum freight train speed is capped at 25 m.p.h. As an example of this approach, Norfolk Southern has recently downgraded its route between Asheville and Salisbury, North Carolina from Class 3 to Class 2.

Service Discontinuance or Line Abandonment

From a legal standpoint, any shipper located along an active rail line operated by a railroad common carrier can demand transportation services from that carrier. A railroad has only two ways to avoid this obligation. It can completely abandon the rail route in question or, as an alternative, it can apply for a regulatory *service discontinuance*. While the administrative processes for these paths are similar, the outcomes are quite different. In the case of a service discontinuance, the railroad retains ownership, must leave the infrastructure in place, and is obligated to restore service if conditions warrant doing so. If the railroad abandons the subject trackage, it relinquishes all claims to the right-of-way and opportunities for service restoration.[24]

In both the case of a service discontinuance or an application for abandonment, the final decision rests with the Surface Transportation Board (STB). If there has been no local freight activity along the line for two years or more, the process is more or less automatic. However, any party with a legitimate interest can express those interests with the STB's evaluation process. Moreover, the governing statutes promote the accommodation of shippers or local jurisdictions that can (a) arrange for a service alternative through external subsidies or a line sale or (b) preserve the existing right of way through a "trails" initiative.

Selling or Leasing a Route to Another Railroad

In the last quarter of the 20th century, rail industry regulatory reforms were capped by the *Staggers Rail Act of 1980* and are directly credited with a surge in short-line activity. After peaking at approximately 700 prior to World War II, the number of U.S. short-lines fell to roughly 200 by 1980.[25] However, the Staggers-related changes to abandonment processes led to a burst in Class I branch-line spinoffs. Babcock et

[24] For a detailed description of the abandonment or service discontinuance process see, Surface Transportation Board, *OVERVIEW: Abandonments & Alternatives to Abandonments*, April 1997. For a more community oriented description of the same processes, see Duane J. Rosa, "Economic Impact Of "Railroad Line Abandonment On Regional And Urban Areas: A Case Study," *Journal of Business Case Studies* – Second Quarter 2014 Volume 10, Number 2, pp. 147-54.

[25] See Fischer, et al (1981).

al. (1997) indicate that 227 new short-line railroads were formed between 1980 and 1989.[26]

The short-lines formed in the decades after Staggers have faced various fates. Many of the Staggers-related short-lines prospered, while others did not. Some of the smallest short-lines of the 1980s and 1990s were combined with other short-lines or acquired by holding companies, and some were reabsorbed by the Class I railroads that divested them or by competing Class I's.

In a sense, the fact that not every short-line railroad prospers is irrelevant. In a time of tremendous structural change, the short-line alternative allowed Class I railroads to make badly needed reductions to their large, multistate networks, while simultaneously allowing communities to preserve railroad network access. In some cases, this preservation ultimately may have proven unnecessary, but in other cases, the continued rail access afforded through short-line development has had very visible economic impacts.

Short-lines clearly play a prominent role in Appalachian rail network access. The scope and scale of the Region's short-line railroads are summarized in Table 7. To a large degree, the amount of short-line activity within any given state reflects the magnitude and nature of the freight traffic left behind in the wake of Class I railroad route rationalizations. However, the strength of local and state-level programs has also affected the extent of short-line activity in the various Appalachian states.

Table 7 – Appalachian Region Short-Lines

State	Short-line Miles	Number of Shortlines	Average Length
Alabama	295	8	36.9
Georgia	123	4	30.8
Kentucky	196	2	98.0
Maryland	52	2	26.0
Mississippi	280	6	46.7
North Carolina	90	2	45.0
New York	256	6	42.7
Ohio	1,768	10	176.8
Pennsylvania	1,176	15	78.4
South Carolina	102	3	34.0
Tennessee	289	12	24.1
Virginia	175	1	175.0
West Virginia	657	12	54.8
TOTAL/AVERAGE	**5,459**	**83**	**65.8**

Source: Center for Transportation Research

[26] For a further, popular discussion of Staggers and short-line railroads, see Stagl (2008).

