WHERE'S THAT COAL TRAIN GOING?

The North American coal market is complex, and so is the rail network that moves coal from mine to user. Here are a few basics to help you better understand how, why, and where coal moves by rail

by Tom Murray

No other commodity has had as great an impact on railroads as coal. It was coal that drove some of the earliest railroad builders to hammer down strips of wood or iron on windswept plains or into dark hollers. Coal fed the fireboxes of railroading's fastest and most powerful steam locomotives, fueled some of the industry's greatest engineering achievements, and kept the balance sheet flush with cash.

Today, one in four carloads moved by North American railroads is filled with coal. Those "black diamonds" made up 45 percent of all tons originated by the Class I railroads in 2008, and generated 23 cents of every revenue dollar they earned that year, pouring $14.2 billion into their coffers.

To meet Americans' insatiable hunger for electricity, the United States produces 90 percent more coal today than it did in 1970 (see page 32), but in that span, the business has changed dramatically. Back then, more than 60 percent of America's coal came from the Appalachian region. Coal from Central or Western states was used close to where it was mined. For railroads, coal was a regional commodity, and single-line hauls were the rule.

Now, Appalachian reserves are in decline, and the cost of extracting what's left has gone up. More than half the coal mined in the U.S. now comes from the West. The result? Much of the coal moving by rail today crosses regional boundaries, and it's often carried by two or more railroads.

For example, 14 states east of the Mississippi each received more than 1 million tons of Western coal in 2008, notes the U.S. Energy Information Administration. (To give you some perspective, every 1 million tons of coal that leaves eastern Wyoming equals 60-70 trainloads, on average.) Illinois received the most Western coal (75 million tons), and three nearby states (Michigan, Wisconsin, and Indiana) were next, each receiving 20 to 25 million tons. With shipments to Kentucky, West Virginia, and Pennsylvania, Western coal now helps turn on your lights and run your refrigerator even in the heart of Appalachia.

Let's examine the relationship between coal and railroads today.

COAL-PRODUCING REGIONS IN THE U.S. AND CANADA

Far and away, the biggest coal producer in North America is the Powder River Basin in Wyoming and Montana. With an output of 496 million tons, the PRB produced 42 percent of all U.S. coal in 2008 (1.2 billion tons in all, see page 31). More than 94 percent of 2008's PRB production came from Wyoming.

Other important coal regions include Central Appalachia (with 20 percent of U.S. production); Northern Appalachia (12 percent); the Illinois Basin (8 percent); and the Uinta region (5 percent). The Western region (excluding the PRB and Uinta) generated 7 percent, much of it used by local power plants in North Dakota, Arizona, and New Mexico. Production in the Interior (excluding the Illinois Basin) made up 4 percent of the U.S. total and was dominated by locally used coal in Texas. Canadian mines produced 74.8 million tons in 2008, originating in British Columbia (46 percent), Alberta (39 percent), and Saskatchewan (15 percent).

There are dramatic differences in the volumes of coal produced by mines in different regions. A single Powder River Basin mine (Peabody's North Antelope Rochelle) generated almost as much coal in 2008 — nearly 100 million tons — as all 72 mines in the Illinois Basin.

WHERE DOES NORTH AMERICAN COAL GO?

Of the 1.1 billion tons of coal used in the United States in 2008, 93 percent went to generate electricity. And which state is the biggest user of coal? It's Texas, the destination of thousands of Powder River coal trains each year, and a coal producer itself. Coke plants took another 2 percent of U.S. consumption, while industrial plants (such as steel, aluminum, cement, and paper mills) consumed 5 percent.

Exports (of mostly metallurgical coal) were once a mainstay of the Eastern coal business. But from a peak of 112 million tons in 1981, they plummeted to 40 million tons in 2002 (of which 17 million went to Canada). CSX and Norfolk Southern enjoyed a surge in 2008, however, when U.S. coal exports rose to 81.5 million tons, a volume not seen in a decade. The Energy Information Administration attributes this to "supply shocks at major international coal exporters such as Australia and exceptionally high demand in countries such as China and India." The weak U.S. dollar also played a role. But even in 2008, coal going overseas made up only 7 percent of total U.S. production.

A glorious Wyoming sunset silhouettes a loaded BNSF Railway coal train on May 3, 2007, just north of Bill on the joint BNSF-Union Pacific coal line. Tom Danneman

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A train loads at West Virginia's Blacksville No. 2 mine in the Monongahela field, served by CSX and NS. Kenneth Lehman

WHAT ARE THE DIFFERENCES BETWEEN TYPES OF COAL?

Three major types of coal are mined in North America today:

• **Bituminous** has relatively high heating values (as measured in British thermal units, or Btu: the amount needed to raise the temperature of 1 pound of water by 1 degree Fahrenheit). Bituminous coal typically ranges between 11,000 and 14,000 Btu, with the highest-Btu coal often classified as metallurgical (*i.e.*, for use in steelmaking). Lower-Btu steam coal is used by electric generating stations and other manufacturing plants. The sulfur content of bituminous coal varies by region, with the Illinois Basin having some of the highest, and Uinta (Utah and western Colorado) and Central Appalachian regions some of the lowest. Bituminous coal is often found in seams only a few feet thick (the major seams in West Virginia, for example, are typically 4 to 6 feet), and much of it lies well underground.

