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FINANCIAL AND PHYSICAL CAPACITY OF
THE BURLINGTON NORTHERN RAILROAD
TO MOVE WESTERN COAL

prepared by

Peat, Marwick, Mitchell & Co.
Washington, D.C.

for

Transportation Research Center
Energy and Environmental Systems Division
Argonne National Laboratory

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I. INTRODUCTION

Studies conducted by the Department of Energy, the Department of Transportation, and the National Transportation Policy Study Commission (NTPSC) express concern about the ability of railroads both to carry projected coal traffic and to finance physical plant expansion to accommodate additional coal volumes. These studies, along with past experiences, have called into question the overall physical capacity of the Burlington Northern (BN) Railroad to meet future demands for the movement of coal out of its service areas. Consequently, Peat, Marwick, Mitchell & Co. (PMM&Co.) was engaged by Argonne National Laboratory to identify the conditions under which the BN could or could not meet projected levels of demand.

PMM&Co. has relied upon secondary information provided by the BN and other sources without verifying such data. The achievement of any financial projection may be affected by possible fluctuating economic conditions and depends on the occurrence of future events which cannot be assured. Therefore, actual results achieved may vary from the projections and such variations could be material.

STUDY PURPOSE

This study was intended to evaluate BN's ability to physically and financially provide adequate coal carrying capacity in its service areas. Particular concern was focused on the BN's capacity to achieve the National Energy Plan (NEP) goals for expanded coal production and use. Specific objectives of this study were to:

- . review existing coal movement projections;
- . assess BN's physical capacity to move coal in 1980 through 1995 under several scenarios; and
- . assess BN's ability to finance an expansion of its facilities to achieve the necessary capacity.

SCOPE OF THE STUDY

The scope of the study was limited to:

- first, determine the physical capacity required to move coal at several differing demand levels and translate the capacity into capital costs associated with the demand projections; and
- second, independently assess the BN's ability to finance the necessary capital programs required.

The study was not intended to estimate the likely range of demand for coal movement, nor to determine specific improvements which would have to be made to the BN facilities. Sufficient operating and engineering detail was developed to be accurate, but not necessarily at a level that specific decisions on facilities could be made. Results of detailed analyses have been omitted from this report because of the proprietary nature of some of the information contained therein.

The study to assess the BN's capacity to finance additional capital programs was prepared from information contained in published journals, reports, and reference documents. Data submitted to the Securities and Exchange Commission and Interstate Commerce Commission was also reviewed.

GENERAL APPROACH

To assess the BN's requirements for capacity expansions to facilities, PMM&Co. followed the approach outlined below:

- identified the range of national and BN regional production forecasts;
- estimated the demand for movement of coal under three production scenarios;
- assigned the resulting coal traffic flows to appropriate DN main lines,
- estimated current capacity of the primary coal lines;
- determined capacity deficiencies in future years under each scenario;
- estimated facility additions required to provide adequate capacity;
- estimated the cost of providing the facilities and related support facilities; and

- estimated the rate of physical plant replacement required as a result of the various coal traffic scenarios, and the resulting capital burden on the BN.

An important element in estimating rail line capacity is the Parametric Analysis technique developed by PMM&Co.

To determine the BN's ability to finance future plant and equipment additions, PMM&Co. reviewed the following indicators:

- Earnings - the ability to generate sufficient cash to meet operating and debt service programs.
- Capital Structure - measures the ability to add new debt or equity to facilitate capital programs.
- Fixed Charges Coverage - measures the ability of the BN to cover interest and lease obligations, the higher the fixed charges coverage ratio the easier additional financing.

Earnings, capital structure, and fixed charges coverages, while computed independently, must be reviewed as an interactive system.