Many of today's 550-plus short-lines were spun-off from Class I railroads. A smaller number have never been directly controlled by larger railroads and are a throwback to the 19th century industry structure. However, regardless of their histories, a large number of America's short-lines are currently owned by and organized within holding companies that often operate properties in widely disparate geographic regions. Holding companies generally manage short-lines in ways that retain a localized focus and small-scale cost advantages, while simultaneously pursing the large-scale procurement, equipment management, and human resources advantages more typically associated with Class I railroads. Holding company activity within the Appalachian Region is summarized in Table 8.

Table 8 – Short-Line Holding Company Presence in Appalachia

Owning Entity	Short-line Miles	Number of Shortlines	Average Length
Genessee & Wyoming	1,415	14	101.1
Gulf & Ohio	73	2	36.5
Iron Horse Resources, Inc	59	1	59.0
OmniTRAX	120	1	120.0
Paducah & Louisville / CSX	158	1	158.0
Patriot	128	2	64.0
Pioneer	132	3	44.0
Public Sector	218	4	54.5
RJ Corman	407	3	135.7
Watco	765	4	191.3
TOTAL/AVERAGE	**3,475**	**35**	**99.3**
Percent of Total	**(63.7%)**	**(42.2%)**	**(151.0%)**

Source: Center for Transportation Research

Five PUBLIC SECTOR RESPONSE

For more than a generation, the efficient movement of freight has been an increasingly prominent goal within the federal legislation that guides regional, state, and local transportation policies.[27] In many ways, however, the resulting federal statutes simply codify and encourage a freight focus that has existed in Appalachia far longer. For more than 50 years, the thirteen states that combine to

INLAND OPPORTUNITIES FOR ALTERNATIVE USE

The continuing emergence of global trade and corresponding congestion at and near coastal deep-draft ports has led to the development of "inland" ports throughout Appalachia. Depending on specific commercial needs, facilities take many forms.

The truck-rail inland ports at Front Royal, Virginia; Greer, South Carolina; Prichard, West Virginia; and (soon at) Chatsworth, Georgia are relatively small-scale, traditional intermodal terminals designed to efficiently extend the reach of larger coastal ports into Appalachia. The cross-dock operation at Somerset, Kentucky provides affordable all-rail access to inland producers who would lack this access otherwise. And, finally, the hybrid intermodal facility at Huntsville, Alabama effectively combines freight rail, trucking, and international airfreight services into a single, robust transportation setting.

Regardless of their specific form and function, these forward-looking inland ports provide two important benefits the regions they serve. First, within the current context, these facilities are a revenue-rich source of alternative freight activity that can preserve and improve traffic densities within railroad corridors where coal volumes are declining.

Second, and perhaps more importantly, the development of inland port facilities can level the transportation playing field for Appalachian producers and product distributors who would otherwise be disadvantaged by higher transportation costs and less reliable freight services. This way, efforts to preserve rail freight capacity by increasing the demand for non-coal freight movement can be made completely consistent with related economic development efforts.

[27] In 2005 the *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users* (SAFETEA-LU) introduced "projects of national and regional significance" which openly embraced freight initiatives, including the *Heartland Corridor*. In July of 2012, President Obama signed a two-year transportation reauthorization bill, the Moving Ahead for Progress in the 21st Century Act (MAP-21) that built on SAFETEA-LU by providing incentives for states to develop statewide freight plans and strongly encouraging the development of state-level freight advisory committees. Finally, the most recent federal surface transportation bill, *the Fixing America's Surface Transportation* (FAST) *Act* requires states to develop freight planning and statewide freight advisory committees.

Norfolk Southern intermodal operations near Greer, South Carolina

First airfreight flight from Huntsville, Alabama to Brazil

form the Appalachian Region have both individually and collectively promoted freight mobility as a way of developing and sustaining critical regional commerce. While these state-level initiatives have certainly embraced the *Appalachian Development Highway System* (ADHS), they have also toppled modal silos by promoting multimodal strategies that link highway transport with inland barge transportation and freight railroads. Against this backdrop, the freight challenges tied to a diminished reliance on coal, while unwelcome, are not insurmountable.