Eastern coal was traditionally extracted in underground mines, but surface mining has become more common recently. This shift has prompted several legal challenges stemming from environmental concerns, notably over techniques such as mountaintop mining.

• **Subbituminous** has lower heating values (8,300 to 11,000 Btu). Powder River Basin coal is almost entirely subbituminous, and owes its rapid growth in large part to its lower sulfur content, which helps utilities comply with environmental regulations. Coal in the PRB lies close to the surface and is found in giant seams averaging 40 to 100 feet thick, making it easy to mine in large quantities. Low-cost production, along with its lower Btu values, explains why PRB coal's per-ton market price is much lower than bituminous (see page 31). However, those lower heating values mean it takes about 1.5 times as much subbituminous coal to generate an equivalent amount of heat as bituminous coal — which translates into more carloads for railroads that haul Powder River coal.

• **Lignite** has the lowest heating value of any coal (6,300 to 8,300 Btu). It is seldom transported very far from where it is mined, and in fact most of the lignite in the United States is used in mine-mouth electric generating stations in Texas and North Dakota.

Anthracite is a high-Btu coal that was widely used for heating in the 19th and early 20th centuries; today, it accounts for just one-tenth of 1 percent of U.S. coal production. — *Tom Murray*

Meanwhile, imported coal has grown from less than 3 million tons a year before 1990 to more than 30 million tons annually, averaging about 3 percent of total U.S. consumption. Some utilities in the Southeast import coal from Colombia (the largest supplier, with 77 percent of U.S. imports) and Venezuela. Indonesia is the second largest source of imported coal.

In Canada (where coal production is 60 percent thermal, 40 percent metallurgical), just under half of the country's 2008 output was exported, says Natural Resources Canada, mainly coking coal for steelmaking mined in British Columbia and Alberta, and shipped through the ports of Vancouver and Prince Rupert, B.C.

WHAT CRITERIA DO BUYERS USE WHEN CHOOSING COAL?

For the coal buyer, delivered cost (including transportation) is always the bottom line. But the range of coals a specific plant can buy is dictated by boiler design and other engineering and property specifications. For example, because it takes up to 1.5 times more Powder River coal than Appalachian coal to generate the same amount of electricity, a plant's stockpile sites, unloading tracks, and other features need to have

This dragline at a surface mine in Farmersville, Ind., scoops 113 cubic yards of overburden in one gulp. David Honan

enough capacity for the coal being used.

Another factor is sulfur content. Since the Clean Air Act of 1970, and even more so following amendments passed in 1990, reducing sulfur dioxide (SO2) emissions has been a key goal of coal users in the United States. The low sulfur content of PRB coal gave it a major advantage. Recently, however, plants have begun installing scrubbers that remove SO2 from plant emissions. This has begun to change the competitive relationship among coal-producing regions.

To best meet environmental and operating criteria, many utilities blend coal from different mines. Some, for example, will use a mix of PRB and Appalachian or Illinois coal to achieve a desired level of boiler efficiency and low SO2 emissions, or to minimize ash deposits left after coal is burned. This blending can be done at the plant, or if it's served by water, at a river terminal where coal from different sources arrives by rail or truck.

Illinois stands to benefit from this changing landscape, notes coal industry consultant John T. Boyd, for three reasons: lower production costs versus Central Appalachia, the Illinois Basin's large contiguous reserves, and the expanding market for high-sulfur coal as more plants install scrubbers. Although PRB coal will continue to dominate the U.S. market, for the first six months of 2009, Wyoming shipped 5 percent less coal than it did a year earlier. Illinois Basin producers, by contrast, shipped 11 percent more.

HOW HAS THE RECESSION AFFECTED COAL?

Less economic activity means less demand for electricity, and U.S. utilities burned 11 percent less coal in the first half of 2009 compared with the same period in 2008. Even bigger declines were reported in exports (down 32 percent that period), coal shipments to coke plants (34 percent), and to other industrial plants (20 percent).

Among the four biggest Class I railroads, revenue ton-miles from coal fell 9.4 percent for the first nine months of 2009, compared with the same period of 2008. But the dam-

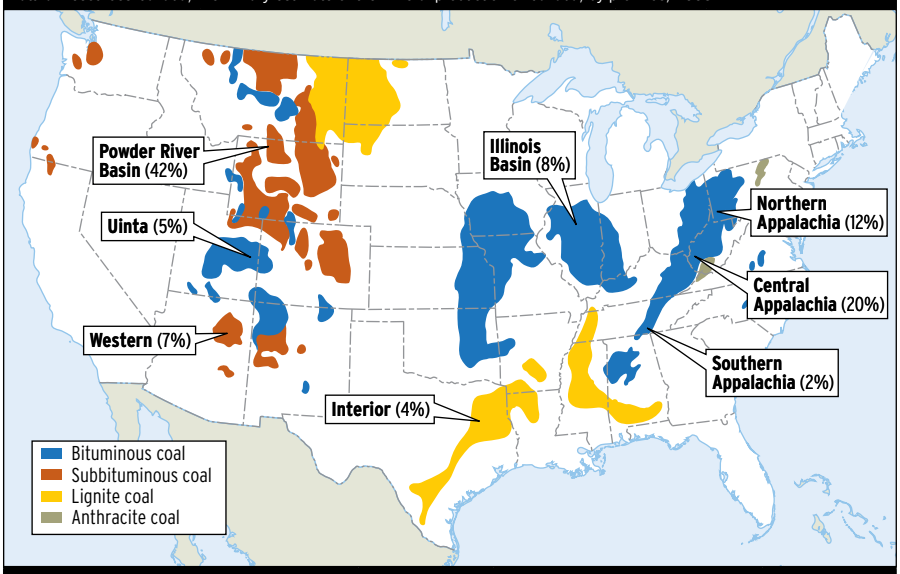
WHERE DOES COAL ORIGINATE?