BACKGROUND

On December 28, 1977, the BN and the St. Louis-San Francisco Railway Company (Frisco) filed a joint application with the Interstate Commerce Commission (ICC) seeking authorization to consummate the merger of the Frisco into the BN. The ICC approved the merger on April 17, 1980. A joint study conducted by the two companies indicated that the merger would result in annual financial benefits of approximately \$32.8 million before income taxes in 1976 dollars based on 1976 operations. These benefits would begin to be realized in the third year following merger. The benefits of the merger include shorter routing of existing joint traffic, consolidation at common points, higher utilization and efficiency in the use of trains and tracks, and the consolidation of management functions. In addition, the merger would open up the opportunity for single line BN service reaching the Eastern Gulf ports of Mobile and Pensacola; stretching to such inland points as Memphis, Birmingham, Tulsa, and Oklahoma City; and running on a shorter route to Fort

Worth-Dallas and on to Houston via the Kansas City gateway. Undoubtedly, the merger would place the BN in an area of the country that is experiencing very rapid growth.

The current BN rail system is shown in Figure 1. Historically, farm and forest products have been the principal components of BN's rail freight traffic. These major commodities provided 51 percent of BN's gross rail freight revenues in 1974 and 43 percent in 1978.

BN serves a large portion of the major grain producing regions of the Midwest and the Great Plains and moves large quantities of wheat, barley, corn and milo, either to the major milling centers or to Pacific Northwest, Gulf, and Great Lakes ports for export. In addition, BN transports produce eastward from the Pacific Northwest. The traffic volume of farm products is subject to fluctuation from year to year depending on weather conditions in the crop producing areas, government policies as reflected in acreage allotments, price supports, export demand, and the amount of grain in storage.

BN also serves the timber producing regions of Washington, Oregon, Idaho, Montana, and Minnesota, hauling significant volumes of lumber, plywood, wood chips, wood pulp, paper and paper products. Variations in the traffic level of forest products result in large part from general economic conditions as reflected in the level of housing construction; demand for furniture, packaging, and paper; competition from other modes of transportation; and from export demand.

The transportation of coal has become BN's largest single source of rail transportation revenues. Between 1974 and 1978, the BN more than doubled its coal traffic, originating 29.5 million tons in 1974 while originating 63.1 million tons in 1978. The majority of this coal traffic increase is due to increased coal production in the Powder River Basin, which is located in northeastern Wyoming and southeastern Montana. Approximately 90 percent of the coal traffic originated by the BN in 1979 originated in the Powder River Basin and was destined for electric generating stations in the Midwest, the Great Lakes, and the Southwest. The balance of the coal traffic originated by the BN in 1979 came from mines in the Midwest and North Dakota, from which coal traffic has been relatively stable since the beginning of the decade.

The BN holds mineral rights on extensive acreage in Montana, North Dakota, Washington, Illinois, Missouri, and Alberta, which the BN estimates contain more than 14.7 billion tons of recoverable bituminous, subbituminous, and lignite coal, most of which

is surface minable. At the end of 1978, approximately 6.7 billion tons of BN's coal, including most of its recoverable sub-bituminous coal, was leased to others under long-term contracts. Generally, these leases are for initial terms of 20 years, renewable for another 20. Under these leases, the BN receives its coal revenue from bonus payments, annual advance and minimum royalties, and production royalties. The BN believes that its coal resources are not material to its present business or assets. It considers the development of most of its coal resources as a long-term project and sees little chance in the near-term for any substantial increase in revenues or profits from such development. Much of BN's coal is intermingled with federally owned coal in a checkerboard ownership pattern, so that prohibition or reduction of mining federal coal effectively prohibits or reduces mining of BN-owned coal. The BN believes that the Department of Interior's preferred federal coal leasing program could remove substantial federal coal properties from development for environmental and other reasons. In addition, state legislation with provision for strong environmental safeguards, severance taxes, reclamation, water rights, economic growth management, and other matters relating to coal development, particularly with respect to surface mining, has slowed development of BN's coal resources.

The BN is engaged in various additional transportation activities and land and real estate development. Wholly owned transportation subsidiaries of the BN include Western Fruit Express Company, BN Transport, Inc., and Burlington Northern Air Freight, Inc. The BN and other participants have also formed Northern Tier Pipeline Company to build a pipeline from Puget Sound to Clearbrook, Minnesota, to transport Alaskan Crude oil to the upper Midwest. The BN does not intend to participate in funding construction of the pipeline.

