

UMR-MEC Conference on Energy

14 Oct 1976

Over One Billion Tons of Coal in 1985: Can the Railroad Industry Handle It?

Larry C. Peppers

Follow this and additional works at: <https://scholarsmine.mst.edu/umr-mec>



Part of the [Chemical Engineering Commons](#), and the [Energy Policy Commons](#)

Recommended Citation

Peppers, Larry C., "Over One Billion Tons of Coal in 1985: Can the Railroad Industry Handle It?" (1976). *UMR-MEC Conference on Energy*. 197.
<https://scholarsmine.mst.edu/umr-mec/197>

This Article - Conference proceedings is brought to you for free and open access by Scholars' Mine. It has been accepted for inclusion in UMR-MEC Conference on Energy by an authorized administrator of Scholars' Mine. This work is protected by U. S. Copyright Law. Unauthorized use including reproduction for redistribution requires the permission of the copyright holder. For more information, please contact scholarsmine@mst.edu.

OVER ONE BILLION TONS OF COAL IN 1985:

CAN THE RAILROAD INDUSTRY HANDLE IT?

Larry C. Peppers
Creighton University
Omaha, Nebraska

Abstract

Any evaluation of our country's resource potential must carefully consider the transport network and the constraints which it places upon future energy development and growth. The federal government has a vague goal of energy independence (or, at least, less energy dependence), but it has not developed a coherent energy plan--a critical element of which is energy transport. The paper analyzes the uncertain coal outlook facing the rail industry, translates these coal scenarios into alternative financial projections for the rail sector, and clarifies the most urgent federal decisions needed in the energy-transport policy matrix. The rail industry is being asked to make substantial long-run financial commitments even though it is unclear how much coal will be produced and what the intermodal split will be between rail, truck, pipeline, and barge. Such uncertainty raises the specter of numerous railroads chasing after the same coal transport business. The success of any coal-centered energy policy is, therefore, directly linked to the federal government's ability to simultaneously formulate an internally consistent set of national energy and transportation policies. It is shown that failure to consider the energy-induced pitfalls facing the railroad industry could lead to severe financial strain on the "strong" Western roads, and thus a counter-productive energy policy.

1. A COAL RENAISSANCE

On July 26, 1975, the United States Railway Association (USRA) released its Final System Plan (FSP) for restructuring railroads in the Northeast and Midwest (12). Following up the recommendations contained in the FSP, President Ford signed (on February 6, 1976) a \$6.4 billion rail-aid bill designed to underwrite the creation (as of April 1, 1976) of the governmentally funded company known as Consolidated Rail Corporation (ConRail). The FSP should be viewed as a de facto

transportation plan for that segment of the freight transportation industry which has been most repeatedly on the verge of financial collapse during the postwar period--the nation's Class I railroads. As such, it will have a tremendous long-run impact on both transportation and energy planning. Table 1 highlights the postwar stagnation experienced by the railroad industry. Total ton-miles of rail freight grew only 45 percent over the period from 1950 to 1973 (a compound rate of approximately 1.6 percent). As

shown in Column (2) of Table 1, ton-miles per dollar of real GNP fell from 1.655 in 1950 to 0.944 in 1975--a forty-three percent decline.

TABLE 1
TON-MILES OF RAIL FREIGHT
TRANSPORTED DURING THE POSTWAR PERIOD

	U.S. RAIL TON-MILES (Billions)	TON-MILES PER \$ OF REAL GNP
1950	588	1.655
1955	623	1.422
1960	572	1.173
1965	697	1.128
1970	764	1.057
1971	739	0.990
1972	776	0.979
1973	852	1.015
1974	854	1.039
1975	753	0.944

Source: See (1).

Contrasted with this decidedly low growth profile, Table 2 highlights the growth outlook contained in the FSP. Between 1973 and 1980 total rail tonnage originations are projected to climb 132.1 million tons, with coal growing 112.1 million tons. For the period from 1980 to 1985, the relative importance of coal as a growth catalyst is diminished (coal provides 101.2 million tons out of a total increase of 277 million), but coal remains the largest absolute source of tonnage growth. If coal growth is eliminated, aggregate rail tonnage grows approximately 2 percent a year between 1980 and 1985.