Appalachia has the most mines, but the Powder River Basin produces the most coal

REGION / TYPE OF MINE	STATES	MINES	2008 PRODUCTION (MILLIONS OF TONS)
Northern Appalachia	Pennsylvania, Maryland, Ohio, Northern West Virginia	378	135.6
Underground		86	105.2
Surface		292	30.4
Central Appalachia	Eastern Ky., Virginia, Southern W.Va., parts of Tenn.	841	234.0
Underground		439	115.0
Surface		402	119.0
Southern Appalachia	Alabama, portions of Tennessee	59	20.6
Underground		8	12.3
Surface		51	8.3
Illinois Basin	Illinois, Indiana, Western Kentucky	72	98.9
Underground		28	64.6
Surface		44	34.3
Interior	Ark., Kan., La., Miss., Mo., Okla., Texas	27	47.7
Underground		2	0.5
Surface		25	47.2
Powder River Basin	Wyoming, Montana	17	496.0
Underground		0	0.0
Surface		17	496.0
Uinta	Colorado, Utah	17	55.5
Underground		15	48.3
Surface		2	7.2
Western	Alaska, Ariz., N.M., N.D., Wash.	24	82.0
Underground		5	11.1
Surface		19	70.9
U.S. Total		1,435	1,170.3
Canada			
Alberta		8	34.6
British Columbia		11	29.3
Saskatchewan		3	10.9
Canada Total		24	74.8

Note: All tonnage figures in short tons (U.S. tons)

Source: EIA Report No: DOE/EIA 0584 (2008), Coal Production and Number of Mines by State and Mine Type, 2008-2007; Natural Resources Canada, Preliminary estimate of the mineral production of Canada, by province, 2008



THE ECONOMICS OF COAL

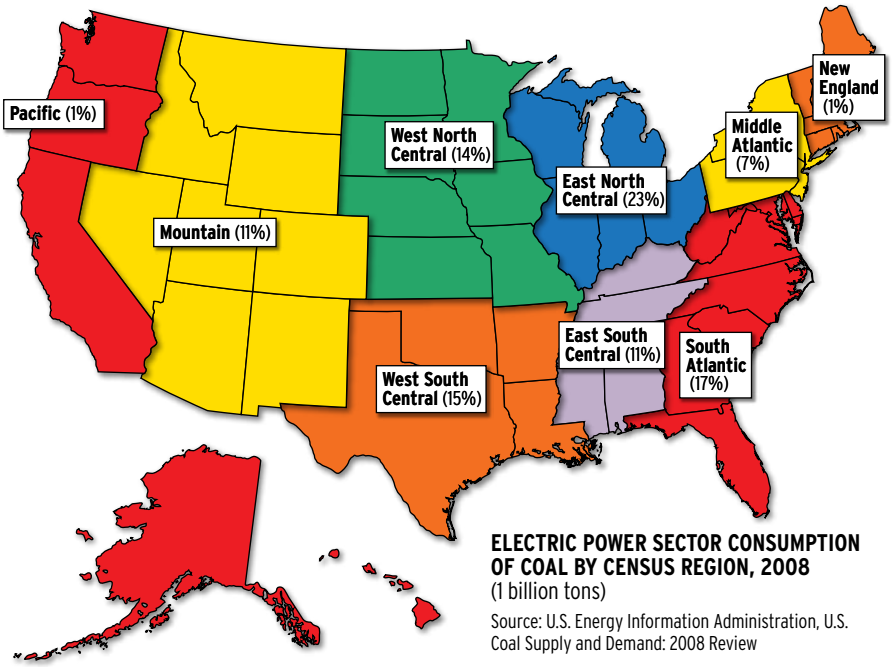
Higher Btu, lower sulfur dioxide = Higher value per ton

REGION	Central Appalachia	Northern Appalachia	Illinois Basin	Uinta Basin	Powder River Basin
STATES	Ky., Tenn., Va., W.Va.	Md., Ohio, Pa., W.Va.	Ill., Ind., Ky.	Colo., Utah	Mont., Wyo.
THERMAL VALUE (BTU)	12,500	13,000	11,800	11,700	8,800
SULFUR CONTENT	1.2	<3.0	5.0	0.8	0.8
SPOT MARKET PRICE PER SHORT TON AS OF WEEK ENDING 10/23/09	$56.15	$50.00	$40.00	$39.00	$9.25