The BN is active in the development of properties adjacent to its rail lines for sale or lease to industries, and currently owns approximately 17,000 acres of land for such purposes. In addition, the BN is active in the development, management, sale, and lease of 32,000 acres of cultivated land and 1.2 million acres of grazing lands.

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FIGURE 1
MAP OF BN SYSTEM

II. REVIEW OF FORECASTS

To assess the potential demand for BN's services, PMM&Co. reviewed the available forecasts of demand for coal. Both national and regional distributions were reviewed, because both are important to the ultimate need for BN capacity. The wide range of forecasts, particularly at the regional level, forced us to establish arbitrary high, low, and middle estimates of demand for BN-moved coal. These levels of demand were established near the extremes of the forecasts as well as approximately at a medium level. The forecasts examined are listed in Table 1.

NATIONAL FORECASTS

The national forecasts for coal production and consumption (the primary difference between them being export coal) were in general more tightly clustered than were the regional forecasts. Figure 2 shows the gradually increased dispersion among the forecasts as they moved toward the future. Some series of forecasts have high, medium, and low ranges, and many do not extend beyond 1990. The BLM forecasts have the widest dispersion with more than a 50 percent range, but most of the 1990 forecasts are clustered around 1,400 to 1,500 million tons production. Some of the inversions of positions on the graph should be noted, i.e., the EIA 1979 forecast ranges from one of the highest values for 1985 production to become the lowest forecast for 1995 production. The 1973 to 1979 trend yields about a 4.4 percent per year growth in total production, albeit rather uneven growth. If coal production continues to grow at that rate, 1990 production would be about 1,250 million tons, and year 2000 production about 1,900. Accordingly, in virtually all the forecasts, some acceleration in that growth rate during the next two decades is predicted.

BN TERRITORY FORECASTS

Coal traffic carried by the BN originates in two primary areas of the country. More than 90 percent is produced in the South Powder River Basis (SPRB) and Fort Union deposits of Wyoming, Montana, and North Dakota. (See Figure 3, Table 2, and Table 3.) Most of the remaining traffic originates in the southern Illinois coal fields. BN is one of many carriers serving the southern Illinois coal fields and, as such, is not one of the major carriers for the area. Although most forecasts expect production of coal from the southern Illinois/western Kentucky area to grow, the fact that much of the coal is high in sulfur will prevent production from growing as rapidly as Western coal production.

TABLE 1
COAL PRODUCTION AND DEMAND FORECASTS

- (DRI) — Data Resources Inc., 1980.
- (WCS) — Coal - World Coal Study, Coal - Bridge to the Future, 1980.
- (BLM) — Bureau of Land Management - Draft Environmental Statement, Federal Coal Management Program, April 1979.
- (NTPSC) — National Transportation Policy Study Commission, Final Report, June 1979.
- (TRW) — TRW Energy Systems Planning Division, Coal Supply/Demand, Final Review Draft, September 1980.
- (EIA - 79) — Energy Information Administration, Energy Forecasts for the Annual Report to Congress - 1979.
- (EIA - 78) — Energy Information Administration, Energy Forecasts for the Annual Report to Congress - 1978.
- (NCA) — National Coal Association, NCA Economics Committee, Long Term Forecast, February 1980.
- (EPRI) — Electric Power Research Institute - Overview and Strategy, 1980 - 1984 R-D Program Plan.
- (LPDO) — DOE/Leasing Policy Development Office, Preliminary National and Regional Coal Production Goals for 1985, 1990 and 1995, July 1980.
- (BN) — Burlington Northern Inc., Form 10-K, for the fiscal year ended December 31, 1979.