The purpose of the current section is to help policy-makers identify and plan strategies for assuring continued affordable freight rail access. While the information provided is generally targeted at state-level policies, there are numerous examples where sub-state jurisdictions have worked successfully to preserve freight access and, in doing so, have created economic opportunities that would have otherwise been unavailable. As appropriate, we provide examples of these sub-state level efforts. At the same time, the current setting is one in which affected rail line segments often span more than one state. Therefore, we also consider the opportunities for and barriers to multi-state initiatives.

Finally, public sector efforts to support freight access almost always require close public-private cooperation. Developing this cooperation in a railroad setting is sometimes difficult. Thus, we offer examples of best practices that have proven useful in the past.

PUBLIC SECTOR TOOLS[28]

Railroads have incentives for and well-tested ways of responding to economic change. Similarly, the public sector has means to guide railroad behaviors and help communities adapt to those changes. Many of the paths for public sector response are available through state sponsored rail programs. However, in some cases, federal resources and assistance from entities like ARC are uniquely valuable.

[28] Materials in this section are largely drawn from, *Tennessee's Short-Line Railroads: Programs, Policies, and Perspectives*, Center for Transportation Research, The University of Tennessee, 2016.

State-Sponsored Rail Programs

Statewide programs affecting freight vary considerably across the Appalachian Region. The scale, scope, and orientation of state-level transportation and economic development efforts differ by state, based on contrasting demographics, economics, and state-specific goals. This makes "apples-to-apples" comparisons of potential post-coal strategies difficult. Still, some form of cross-state reference is useful.

A forthcoming Transportation Research Board publication contains an extensive description of state-level rail programs for all 50 states. We summarize a subset of that information here in Table 9. These data include 30 states that have ongoing rail programs applicable to short-line railroads, eight of which are located within the Appalachian Region.[29]

Of the roughly 30 states included, 28 have short-line-applicable programs that can only be used in support of capital expenditures. There is, however, some variation in whether resources can solely be used to rehabilitate or improve existing facilities or whether these resources can also be used to expand network extent. From an eligibility standpoint, roughly two-thirds of the programs allow independent shippers or sub-state jurisdictions (like local rail authorities) to serve as program recipients and, surprisingly, more than one-quarter (27 percent) of the programs do not exclude Class I railroads from applying for program support.[30] Of the freight-applicable programs, 77 percent can also be used to support passenger rail projects.

Of this subset of state rail programs for which short-line freight carriers qualify, roughly tw0-thirds provide funding through grants; two-thirds provide loans through revolving infrastructure funds or offer guarantees; and nearly two-thirds have programs that extend both forms of financial support. Most grant programs simply require non-state matching funds from participants. Generally, the matching shares range between 10 and 25 percent. However, a significant portion of the states represented in Table 9 (27 percent) require that participants provide a match between 50 and 100 percent.

Two additional results of the cross-state comparison that are not apparent from the summary provided in Table 9 are, nonetheless, worth noting. First, the magnitude of the short-line support extended by Appalachian states appears to be greater than evidenced in many other states. This result is particularly true when funding is expressed on a per track-mile basis. Second, many other (though certainly not all)

[29] This table excludes information for California, Florida and Texas and those states that do not have ongoing programs that are clearly available to Class III freight railroads. In making this judgment, we excluded grade-crossing improvement programs from consideration.

[30] We do not have information that would indicate whether or not Class I railroads have successfully applied for program support.

state programs now base distributions on the results of formal benefit-cost estimations.