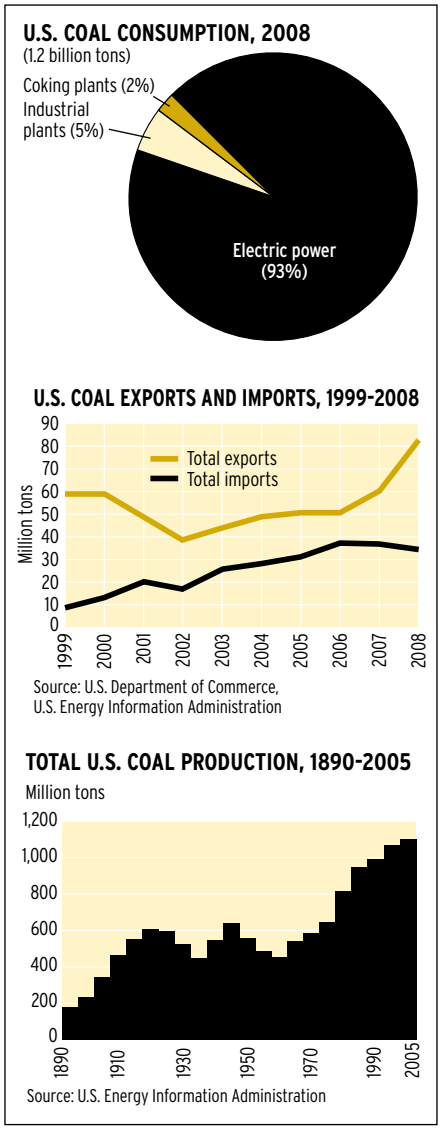
Notes: Spot market price does not include transportation to consumption point. Thermal, sulfur dioxide, and spot market price figures are benchmarks, and vary according to specific origin within each region as well as other variables.

Source: EIA Coal News and Markets Report, Oct. 26, 2009

Ameren's Labadie, Mo., generating station, 35 miles from St. Louis, is one of the top 10 coal-fed power plants in the U.S. A UP train unloads there in 2007. Mike Yuhas and Ed Yuhas



ELECTRIC POWER SECTOR CONSUMPTION OF COAL BY CENSUS REGION, 2008
(1 billion tons)
Source: U.S. Energy Information Administration, U.S. Coal Supply and Demand: 2008 Review



age wasn't spread evenly. Norfolk Southern, which benefited the most from 2008's export surge, saw its coal ton-miles drop 21.4 percent. On the other hand, BNSF Railway saw a drop in coal ton-miles of less than 1 percent, thanks in part to a customer shifting volume from competitor Union Pacific.

Other consequences include an increase in utility coal stockpiles (67 days of supply versus the typical 45 days by mid-2009, notes investment group Credit Suisse), and the elimination of test burns of Powder River Basin coal by Eastern utilities. Such tests were common as recently as two years ago.

"It's difficult to perform test burns when there are existing high stockpile levels [because physical space is limited] and a utility may also have contract minimums with existing coal suppliers that need to be executed," explains Steve Bobb, coal group vice president at BNSF.

The upside, if there was one, was that railroads were able to tighten their equipment cycles after hundreds of locomotives and thousands of cars went into storage. By

The towering billboard at Cabin Creek, W.Va., says it all, as a CSX coal train rolls east on Jan. 22, 2005. Scott Lothes

September 2009, BNSF had 210 trainsets in service for customers on the PRB Joint Line, down from a high of 265 in 2008. The improved asset utilization levels of 2009 will undoubtedly become the new performance standard when business picks up again.

HOW DOES COAL MOVE FROM MINE TO CONSUMER?

Sources differ, but they all reinforce what you already know: Most coal moves by rail. The Energy Information Administration says that in 2007, railroads carried 790 million tons of coal, or 68 percent of U.S. production (see page 34). Truck and river delivery each had about 10 percent of the market. But since the agency relies on utilities and other energy consumers for most of its reporting, it tries to keep things simple by asking them to report the destination mode. In addition, the mode used to haul exports isn't reported at all.

A more reliable figure comes from the Association of American Railroads, which says that in 2007, the Class Is originated almost 850 million tons of coal, which would be 74 percent of U.S. production. That's still an understatement, since it leaves out coal moved by non-Class I carriers. (Regionals and short lines handled 2,326 cars of coal a day in 2009, according to the Railinc Short Line Traffic Index.)

RAILROADS AND COAL

Coal is a major revenue generator (22 percent of revenues for BNSF and UP, and 29 percent for CSX and NS), but it isn't as lucrative as other traffic on a revenue-per-ton-mile basis (see page 37). On the Western Class I railroads, every ton-mile of coal generates only about 35 percent as much revenue as non-coal traffic.

There are two things to keep in mind, though. First, unit coal trains are more efficient compared with manifest or intermodal traffic. Second, railroads aren't done raising their prices on coal. That's especially true in the West, where the railroads still move some coal under "legacy" shipper contracts that were negotiated more than two decades ago. Repricing these contracts "at levels that support reinvestment in the railroad's energy business represents the largest single financial opportunity over the next two to three years," said Doug Glass, Union Pacific's Energy group vice president in early 2009.