TABLE 2
RAIL TONNAGE GROWTH: 1973-1985
(Millions of Tons)

	1973 <u>Tons</u>	1980 <u>Tons</u>	1985 <u>Tons</u>
COAL	375.7	487.8	589.0
NON-COAL	1,158.8	1,178.8	1,354.6
TOTAL	1,534.5	1,666.6	1,943.6

(Table 2 continued)

Source: See (6).

The freight transportation outlook which emerges in the FSP for the next ten years, therefore, is one of high rail dependence on coal growth. The forecasted resurgence in national rail freight demand (and, also, ConRail demand) is quickly dissipated if the coal growth proves to be a mirage. If the FSP presents an accurate picture of future rail freight demand, any significant shifts in federal policy (affecting either the level of coal production or the method of transportation) will have an immediate and pronounced impact on the rail transport sector. It is increasingly apparent that the failure of the rail sector to experience the expected resurgence in coal tonnage will significantly increase the likelihood that the ConRail system will be permanently appended to the United States Treasury and that the national rail system will be financially stagnant.

2. COAL PRODUCTION IN 1985

While a multitude of problems are evident in surveying the uncertain energy outlook and assessing the impact on the rail transport sector, there is no dearth of coal production forecasts. Table 3 summarizes the range of projections for national coal production. In comparison with approximately 650 million tons of coal produced in 1975, Table 3 displays a range from 738 to 1,376 million tons in 1980 and from 930 to 2,063 million tons in 1985. At one extreme, coal is projected to grow only 43 percent in ten years while at the other it is forecasted to jump by 217 percent. The transport sector is thus faced with a highly variable coal demand picture over the next ten years. It is being asked to make substantial long-run financial commitments even

though it is unclear how much coal will be produced and how the coal will be transported (via rail, pipeline, truck, or barge).

TABLE 3
ALTERNATIVE FORECASTS OF
NATIONAL COAL PRODUCTION
(Millions of Tons)

	<u>1980</u>	<u>1985</u>
Temple, Barker & Sloane*	738	1,028
Office of Coal Research*		
5% Growth	879	1,121
3.5% Growth	785	930
Project Independence*		
Business as Usual	895	1,100
Intermediate	950	1,200
Accelerated	1,376	2,063
National Petroleum Council	845	1,001
Task Group on Coal Supply Potential*	856	-----
MITRE Corp.*	855	972
Bureau of Mines*	806	998

*Listed in order, the sources are: (12), (11), (9), (10), (5), (4), (8).

Faced with this range of basic diversity in coal production estimates, we have chosen the following four production scenarios to use in the rail demand analysis given below:

COAL PRODUCTION FORECASTS
(Millions of Tons)

	<u>1980</u>	<u>1885</u>
Low	773	896
Final System Plan	738	1,028
Bureau of Mines	806	998
Project Independence	950	1,200

Compared to Table 3, these projections may appear conservative, but they do more accurately reflect the current assessment of problems faced by the coal sector in achieving rapid growth. When the FSP was constructed in early 1975, the intermediate projection of 1,200 million tons of coal in 1985 was considered to be an attainable policy target. Now, however, we categorize this as a high-side

projection. On the supply side, there has arisen a multitude of problems resulting from environmental concerns, legislative inaction, wildcat strikes, and factor bottlenecks. On the demand side, there is also a controversy raging over the long-term growth rate for energy demand. The low-side estimate of 896 million tons of coal in 1985 incorporates approximately a 3% compound rate of growth in coal production over the next ten years, less than half the growth rate incorporated in the FSP.

The last two rows in Table 4 contain the specific coal forecasts underlying the FSP. At the national level, rail originations of coal are projected to climb by roughly 200 million tons, with the increase equally divided between the 1974 to 1980 and the 1980 to 1985 sub-periods. Note that the rail share of national coal production is expected to remain basically level between 1974 and 1980, but is projected to decline nine percentage points by 1985. Prior to 1980 the artificial demand for low-sulfur coal (the direct result of policy decisions pertaining to environmental standards) stimulates Western coal, which is much less subject to intermodal competition. After 1980, it was assumed in the FSP that there would be more balanced growth in coal production with Eastern coal (which has a higher sulphur content than Western) rebounding due to the appearance of more efficient scrubbers (the use of which may be federally mandated). While the total rail share of coal production is projected to drop 8.8 percentage points by 1985 (from 66.1% to 57.3%), 2.4 percentage points can be directly attributed to a 25 million ton slurry pipeline carrying coal to utilities in 1985. The FSP notwithstanding, we have, in October, 1976, no more definitive

information about the future level of coal production and the mode of transport than was available in October of 1973.