Table 9 – Indicators for State-Level Short-Line Programs

State	Class III Only	Class I Allowed	Shipper Other	Grants	Loans	Tax Credit	>50% Match	Freight Only
Arkansas		■	■		■	■		■
Delaware	■			■				■
Florida	■			■				■
Georgia	■			■				
Idaho			■		■			
Illinois		■	■		■			■
Indiana		■		■				
Iowa			■	■	■		■	
Kansas		■	■		■			
Maine		■	■	■			■	
Maryland			■	■				
Massachusetts		■	■	■			■	
Michigan		■	■		■		■	
Minnesota		■	■	■	■			
Mississippi		■	■	■				
Missouri	■				■			
Montana		■	■		■		■	■
New Hampshire	■			■	■			
New Jersey		■	■	■				■
New York		■	■	■	■			
North Carolina	■				■		■	
North Dakota			■		■			
Ohio		■		■	■		■	
Oklahoma	■			■				
Oregon			■	■	■		■	
Pennsylvania		■	■	■	■			
South Dakota			■		■			
Tennessee	■			■				
Virginia			■	■	■			■
Wisconsin		■	■	■	■			

Source: Center for Transportation Research

Federally-Sponsored Rail Programs

Currently, there are, at least, seven active (or inactive) federal programs that may be useful to Appalachian communities that seek to preserve or enhance rail freight access. Four of these programs are available throughout the U.S. The remaining three programs are administered specifically by ARC. The seven programs include:

- The LOCAL RAIL FREIGHT ASSISTANCE (LSRA) program inactive grant program;
- The RAILROAD REHABILITATION AND IMPROVEMENT FINANCE (RRIF) loan program;
- The TRANSPORTATION INFRASTRUCTURE FINANCE AND INNOVATION (TIFIA) loan program;

- The TRANSPORTATION INFRASTRUCTURE GENERATING ECONOMIC RECOVERY (TIGER) non-recurring grant program;
- The ARC's AREA DEVELOPMENT FUND grants;
- ARC's INDUSTRIAL ACCESS ROAD PROGRAM, an ongoing grant program; and
- The joint ARC-EDA PARTNERSHIPS FOR OPPORTUNITY AND WORKFORCE AND ECONOMIC REVITALIZATION (POWER) non-recurring grant program.

The Local Rail Service Assistance (LRSA) Program was established by the Regional Rail Reorganization Act of 1973 to provide financial support to states for the continuation of rail freight service on abandoned light density lines in the Northeast. The *Railroad Revitalization and Regulatory Reform Act* of 1976 expanded the program to all states. The program was reauthorized in 1989 and renamed the Local Rail Freight Assistance (LRFA) Program.[31] In 1996, legislation was introduced to abolish this program (H.R.2216). However, no action was taken, so that the program, while inactive, exists.

The RRIF program was established by the Transportation Equity Act for the 21st Century (TEA-21) and amended by the Safe Accountable, Flexible and Efficient Transportation Equity Act: a Legacy for Users (SAFETEA-LU). Under this program the FRA Administrator is authorized to provide direct loans and loan guarantees up to $35 billion to finance development of railroad infrastructure. Up to $7 billion is reserved for projects benefiting freight railroads other than Class I carriers.

Direct RRIF loans can fund up to 100 percent of a railroad project with repayment periods of up to 35 years and interest rates equal to the cost of borrowing to the government. Eligible borrowers include railroads, state and local governments, government-sponsored authorities and corporations, joint ventures that include at least one railroad, and limited option freight shippers who intend to construct a new rail connection.[32] As of 2015, less than one-third of the $2.7 billion in RRIF loan approvals were for freight-oriented projects. The balance has been for passenger projects that typically have included a large public-sector participant.[33]

The TIFIA program's primary objective is to encourage public-private infrastructure endeavors and, thereby, fill existing funding gaps while limiting federal exposure. The program imposes minimum project threshold amounts of $10 million for transit projects, $15 million for intelligent transportation systems (ITS), and $50 million for all other eligible projects, which include a variety of areas applicable to short-line creation, rehabilitation, and improvements.