The primary export coal pier on the West Coast is Roberts Bank, near Vancouver, B.C., where a CP train with mid-train distributed power arrives on March 22, 2008. David Honan

The commodity is not as critical for the two large Canadian railroads, but nevertheless, Canadian Pacific's biggest single source of revenue is a coal company, and over the past five years coal revenues on Canadian National have nearly doubled. Let's examine the coal franchise for each Class I railroad.

BNSF RAILWAY

BNSF hauls more coal than any other North American railroad, and in 2008, 92 percent came from the Powder River Basin. BNSF's total PRB volume that year came to 275 million tons, of which 171 million tons came from mines on the Joint Line it co-owns with Union Pacific south of Gillette, Wyo. The balance came from PRB mines in northern Wyoming and southwestern Montana served solely by BNSF.

High volumes don't always translate into high profits, however. "Our coal business is the least profitable business we have on this railroad today," CEO Matt Rose told analysts at a 2006 conference. The major reason was that many of the company's legacy contracts with utilities didn't offer sufficient protection against fuel cost increases, a situation Rose described as "devastating to the coal business.... Now we just don't sign coal contracts without having a fuel component."

Four years later, BNSF coal chief Steve Bobb says the railroad has renegotiated about 50 percent of the contracts that Rose was referring to. And BNSF, like every other carrier, continues to push for increases in the base rates it charges customers — a source of contention among "captive" (one-railroad) utilities clamoring for reregulation.

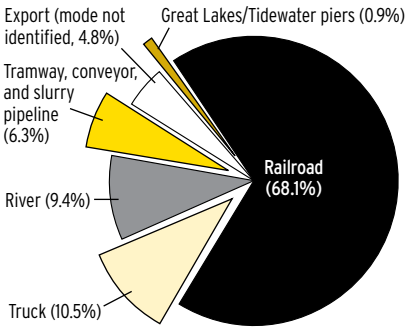
Operating changes have also improved

Unit trains have reduced the once-common mine runs with long strings of railroad hoppers, as seen in this October 1987 view at Grafton, W.Va., on CSX. George W. Hamlin

Distributed power has helped boost train length and tonnage. A DPU shoves a UP train to Sheboygan, Wis. Drew Halverson

HOW DOES COAL MOVE?

Railroads moved more than two-thirds of U.S. coal produced in 2007



Source: U.S. Energy Information Administration, Coal Distribution Database, 2007

coal's financial contribution. BNSF's maximum train size out of the PRB is now 150 cars, and the average payload per car is 117 tons, meaning the longest trains are carrying more than 17,000 tons of coal. But train length depends on many factors including track configuration at the destination, helper districts, siding capacity, and the willingness of connecting lines to accept distributed power. Bobb says about 25 percent of BNSF's coal business is interchanged to connections, and another 10 to 15 percent goes to lake or river terminals.

BNSF's coal fleet consists of approximately 80 percent customer-supplied cars and 20 percent railroad-owned equipment. The utility cars are overwhelmingly aluminum-bodied, but some steel cars are in service to cement plants and other industrial users.

BNSF also serves mines in North Dakota, New Mexico, and Utah (through a haulage arrangement with Utah Railway). In the past, it moved coal from Illinois, but the one BNSF-served mine in that state closed in 2007. While most BNSF-originated coal is used domestically, some has been exported through the Canadian port of Roberts Bank.

Bobb says that in the future PRB coal won't be able to depend on its low-sulfur characteristics as a tailwind for growth, but he sees an opportunity for new business in the potential conversion of mine-mouth, lignite-fueled power plants in North Dakota and Texas to Powder River Basin coal.

UNION PACIFIC

Union Pacific trails BNSF only slightly in the size of its coal franchise. UP's Energy group (which includes petroleum coke, but is overwhelmingly coal) generates a bigger share of overall revenues than any of the railroad's other commodity groups.

Although Union Pacific doesn't reach as many Powder River mines as BNSF does, it serves a wider variety of coal shippers outside the PRB, notably mines in Utah and Colorado, three loadouts in the Illinois Basin, and mines along its main line in southern Wyoming. In July 2009, UP originated an average of 8.1 trains a day from the Utah and Colorado mine region. This area generated 25 percent of UP's 2008 coal revenue, versus 68 percent for the PRB and 7 percent for other origins (Illinois and southern Wyoming mines, plus shipments from BNSF and Utah Railway origins to UP destinations).

Union Pacific has a slight lead in traffic on the Powder River Basin Joint Line, moving 54 percent of the line's tonnage in 2007 and 2008. For the first seven months of 2009, UP originated 102 million tons of coal on the Joint Line, versus 98 million for BNSF. In July 2009, UP sent an average of 32.7 trainloads a day out of the PRB, down five trains a day from July 2008. Thanks to improved cycle times and better equipment use, UP has cut the number of trainsets in PRB service from 295 in 2008 to 200 as of September 2009.