TABLE 4
ACTUAL AND FORECASTED PRODUCTION AND RAIL ORIGINATIONS OF COAL: 1964-1985
(Millions of Tons)

	COAL PRODUCTION	NATIONAL RAIL ORIGINATIONS	RAIL ORIGINATIONS AS A PERCENT OF PRODUCTION
1964	509	357.7	70.3
1973	590	376.1	63.8
1974	594	390.9	65.8
1980	738	487.9	66.1
1985	1,028	589.0	57.3

Source: See (6).

The range of possible coal production estimates was summarized above. Table 5 contains alternative estimates of national rail originations of coal. For example, the coal production figure provided by the Bureau of Mines (BOM) for 1985 is 998 million tons of coal. The unadjusted estimate of rail originations of coal based on this production figure is 659 million tons; it assumes no change in rail market share (i.e., it stays at the 1974 level of approximately 66%). The adjusted BOM production series incorporates, however, a continuously declining rail market share after 1980 and produces a 1985 rail originations projection of 571 million tons of coal.

TABLE 5
RAIL TONNAGE ORIGINATIONS OF COAL
(Millions)

	1980	1985
Low Growth Final System Plan (adjusted)	510	510
Bureau of Mines (adjusted)	488	589
Bureau of Mines (unadjusted)	532	571
Project Independence (adjusted)	532	659
	589	624

(Table 5 continued)

	1980	1985
Project Independence (unadjusted)	627	792

For 1980, there is a forecast range from 488 to 627 million tons; for 1985, the spread is from 510 to 792 million tons. If one throws out the Project Independence alternative, the range is narrowed greatly --from 488 to 532 in 1980 and from 510 to 659 in 1985. It should be mentioned that the FSP forecast incorporated a mild recession in 1978. Thus explains the low estimate for rail originations (488 million tons) in 1980.

The present study utilizes a quarterly rail sector model which can be simulated for the purpose of evaluating alternative coal scenarios. In simulating rail freight demand over the period from 1976 to 1985, we have used the long-term forecast of economic activity produced by Data Resources Incorporated. This basic scenario incorporates a sustained economic rebound beginning in 1975, with a temporary slowdown in the rate of real growth in 1978. Six separate simulations for rail freight demand were generated; the forecast results are summarized in Table 6.

TABLE 6
PROJECTIONS OF RAIL VOLUME GROWTH
BASED ON ALTERNATIVE ESTIMATES
OF COAL PRODUCTION*
(billions of ton-miles)

	1975	1980	1985
Bur. of Mines Unadjusted	753	996	1,209
Adjusted	753	996	1,173
Project Indep. Unadjusted	753	1,032	1,261
Adjusted	753	1,018	1,194
Final System Plan	753	979	1,181
Low Growth	753	986	1,146

(Table 6 continued)

*The production categories listed in this table are defined in Table 3. It should be noted that the ton-mile estimates shown above for the Final System Plan (next-to-last row) reflect only the coal volume estimates contained in the Final System Plan. All other forecast inputs are taken from the long-term outlook provided by Data Resources, Inc. Thus the variation in long-term estimates is due solely to coal.

Looking at the forecast results shown in Table 6, it is obvious that the volume of coal production will have a tremendous impact on ton-miles of rail freight. Starting from the depressed 1975 level of 753 billion ton-miles, the rail model yields a forecast range for 1980 from 979 billion to 1,032 billion ton-miles, while the comparable range for 1985 is from 1,146 billion to 1,261 billion ton-miles. Taking the 1980 projection of 996 billion and the 1985 estimate of 1,209 billion ton-miles (both based on the latest estimate of coal production from the Bureau of Mines), this produces a compound rate of growth of 5.8 percent between 1975 and 1980 and 4 percent between 1980 and 1985, both of which are quite high when compared to the secular growth rate of 1.6 percent highlighted in Table 1.

3. FINANCING THE COAL BOOM: HOW MANY HOPPER CARS?

The alternative estimates of coal tonnage originations (see Table 5) can be translated into various financial projections. Table 7 contains a forecast of expenditures for the open hopper cars which will be required by the higher volume of coal traffic. Needless to say, this forecast of capital requirements should be viewed as a rough barometer of the order of magnitude, since there are a number of variables (load per car, trips per car per year, system capacity, etc.) which

interconnect rail volume and needed rail equipment.