Like the RIFF program, TIFIA imposes a number of responsibilities on applicants. TIFIA credit assistance is limited to 33 percent of total project costs; TIFIA loan must receive investment grade ratings from at least two nationally recognized credit rating agencies;

[31] Text is drawn directly from the FRA. See, www.fra.dot.gov/Page/P0225

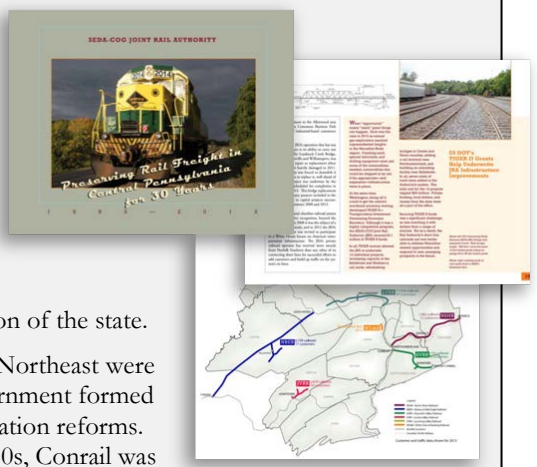
[32] Text is drawn directly from the FRA. See, www.fra.dot.gov/Page/P0128

[33] CRS (2015, p. 13.)

and applicants must demonstrate the availability of a dedicated repayment revenue stream.[34]

As one of the most popular currently available federal grant programs, the TIGER program was initially designed as a federal response to the economic recession of 2007-2009. Since its inception, TIGER, now with its eighth round completed, has provided nearly $4.6 billion to 381 projects in all 50 states. At least a small number of these grants have been for short-line railroads or projects with a significant short-line component. Like the loan-based TIFIA program, TIGER grants seek to leverage private sector funding. The 2015 TIGER round alone has leveraged $500 million in federal investment to support $1.4 billion in overall transportation investments.[35]

LOCAL ACTION: THE SEDA-COG EXAMPLE



Much of the current discussion is centered on state-level rail policies. However, assuming that state policies are accommodating, it is certainly possible for sub-state jurisdictions to act to preserve rail freight access. While this form of intervention is evident in several Appalachian states, one of the best and earliest actions involved Pennsylvania's SEDA-Council of Governments (SEDA-COG), an organization of 11 counties in the central portion of the state.

Very simply, in the mid-1970s, railroads in the Northeast were in financial crisis. In response, the federal government formed the Conrail system and enacted other transportation reforms. As federal regulations were eased in the early '80s, Conrail was free to abandon unprofitable rail lines, some of which were in Central Pennsylvania.

Faced with probable abandonments, and little outside help, local leaders settled on a novel but risky alternative – the purchase and control of the subject rail lines. SEDACOG was interested in four specific segments — one from Northumberland to Berwick, and three shorter lines in Centre County. In combination, these lines served 21 industrial customers along 80 route miles.

Undertaking the purchase and control was an exacting process involving traffic analyses, market forecasts, and cost determinations. To execute these tasks and to acquire necessary funds, leaders formed the SEDA-COG Joint Rail Authority, an autonomous entity responsible for public oversight of the soon-to-be-acquired rail lines.

In the years to follow, those responsibilities were increased. Funds were needed to maintain and improve the lines, and additional lines were purchased, ensuring continued rail service in other parts of the region. A solid working relationship was developed between the Authority and the private operator it had chosen to operate trains and serve shippers on the lines.

[34] See https://www.transportation.gov/tifia/tifia-credit-program-overview

[35] See https://www.transportation.gov/tiger

While particularly popular, the TIGER program is extremely competitive, with an application success rate of 2.9 percent. Indeed, experience suggests that virtually no TIGER applications succeed as a result of their initial submission. The application process includes the formal development of a benefit-cost analysis based on USDOT methods and standards. In this way, the TIGER program has become a test ground for the development of BCA criteria that are now applied more broadly throughout both federal and state grant programs. There is no dedicated source of TIGER program funding nor any guarantee of subsequent grant rounds.