Andy Schroder, general director-logistics & demand for UP's Energy group, says the railroad is currently moving coal to 15 Eastern utilities, some in all-rail movements and others via river terminals. Schroder says that 12 percent of UP's 2008 coal tonnage moved to lake or river terminals. Some of the biggest hauls to Eastern buyers are:

- From Powder River mines to two NRG Energy power plants in northwestern New York state: the Huntley generating station near Tonawanda, and the Dunkirk generating station at Dunkirk. CSX handles these trains east of Chicago. Both plants burned 100 percent PRB coal in 2008
- From UP's North Fork branch (south of Grand Junction, Colo.) to Appalachian Power's Clinch River plant near Carbo, Va., on Norfolk Southern. The source of this coal is the Bowie No. 2 mine, which provided about 15 percent of Clinch River's coal in 2008, while the balance came from Appalachia
- From Utah mines to Ohio River terminals, such as Calvert City, Ky. (on the Paducah & Louisville) for barging to Tennessee Valley Authority generating stations. TVA power plants received 2.9 million tons of Utah coal in 2008

The cars that UP uses for coal service differ by loading region. In the PRB, 98 percent are high-capacity cars (286,000 pounds on rail), almost all of them aluminum. The other 2 percent are primarily steel, with a gross weight on rail of 268,000 pounds. The fleet is 95 percent customer-controlled. The 5 percent owned by the railroad is used mainly for smaller utilities or industrial customers that don't ship in large volumes.

In the Colorado/Utah region, the equipment mix is 80 percent 286 cars, 20 percent 268s. Roughly two-thirds are railroad-owned — a high percentage. The reason for this, Schroder says, is that many buyers of coal from this region are industrial users with non-repetitive movements,

A Union Pacific coal train twists through Little Gore Canyon, Colo., in September 2009, on former Rio Grande trackage. Scott Lothes

and owning equipment gives UP the ability to shift cars from one mine to another as customer requirements change.

Distributed power is a mainstay of UP's coal trains. Configurations out of the Powder River tend to be either 2-by-1 (two units on the head end, one DPU on the rear) or 2-by-2. Many of the 2-by-2 trains have their second DPU removed at South Morrill, Neb., and continue east in 2-by-1 mode. Average train size from the PRB is currently 132 cars, with a maximum of 142 on trains destined for the St. Louis corridor.

Colorado and Utah trains that move east through the Moffat Tunnel are generally configured as 2-by-2-by-2 (two head-end, two mid-train, two rear). At Denver, the mid-train power and one of the rear units are removed, and trains continue east in 2-by-1 mode. The average size of these trains is 103 cars, but as on the other big railroads, UP expects train lengths to keep growing.

CSX TRANSPORTATION

If you want to see the most dramatic difference between Western and Eastern coal railroads, just compare the number of mines they serve. CSX's 2009 mine directory lists 177 separate loading facilities (half in Kentucky, and another third in West Virginia). BNSF's mine directory, by contrast, has just 28 entries, and UP's lists 30. Though not all of the facilities are active, CSX says 123 locations shipped out coal in the past two years.

This abundance of loading points reflects the heritage of Eastern coal railroading. Mine runs once trundled up and down rural branch lines, picking up loads and setting out empties at small-volume loadouts, and returning each night to yards like Corbin, Ky., and Grafton, W.Va., where the cars were assembled into trains for export terminals or utilities. Today, most of CSX's coal business moves in unit trains from high-production mines in Kentucky, West Virginia, and Pennsylvania. Chris Jenkins, vice president-coal and automotive at CSX, says that more than 95 percent of CSX's coal business moves in unit trains of 75 to 150 cars. Twenty loading points can handle trainsets of 150 cars or more, and another 25 points can load trains of 100 to 130 cars.

On CSX, average train length has grown from 96 cars in 2004 to 101 in 2009, while the average tons per car have gone from 104.5 to 111 over the same period.

CSX carried 195.8 million tons of coal and related commodities in 2008: 76 percent for utilities, 15 percent for export, 7 percent for its "integrated steel" business (domestic metallurgical coal, as well as coke and iron ore), and 2 percent for industrial customers. CSX's average length of haul for its coal traffic in 2008 was 458 miles.

The other key difference between Eastern and Western coal railroads involves car ownership. At CSX, the split between railroad and shipper cars is close to 50/50. Having such a large pool of railroad-owned coal cars available for export and domestic steel shipments gives CSX the flexibility to shift cars between origin and destination points as demand warrants, Jenkins says. In some situations, it also enables CSX to position equipment for loading more quickly than if a shipper had to wait for a dedicated trainset to return from an unloading point.

Over time, Jenkins says, CSX will likely see more shipper-controlled cars in its coal service. However, the railroad recently put 2,000 hybrid gondolas into its own fleet. These cars, built with a combination of steel, stainless steel, and aluminum components, carry higher payloads than conventional steel cars while still enabling coal to be thawed in the car during subfreezing weather.

CSX delivers Eastern export coal to terminals at Baltimore and Newport News, Va. Its river terminals and its Great Lakes docks (Ashtabula and Toledo, Ohio, plus Chicago and Conneaut, Ohio, via connections) handle coal for utilities, steelmakers, and other industrial users along the inland waterway system. CSX also moves some export coal from Alabama mines to the Port of Mobile.