TABLE 7
ESTIMATED COST OF NEEDED
OPEN HOPPER CARS FOR PROJECTED
RAIL ORIGINATIONS OF COAL
(billions of dollars)

Production Estimate*	1975-1980	1981-1985	Total
Low Growth	\$3.9	\$3.5	\$ 7.4
Final System Plan	3.6	5.2	8.8
Bur. of Mines Adj.	4.3	4.3	8.6
Bur. of Mines Unadj.	4.3	5.9	10.2
Proj. Indep. Adj.	5.2	4.5	9.7
Proj. Indep. Unadj.	5.8	7.2	13.0

*See Table 3 for definitions of production categories. There are a number of variables which must be considered in developing open hopper car requirements. Based on an average load factor of 86 tons per car in 1974, we have estimated load factors of 91 and 96 tons per car in 1980 and 1985, respectively. In addition, we have incorporated improvement in the average turn-around time for coal cars. In particular, we have projected that incremental coal cars will achieve 28 trips per year by 1980 and 30 trips per year by 1985 (this compares with an average of 12.5 trips per year in 1974). This improvement reflects increased usage of unit trains. Financial estimates are based on a 1976 price of \$38,000 for a 100-ton, rapid discharge open top hopper. Price is projected to increase 5% per year.

The figures in Table 7 do serve to illustrate the tremendous financial impact of a coal-centered energy policy on the rail sector. For some perspective, consider that in 1974 net operating income for Class I railroads was less than one billion dollars (1). If one takes the most conservative hopper car projection of \$7.4 billion over the ten-year period from 1975 to 1985, this implies over \$700 million a year for open hoppers. Clearly, part of this

money will be raised by public utilities and other customers who will buy their own coal cars. Even if one divides the original figure of \$7.4 billion by, say, a factor of three to reflect financing external to the industry and to adjust for any upward bias in the projections, the rail industry still needs close to \$250 million a year to finance coal car purchases. This completely ignores the needed capital investment for roadbed and the accelerated maintenance resulting from the rapid growth in unit coal trains. Open hopper cars do have some alternative uses, but such potential growth in the hopper car fleet will make the rail industry much more susceptible to policy "quirks" in the energy area. A large percentage of the coal cars purchased in 1985 will still be in service at the turn of the century. Thus the rail industry's present perception of current and future energy policies will be "built" into the rail fleet for an extended time period.

Referring back to the coal tonnage projections for rail traffic outlined in Table 5, it appears that the moderate level of coal growth most likely to occur by 1985 will not place a severe strain on the physical capacity of the rail system. Rather, the focus should be on the financial ability of the railroad and utility industries to raise large sums of money for rail car expansion. Looking beyond 1985, one must be cognizant of the inflexibility that such a rapid increase in coal car ownership imposes upon both the railroads and the utilities. Given the nature of regulated pricing in these two industries, the increased cost of coal cars will be built into the cost structure, regardless of the level of coal car utilization.

4. AN AGENDA FOR GOVERNMENT ACTION

Prior to 1973, very few economists, politicians, railroaders, or truckers would have been willing to predict a rail renaissance. The Arab embargo, however, has wrenched the economy. While it has raised the possibility of a rail resurgence, it has simultaneously made the rail sector much more dependent on federal policy.

Although both former President Nixon and President Ford have urged the nation to achieve energy independence by 1985, very little has been accomplished in that direction. In fact, we have regressed--foreign oil now comprises nearly forty percent of our total oil usage. While the federal government has usurped the leadership role in the national energy arena, it has developed no substantive energy plan in the three years since the oil embargo. As a result of this planning vacuum, the freight transportation sector desperately needs clarification from the federal government on the following issues:

- (1) Does this nation propose to reduce--totally or partially--its dependence on foreign oil by 1985?
- (2) What role will coal (as well as all other fuels) play in this national energy plan?
- (3) Will the federal government support recent proposals to grant the right of eminent domain to slurry pipelines?
- (4) The inflated demand for low sulphur coal has produced a surge in business for Western railroads. Will the Environmental Protection Agency maintain its present sulphur emission guidelines?
- (5) Will the federal government favor

the development of Eastern coal in order to keep ConRail profitable?