Currently, ARC operates three grant programs that could potentially serve as resources for the Region's short-line railroads. The first of these is the Commission's traditional Area Development Fund (ADF). ADF initiatives are developed and administered locally within ARC development districts and can be used for a wide array of specific facilities and activities aimed at improving economic conditions and generating employment.

ARC provides transportation assistance through its *Local Access Road* program. Grants under this program are recurring and may be used to develop roadway infrastructure that connects a potential industrial location to the greater transportation network. The second (non-recurring) grant program is ARC's POWER initiative. Grant funds under this program are intended to offer economic relief to areas within the Appalachian Region that are currently suffering economic consequences associated with the national trend of reduced coal consumption.

BEST PRACTICES AND LESSONS LEARNED

As noted already, diminished coal volumes are unlikely to immediately impact roadway and waterway infrastructure availability, at least within the short-run. However, communities wishing to maintain affordable freight rail access may be called on to act quickly and with very little advance warning. Therefore, anticipating future challenges and understanding how to effectively use available resources are important preparatory steps.

General Best Practices: Statewide Freight Plans

The most recent federal surface transportation bill, the *Fixing America's Surface Transportation* (FAST) *Act* continues to require that states develop statewide rail plans and that these plans be approved by the U.S. Secretary of Transportation.[36] In this light, every state should have available basic information describing the nature and extent of railroad infrastructure, carrier operations, and traffic composition. In addition to collecting and updating this information, states may wish to include freight plan elements that:

[36] See 49 U.S. Code § 22702 as amended by Pub. L. 114–94, div. A, title XI, § 11315(a)(1), Dec. 4, 2015, 129 Stat. 1674.)

- Preserve the railroad infrastructure footprint, if at all possible;
- Support quick (if not automatic) state responses to potential abandonments;
- Create or identify potential sources of funding; and
- Integrate rail planning as fully as possible into broader statewide freight planning and plans for economic development.

Experience shows that, once lost, the railroad "footprint" is difficult (or often impossible) to recreate. Moreover, while retaining rights-of-way is essential to rail capacity preservation, the ability to restore service to an inactive route may also depend on the presence and condition of the infrastructure on that right-of-way. This is particularly true of tunnels, bridges, and other infrastructure components. North Carolina's program for retaining abandoned trackage is exemplary in this regard.[37]

It is also important that states be prepared to act quickly in the face of potential abandonments. Federal reform legislation of the 1970s and 1980s included provisions that diminish the duration of abandonment proceedings. Moreover, railroad owners are not generally compelled to discuss system rationalization plans prior to executing them. Thus, it is easy for both on-line communities and state authorities to be surprised by proposed abandonments.[38]

Next, if short-line railroads share any common attribute, it is that they are financially fragile. Accordingly, states that choose to actively rely on short-lines as a means of preserving railroad capacity must be prepared to either provide direct financial assistance or, at the very least, provide sub-state jurisdictions with the legal authority and technical support necessary to pursue non-state funding for short-line acquisition, rehabilitation, and operations.

Finally, based on our experience, state rail policies are most effective and most easily executed when the role of rail freight within broader state programs is well understood. This is particularly important when states are faced with fairly sudden preservation decisions that must be met with a yes or no.

Corridor Initiatives

Roads, railroads, and waterways follow common geographic paths that combine to form transportation corridors within and between regions. Like threads linking beads in a strand, these corridors connect the economic interests that are common to the communities they serve. For this reason, these corridors provide natural organizational and planning opportunities for individual communities. Moreover,

[37] For example, North Carolina purchased and nominally maintains a 14 mile segment of the former "Murphy Branch between Andrews and Murphy, NC. In the event that these communities ever wish to restore rail service, this state action will likely prove to have been quite valuable.

[38] Accelerated abandonment processes were components of both *the Railroad Revitalization and Regulatory Reform (4R) Act of 1976* and *the Staggers Rail Act of 1980*.

the substantial economic and political resources of unified corridor initiatives often yield powers that would be less available to individual communities.

Within Appalachia, leaders and planners have identified numerous transportation corridors which are typified by the *I-81 Corridor* that links communities from southern Pennsylvania, Maryland, West Virginia, Virginia, and Tennessee.