FIGURE 2
FORECASTS OF
U.S. COAL PRODUCTION

FIGURE 3

BURLINGTON NORTHERN SERVICE TO
WESTERN COAL FIELDS

Consequently, coal from this area is never likely to become a major component of BN's coal movements, nor to require significant capital investments. Coal from this area is consumed within the region and consequently moves a relatively short distance compared to Western coal. Although coal movements from this area were analyzed as part of this study, they were not examined in as much detail as the Western area movements.

TABLE 2

Estimated Distribution of
Origins of BN Coal - 1979

Gillette Area	44%
Sheridan Area	21%
Colstrip-Kuehn Areas	24%
Other Western	4%
Illinois	7%

BN is the only significant carrier currently serving most the SPRB and North Dakota coal fields and, as a consequence, is of major importance to the successful expansion of production from these areas. Production in the SPRB and Fort Union fields was about 105 million tons in 1979 (depending upon the precise definition of the producing areas). BN moved about 74 million tons of this coal, or about 70 percent. The remainder was consumed locally or moved via other modes or carriers. In 1980, BN expects to move an estimated 90 million tons out of a production of approximately 126 million tons, or about 71 percent.

Much more dispersion is evident in the production forecasts from the SPRB and North Dakota deposits (Figure 4) than for over-all U.S. production. For example, the 1990 BLM estimates range from a low of less than 200 million tons to a high of more than 650 million tons. The high seems to be based primarily upon the ability to put the fields into production, while the low is based on the assumption that demand is low and that significant difficulties will impose restrictions on the development of leases, etc. Such a range of forecasts provides little practical guidance toward a reasonable range of expected demands for moving Western coal via the BN. Even among the other forecasts, however, a considerable range of values exists. The variances are caused by not only those factors that affect the overall national demand for coal, but also by an additional set of factors that affect the national sourcing

TABLE 3
MAJOR PRODUCERS IN 1979 ON BN LINES
IN WYOMING & MONTANA
(See Figure 3)

Company	Mines	Location	1979 Tonnage (Millions)
Western Energy	Rosebud 1 & 2	Colstrip	11.7
Peabody Coal	Big Sky	Colstrip	2.4
Westmoreland Resource	Absaloka	Kuehn	4.9
Decker Coal	E & W Decker	Decker	13.0
Peter Kiewit Sons	Big Horn	Sheridan	3.5
Amax Coal	Belle Ayr	Gillette	15.0
Amax Coal	Eagle Butte	Gillette	3.7
Kerr Mc Gee	Clovis Point	Gillette	5.0
	Jacob's Ranch	Reno	}
Thunder Basin Coal	Black Thunder	Reno	
			6.2
			<hr/> 85.4
Total BN Coal (Including Illinois)			80.2

Source: Coal Age

FIGURE 4

COAL PRODUCTION IN THE SOUTH POWDER RIVER BASIN & FORT UNION DEPOSITS

of coal. Among these factors, the primary one is the environmental restrictions on the burning of high sulfur coal, which require more cleaning for high sulfur coal. Western coal, with its relatively low sulfur content, will be relatively high in demand if cleaning high sulfur coal is more expensive than transporting and cleaning low sulfur coal. Much of the location sensitive demand will depend upon technological developments and the relative economics of stack emissions scrubbing. As a result, it is relatively impossible to accurately estimate the demand for this coal beyond the next several years.

A range of possible scenarios was developed to cover the range of the most reasonable forecasts. The scenarios used for this analysis and the equivalent values from other forecasts, where appropriate, are shown in Table 4, on the following page.

FORECASTS OF EXPORT COAL

Forecasts for the export of coal are also highly conjectural and difficult to identify. Forecasts for the export of Western coal have generally not been made, even though exports to the Far East have recently been recognized as a potentially significant market. In lieu of available forecasts, the study team developed estimates. (See Table 5, below). In this table, the coal is assumed to originate in BN-served territories and to move to the West Coast (probably to the Portland, Oregon, area) for export. We made no attempt to estimate the total export market.