NORFOLK SOUTHERN

Two regions saw a drop in Norfolk Southern coal originations between 2000 and 2008, Chief Marketing Officer Don Seale told investors in June 2009: Central Appalachia (from 105 million tons to 80 million) and the

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Returning from Roberts Bank, a CN train passes Jasper, Alta., on its 689-mile run to the Cheviot mine in 2009. Tim Stevens

THE BIGGEST COAL MOVES

Class I railroads participate in moving coal to 18 of the 25 largest U.S. electric generating stations (see "Map of the Month," pages 38-40). Those top 25 coal-burning plants devoured one-fifth of all U.S. coal consumed in 2008. Ten of the 25 plants receive coal from all-rail movements using Class I railroads; three more get coal via barge after an initial Class I rail haul; three use Class Is plus another delivery method; and two get their coal using a combination of Class I and private railroads. (Another three are mine-mouth plants, two more are served by captive electrified railroads, and two receive coal via barge without a prior Class I rail haul.)

Among the top 25 utility coal movements in the U.S. (based on 2008 Energy Information Administration data), the No. 1 and 3 volume rankings were long-distance rail moves from Powder River Basin mines to Southern Co.'s Plant Robert W. Scherer in Juliette, Ga., and its James H. Miller Jr. Electric Generating Plant near Palos, Ala.

The average rail haul for Powder River coal is 1,200 miles, versus 500 miles or less for Eastern U.S. coal, and only about 200 miles for coal from the central part of the U.S. — *Tom Murray*

Illinois Basin (12 million tons to 10 million). Over the same period, Northern Appalachia coal grew from 35 million tons to 49 million, and imports jumped from zero to 1.1 million tons. But the biggest growth story involved Western coal, which grew from just 13 million tons in 2000 to 40 million (22 percent of NS's coal business) in 2008.

Norfolk Southern's coal group moved 194.2 million tons in 2008 (approximately 180 million tons of coal, with the rest coke and iron ore). Shipments to electric utilities made up 72 percent of the tonnage, while 12 percent went for export, 11 percent was domestic metallurgical coal, and 5 percent went to industrial customers. The railroad's average coal train haul in 2008 was 320 miles.

Norfolk Southern serves 134 active coal-loading facilities, 101 utility power plants, and 11 water terminals. "Total coal handled through all system ports in 2008 was 41.8 million tons," says spokesman Robin Chapman. "Of this total, 18.9 million tons moved through Norfolk, Va., 5.7 million tons moved through the Baltimore Terminal, 11.3 million tons moved to [seven] docks on the Ohio River, and 5.9 million tons moved to Lake Erie ports [Ashtabula and Sandusky, Ohio]."

With low-cost Illinois Basin coal poised to capture a larger share of production [see "News," February 2010], NS signed a February 2009 agreement with Canadian National for a trackage-rights and haulage initiative called the "MidAmerica Corridor." The deal will improve NS's Chicago-St. Louis route, and CN lines from Chicago and St. Louis to Fulton, Ky., where traffic will funnel south on short line West Tennessee Railroad to reach NS at Corinth, Miss. As part of the deal, the railroads will upgrade the West Tennessee and "create a new coal gateway at Corinth, Miss., to better link NS-served southeastern utility plants with CN-served Illinois Basin coal producers." About 70 percent of NS-served power plants have installed scrubbers to reduce SO2 emissions, and this will enable them to burn Illinois Basin coal, typically as part of a blend with Powder River coal, Seale said.

CANADIAN NATIONAL

Coal generated just 6 percent of Canadian National's 2008 revenues. However, the railroad serves two mining regions with the potential for growth: northern British Columbia (thanks to its 2004 acquisition of BC Rail) and the Illinois Basin (from its 1999 purchase of Illinois Central). In 2008, 49 percent of CN's coal and coke business came from Canada, with the bulk going to Vancouver and Prince Rupert for export. The other 51 percent was U.S. business, about a quarter of it PRB coal received from connections. Most U.S. shipments went to utilities in Michigan, Kentucky, Illinois, and Wisconsin.

CN serves five coal-loading facilities in Illinois, and nine loadouts in Canada. Spokesman Mark Hallman says 72 percent of the tonnage originated from CN-served mines in 2008 came from the U.S., and 28 percent from Canada. About 31 percent of CN's coal tonnage moved to river or lake terminals.

Hallman says, "Ninety-nine percent of our coal traffic moves via unit trains. Train sizes range from 100 cars to 155 cars, with DP units used on trains over 122 cars. Typ-

On the former Norfolk & Western main line, two GEs wheel a Norfolk Southern coal train east at Hull, W.Va., while a mine shifter sorts cars on Oct. 23, 2008. Bryan Pleasant

ically trains originating at Canadian mines will be a minimum of 112 cars; however, we have had good success with some origins running at 150 cars. In the U.S., train lengths will vary, but typically we strive for 135 cars per train."

Hallman enumerated Canadian National's longest-distance coal movements:

- Winniandy, Alta. (Grande Cache mine), to Thunder Bay, Ont. (1,539 miles)
- Coal Valley, Alta., to Prince Rupert, B.C. (864 miles)
- Luscar, Alta. (Cheviot mine), to Roberts Bank, B.C. (689 miles)
- Winniandy, Alta. (Grande Cache), to Roberts Bank, B.C. (678 miles)
- Dial, Ill., to Convent, La. (653 miles)
- Galatia, Ill., to Mobile, Ala. (642 miles)

CANADIAN PACIFIC

Prior to its acquisition of Dakota, Minnesota & Eastern, Canadian Pacific earned 93 percent of its coal revenues from Canadian traffic, and 7 percent from U.S. business. Most of the Canadian revenue came from a single customer, Elk Valley Coal, which has since been acquired by Teck Resources Limited. (Both the CP-DM&E deal and the Teck-Elk Valley acquisition were completed on Oct. 30, 2008.)