Public-Private Partnerships

Nearly every productive rail freight preservation initiative has coupled public sector and private sector interests. There are indisputable gains achievable through public-private partnerships. Unfortunately, effectively blending public and private interests also imposes challenges that generally do not exist when a project lives wholly in one sphere or the other. Public-private partnership challenges are generally traceable to differing outlooks. Common sources of friction are often traceable to:

- Substantially different objectives;
- Differences in time horizons;
- Differing perspectives on risk or uncertainty; and
- Vastly different administrative practices and constraints;

Private sector participation is generally motivated by anticipated profits. Thus, while private sector partners may be mindful and proud of the partnership's community or regional value, their first concern and most binding constraint is their ability to earn returns on required investments. Absent this ability, the partnership will not succeed. Public sector motives may be more diverse and can include the retention or attraction of new commerce, local, regional or state fiscal implications, environmental outcomes, etc. These divergent motives complicate strategies and often imply vastly different time horizons for project partners.

Next, the issue of risk can challenge the viability of proposed public-private partnerships. For private sector participants, risk has very clear and understandable meaning and, in the extreme, can endanger commercial viability. On the public side of most partnerships, the downside consequences of poor project performance typically imposes less dire financial or fiscal penalties. In general, private sector partners will argue that public sector entities are better able to withstand unfavorable financial results and, therefore, can improve overall project performance by assuming a disproportionately large share of project risks. However, even if this assumption is true from a financial perspective, the associate political consequences can breed reluctance on the part of would-be public sector participants.

Finally, private sector participants and public sector entities conduct routine business very differently from one another. Private sector administrative processes are generally far more streamlined, so that larger decisions can be made and acted upon for quickly. On the other hand, private sector participants are also used to

acting confidentially. For their part, most public sector entities must sacrifice flexibility, speed, and stealth in order to achieve requisite transparency and public confidence. These administrative differences can lead to very different expectations and considerable frustration on both sides of a public private partnership. Ultimately, to succeed, both public sector and private sector participants must compromise and accept a project path that is, to some degree, foreign and uncomfortable.

A PARTNERSHIP FOR THE *HEARTLAND*

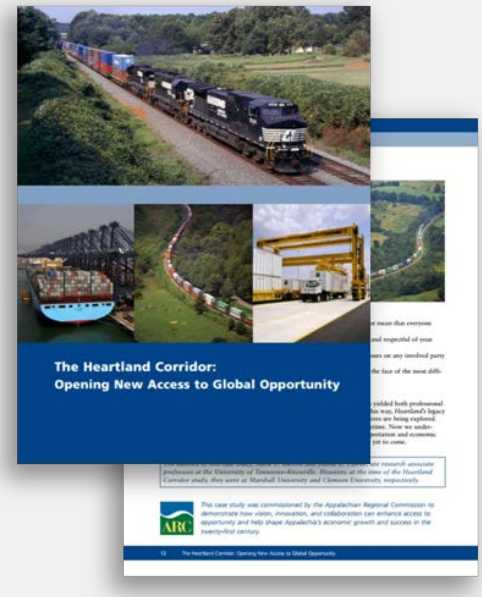
Accommodating economic change while preserving and enhancing freight capacity can require partnerships that span many jurisdictions and both public and private sector interests. Affecting timely change in this sort of highly diverse environment brings a new set of challenges. However, the requisite extra effort can also yield significant rewards. Few projects exemplify this tradeoff better than Appalachia's *Heartland Corridor*.

In 1999, the ARC funded an intermodal study through Marshall University. The study documented the extent to which a lack of intermodal access disadvantaged many communities in the heart of Appalachia. The study outcome struck a resounding chord with regional business and economic development interests, as they recognized the economic and employment potential of the emerging global marketplace.

At the same time, leaders at Norfolk Southern Corporation (NS), encouraged by the rapid growth in international container traffic at the ports in Norfolk, Virginia, were anxious to explore infrastructure improvements that would accelerate the railroad's growing role as a national force in intermodal transport.