TABLE 5

Assumed Export Tonnages Annually
(Millions of Tons)

	<u>Low</u>	<u>Medium</u>	<u>High</u>
1985	--	10	15
1990	5	15	20
1995	10	20	25

TABLE 4
FORECASTS FOR PROJECTED
BN COAL DEMANDS
Millions of Net Tons

Year	Total U.S. Production	S.P.R.B. & Fort Union Production
1979 Actual	776	115
1980 Proj.	773 (DRI)	126 (DRI)
1985 Low	886 (WCS)	167 (BLM)
Medium	1055 (TRW)	206 (TRW)
High	1197 (NTPSC)	352 (BLM)
1990 Low	1114 (BLM)	197 (BLM)
Medium	1343 (EIA '79)	322 (EIA '79)
High	1465 (EIA '78)	502 (EIA '78)
1995 Low	1500 *	325 *
Medium	1718 (LPDO)	448 (EIA '79)
High	2050 *	700 *
2000 Low	1931 (DRI)	578 (DRI)
Medium	2095 (WCS)	700 *
High	2621 (NTPSC)	900 (NTPSC)

Sources:

* - Estimated by PMM

Others - See Table 1

DEMAND FOR BN MOVEMENT OF COAL

After developing estimated ranges for production of coal in the BN service area, it was necessary to estimate the proportion of the production that would be shipped on the BN, and the routes and destinations of the movements. First, the proportion of the coal to be shipped out of the area (or conversely not consumed locally within the area) was estimated. Then, the availability of other carriers to move the coal was estimated. And, finally, the production to be moved by BN was distributed to consuming areas.

Proportion of Production Shipped

Historically, the BN has moved only about 65 percent of the coal being produced in those production areas which are essentially captive to the BN in the West. This percentage has been increasing recently, apparently because consumption locally has grown relatively slower than consumption outside the producing area. The proportion of production that could potentially move via the BN should be expected to continue to increase, probably through the 1980s until the production of synthetic fuels from coal becomes a significant factor. Through the 1990s, the proportion should begin to stabilize and possibly even drop slightly. Table 6 shows the proportions assumed to be available for movement outside the SPRB and Fort Union areas.

Other Means of Transporting the Coal

Of the coal production potentially available for movement by the BN, further adjustments must be made for other coal transportation means that are likely to become available during the next two decades. Primary among these are the line proposed to be built by the Chicago and North Western Railroad (CNW), that will probably access most of the same Wyoming coal fields currently served by the BN. A second major alternative is the proposed slurry pipelines which would also access SPRB coal fields, most of which are also on BN rail lines. The CNW line would be competitive with the BN to most markets south and east of the coal fields and some markets in the North Central states as well. The slurry pipelines that are most seriously being proposed would provide service to either the South Central or Central states. Other slurry pipelines being proposed would be competitive in virtually any other direction served by the BN, but most of these seem to be much longer-range proposals. One thing that seems likely is that the greater the demand for Western coal, the more likely it is that these competitive projects will be built.

TABLE 6
BN SHARE OF WESTERN COAL
TRANSPORTATION

Year/Scenario	S.P.R.B. & F.V. Production Annual Tons (Millions)	BN Potential		Less CNW Moved	Less Slurry Pipeline Moved	Net BN
		%	Tons (Millions)			
1979	105	70	74	—	—	74
1980 (Est.)	126	71	90	—	—	90
1985 Low	167	75	125	18	—	107
1985 Medium	206	75	155	—	—	155
1985 High	352	75	264	36	—	228
1990 Low	197	80	158	36	25	97
1990 Medium	322	80	258	36	25	197
1990 High	502	80	402	42	37	323
1995 Low	325	75	244	40	37	167
1995 Medium	485	80	388	50	50	288
1995 High	700	80	560	60	75	425

Assumptions:

See Text

- . CNW on line in 1982, except Medium Case 1986
- . One Slurry pipeline on line 1986
- . Additional Slurry pipelines on line after 1990

The CNW line, which, in accordance with the Staggers 1980 Rail Act, is to be given priority for review by the FRA when the EIS is finalized, is probably the most likely of the projects that will be built, if it meets the FRA criteria. Consequently, its completion was assumed in all of the scenarios after 1985. It is included in the 1985 low scenario to reduce the demand for BN service in that scenario. Also, its competition was assumed for the high 1985 scenario, because the assumed high demand for Western coal at that time would virtually force its construction. Another assumption was that by 1990, at least one slurry pipeline would be completed and competing with the BN for coal moving toward the Southeast. In the 1995 scenarios it was assumed that one or two more pipelines would have been completed in the medium and high scenarios.