Teck is Canadian Pacific's biggest customer, accounting for more than 10 percent of the company's revenue. Teck coal originates at five mines in southeastern British Columbia. Most of it is metallurgical, and delivered to Vancouver for overseas steelmaking. Some also goes east to Thunder Bay, Ont. (a distance of 1,300 miles) to be shipped to steel producers along the Great Lakes, and some travels to Chicago-area steel plants (a 1,700-mile move).

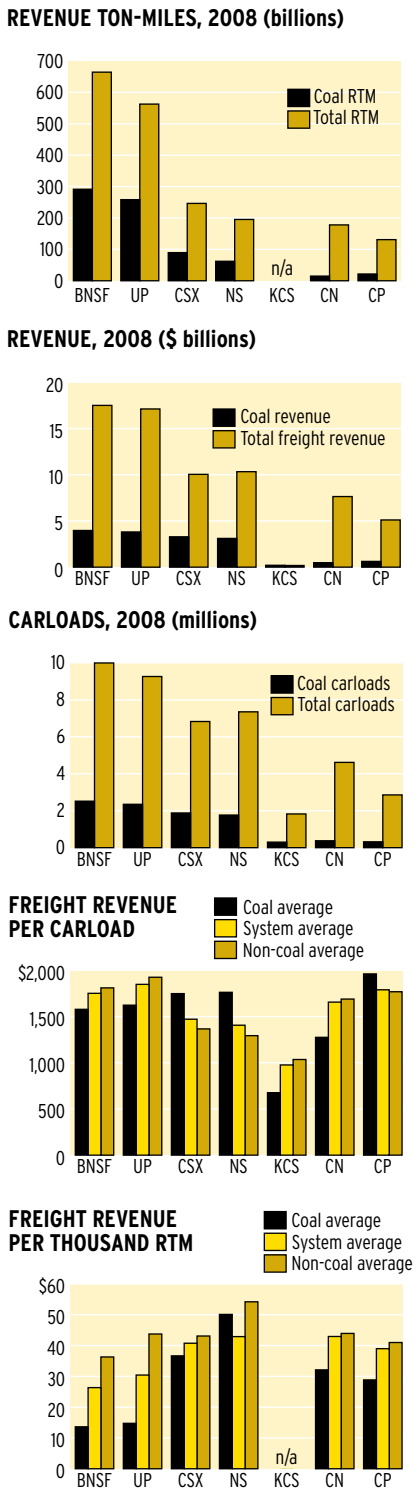
CP's contract with Teck normally renews every five years, but the most recent July 2009 agreement established a one-year term with some unfavorable outcomes for the railroad. Both CP's shipping rate, and Teck's guarantee of tonnage, were reduced. (One analyst pegged the volume reduction at more than 20 percent and the rate drop in the low double digits.) And Teck is now able to use Canadian National between Kamloops, B.C., and Vancouver for up to 15 percent of its tonnage moving from B.C. mines to the port.

On CP, the standard Teck trainset for Vancouver is 129 cars, with 1-by-1-by-1 distributed power, says Jason Copping, CP's senior account manager for coal, though the railroad has experimented with sets of 134 to 136 cars. These trains make the steep climb through the Selkirks over Rogers Pass. The Vancouver trains are 90 percent through a transition from steel to aluminum cars. Thunder Bay trains remain all-steel because of the configuration of the car dumper at the port. The Chicago trains also use steel cars in case the coal needs to be thawed on arrival in winter. Most cars in B.C. coal service are owned by CP, but some are owned by Teck.

Canadian Pacific's U.S. coal activity consists of delivering or forwarding unit trains received from other carriers to online power plants, mainly in the Midwest. The unanswered question, however, concerns whether the railroad will follow through on plans made by DM&E managers a decade ago to build into the Powder River Basin. A portion of the price that CP paid for DM&E was contingent on the extension being built. But CP has said it will proceed only if management is convinced that doing so is in the best interest of its shareholders. That point has not been reached yet, and some observers wonder whether it ever will be.

KANSAS CITY SOUTHERN

From Kansas City, Mo., Kansas City Southern receives unit trains of Powder River coal from BNSF and UP to deliver to eight online power plants. KCS also hauls Illinois coal in merchandise freights for industrial customers, and petroleum coke from U.S. refineries to cement plants in Mexico or its export terminal at Port Arthur, Texas. In 2008, 80 percent of KCS's coal revenues came from unit trains, which can number about 10 a day (loads and empties) on its Kansas City-Shreveport, La., spine [see "Midwest Mountain Railroading," September 2009 Trains].



Note: CN and CP dollar figures are C$; CP figures include Dakota, Minnesota & Eastern; CSX and NS figures include coke and iron ore; UP figures include coke
Source: Corporate earnings releases, 2008

As you've seen, there's nothing simple about the coal business, but railroads are the key component in the supply chain.

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