The resulting initiative, ultimately known as the *Heartland Corridor* created a new double-stack-cleared container route from the Virginia Port Authority's marine terminals in Hampton Roads through the heart of West Virginia to the logistics park at the Rickenbacker International Airport in Columbus, Ohio, and on to the Midwestern industrial heartland.

This was an interdisciplinary effort driven collectively by transportation, economic development, and international trade interests, as well as an intermodal vision bringing together highway, rail, maritime, and aviation professionals. It required inter-jurisdictional cooperation, extending over 677 miles, involving three states, and the federal government. And, finally, success required carefully navigating the often varied needs and expectations of its public and private-sector partners.



From its inception in 2001 to the launch of the first high-speed double-stack trains in 2010, *Heartland* has been a testament to vision, persistence, and collaboration. It is a half-billion-dollar investment that has increased transportation capacity and efficiency, enhanced global competitiveness, and offers new economic and employment opportunities in Central Appalachia.

Six FINAL THOUGHTS

For more than a decade, the accelerated transition of electricity generation from coal to alternative fuels combined with cyclical, but trenchant, international market downturns to produce a rapid decline in Appalachian coal production and a corresponding decrease in coal-related transportation activity. As expected, portions of this calamitous decline were transitory and there is a sense that, at least for now, the worst of the coal-related shocks have passed. Still, 2015 will likely stand as a watershed year, marking a lasting change in the relationship between coal, commerce, and Appalachian life.[39]

The fundamental forces that launched the 2015 declines have not abated. Thus, the current lull in coal's declining importance—and we believe it is that—is a valuable opportunity to calmly and thoughtfully plan a coordinated, ongoing response to ongoing structural economic change. For us, this has meant examining the initial effects of diminished coal production on the availability and affordability of freight transportation and exploring if and how communities can preserve freight capacity.

The effects of reduced coal production were ubiquitous across transport modes. Hundreds of daily truck movements ceased and coal movements by barge fell by one-third. Still, the greatest visible transportation effects were on the region's railroads, where similar reductions in coal volumes combined with private network ownership to prompt facility closures, sharp workforce reductions, the curtailment of at least some services, and a semi-permanent disposal of some route segments.

As the decline in coal production has slowed, so has the rail industry's response to diminishing coal traffic. Nonetheless, there is nearly universal agreement that Appalachian coal traffic will never return to its 2007 peak and that the 2015 retrenchments were only the first difficult round in what is likely to be an ongoing "rationalization" of Appalachian freight rail capacity. To the extent that this capacity may be important to Appalachia's economic future, the current trend must be

[39] To every extent possible, the ARC has responded to these new challenges. The Commission's ongoing programs have focused with a new vigor to meet the region's human needs and to nurture the fragile seeds of recovery. Moreover, to help in this regard, the federal government nearly doubled the ARC's financial resources for fiscal 2016 through the launch and implementation of the POWER initiative described above.

accepted as a warning. If rail capacity preservation—limited or extensive—is appropriate, now is an opportune time to begin preservation efforts.

Fortunately, while there is urgency in this conclusion, we also have confidence in the Region's ability to frame and execute an effective response. Experience has left planners and policy-makers abundant tools, many of which are traceable to Class I railroad network reductions in the 1980s. The railroads also seem to have learned from experience. Even though they have acted quickly to reduce costs as coal volumes have fallen, they have done very little that is not reversible. Moreover, both the large Class I carriers and the short-line portion of the rail industry seem well positioned to afford caution. Thus, while there is urgency, there is no crisis. In fact, in some cases, we would contend there is opportunity.

Finally, we are convinced that ARC will (and should) continue to play a pivotal role in the Region's adjustment to a "post-coal" freight environment. The network environment suggests that distinct states can benefit from common action. In that light, ARC stands as a crucial nexus, wherein states can effectively gather and process transportation information, coordinate program activities, and join to form a more unified voice in dealing with those outside the Region.

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