It can be argued that the Project Independence estimates are no longer feasible as a target level for government energy policy. Even if it is impossible to hit the target of 1,200 million tons of coal in 1985, the current political environment continues to focus on the need for energy independence. Both President Ford and Jimmy Carter have urged the country to reduce the potential impact of another oil embargo by developing alternative energy sources. Energy companies and railroads are, in fact, currently spending billions of dollars to handle this future onslaught of coal production. There is already ample evidence of labor and equipment shortages in the coal mining industry. On the other hand, there is no guarantee (or even a well-thought-out-argument) that the United States could utilize 1,200 million tons of coal in 1985. Work done by Chase Econometrics Inc. suggests that, due to the declining growth rate of steel production (smaller cars) and due to the lower growth rate for high-priced electricity, coal production will be under 900 million tons in 1985 (6). If one accepts the position that the near-term growth of coal is limited by demand forces, the rail sector may be, in fact, in the process of developing massive excess capacity.

The mere presence of a federal coal production target in 1985 (whether it is 1,200 million tons or 900 million tons) does not eradicate a fundamental rail planning problem: To what degree will the federal government rely on the railroad industry to move future coal production? If the federal government

permits the development of slurry pipelines, and, at the same time, encourages rail development, what guarantees, if any, will be (should be) provided to the rail industry?

Assuming that the nation does develop a coal-centered energy policy and that the rail industry maintains its present dominance in coal transport, will the coal come from the East or the West? Historically, coal production has been concentrated in the East. With the advent of sulphur emission guidelines by the Environmental Protection Agency, however, an artificial demand has developed for low sulphur coal (mined mainly in Wyoming). Concern for the environment might dictate, therefore, an energy policy which boasts strong Western railroads such as Union Pacific and Burlington Northern. The federal government's interest in keeping ConRail profitable, however, may yield an energy plan which favors Eastern coal.

The analysis in this article supports the possibility of a rail renaissance in conjunction with a surge in coal production. The growth scenarios outlined in Table 6 display a pattern of increase which is a complete reversal of the rail stagnation experienced during the postwar period. The financial needs outlined in Table 7, however, are sobering when one considers the past earnings history of the railroad industry. Given the tremendous uncertainty which permeates current transportation planning, it is apparent that the future of the rail system is intricately interwoven with the maze of policy decisions still to be made in the energy and transportation domains.

REFERENCES

- (1) Association of American Railroads, Yearbook of Railroad Facts, Washington, D.C.: Government Printing Office, 1975.
- (2) Federal Energy Administration, Project Independence Report, Washington, D.C.: Government Printing Office, 1974.
- (3) Joint Economic Committee, Reappraisal of Project Independence Blueprint, Washington, D.C.: Government Printing Office, 1975.
- (4) Mitre Corporation, An Analysis of Constraints on Increased Coal Production, McLean, Virginia, 1975.
- (5) Task Group on Coal Supply Potential Report, Utility Oil Saving Study, Washington, D.C.: Government Printing Office, 1975.
- (6) Temple, Barker, & Sloane, Inc., Forecast of Traffic and Revenues 1975-1980, 1985 (Report prepared for United States Railway Association under contract No. D-50000), Wellesly Hill, Massachusetts, 1975.
- (7) Temple, Barker, & Sloane, Inc., A Comparison of TBS's Forecast of the Traffic of Eleven Selected Eastern Railroads in 1974 with Actual Results (Report prepared for the United States Railway Association), Wellesly Hills, Massachusetts, 1975.
- (8) U.S. Department of Interior, Bureau of Mines, United States Energy Through the Year 2000 (Revised), Washington, D.C.: Government Printing Office, 1975.
- (9) U.S. Department of Interior, Inter-agency Coal Task Force, Report on Project Independence Blueprint, Washington, D.C.: Government Printing Office, 1974.
- (10) U.S. Department of Interior, National Petroleum Council, U.S. Energy Outlook - Coal Availability, Washington, D.C.: Government Printing Office, 1973.
- (11) U.S. Department of Interior, Office of Coal Research, Prospective Regional Markets for Coal Conversion Plant Products Projected to 1980 and 1985, Washington, D.C.: Government Printing Office, 1974.
- (12) U.S. Railway Association, Final System Plan, Washington, D.C.: U.S. Government Printing Office, 1975.

BIOGRAPHY

Larry C. Peppers is Associate Professor of Economics, Creighton University. He holds a Ph.D. in economics from Vanderbilt University and was formerly Manager of Commercial Forecasts for Union Pacific Railroad.