The effects that the foregoing new transportation services would have on the amount of coal that BN would move are also shown in Table 6. It is important to note that if the demand for Western coal does not grow dramatically (low scenario), and if both the CNW line and a coal slurry pipeline are built then the BN might not have to move any more coal in 1990 than it expects to move in 1980. This tends to indicate that before investing in rail to limit the downside risk, the BN should be relatively certain of how much traffic will materialize. The three scenarios analyzed are shown in Figure 5.

Distribution of Demand

The next step in the process was to estimate the destinations for the coal traffic to be moved by the BN. Although several detailed sources of projections were available, none proved entirely satisfactory. The study team reviewed both the NTPSC and the NETS detailed coal traffic flow forecasts at a BEA zone level. BLM, TRW, and others also had consumption pattern estimates or flow estimates at a regional level, but these were generally too aggregate to enable identifying potential specific moves to assign to rail lines. The NTPSC forecasted overall flow patterns toward the East and South looked reasonable. The primary problems found in the NTPSC flows are to Mountain and Western states. Several flows expected to occur in the next decade are not reflected in the NTPSC patterns. On the other hand, the NETS study did reflect significant flows to these areas, however, a considerable amount of crosshauling of coal appeared in the NETS data. A number of extremely long and uneconomical flows appeared in the NETS patterns toward the East. It must be remembered that most of the BN coal is of moderate BTU content per pound, and transportation costs tend to increase roughly in proportion to weight and distance hauled. Long hauls of relatively low BTU coal will probably be rare.

FIGURE 5
TOTAL COAL ORIGINATIONS ON BN
(Millions of Tons)

As a result of large variations in the available BEA zone forecasts, the study team was forced to develop its own estimates of coal flow patterns for the BN, as shown in Table 7. The flows used were based, in the aggregate on the TRW regional flows, and were then allocated within regions using the NTPSC flows to the East and South. Separate allocations to the Mountain and Pacific States were estimated, based on the railroads and routes available to the zones. The Union Pacific (UP) and the Denver and Rio Grande Western (DRGW) Railroads are particularly competitive to the Southern and Central Mountain and Pacific States. The UP obtains coal from southern Wyoming, while the DRGW serves coal lines in central Colorado and Utah. Both of these sources can be competitive with BN coal to some markets. Insufficient information was available to identify likely shifts in competitive patterns over the study time period.

TABLE 7**REGIONAL DISTRIBUTION OF
COAL MOVES
(Domestic Consumption)**

Region	TRW	PMM
East	0.0	1.0
East North Central	18.0	18.0
East South Central	0.7	0.7
West North Central	36.0	36.0
West South Central	23.3	22.8
Mountain	18.9	12.5
Pacific	3.0	9.0
	100.0	100.0

NOTE: Pipelines through 1995 assumed to divert from WNC and WSC regions.

III. ANALYSIS OF PHYSICAL PLANT CAPACITY

An analysis was performed of the physical capacity of the Burlington Northern lines expected to be used to haul significant amounts of coal traffic, and the expected deficiencies in capacity were identified to assess the need for capital investment in capacity expansion. The technique used to estimate the current capacity and the expected increases required was the "Parametric Analysis of Railway Line Capacity"¹ developed by PMM&Co. for the Federal Railroad Administration. Although more precise techniques are available to assess rail line capacity, the approximation technique was necessitated by the large number of lines to be analyzed and the limited time and resources available to perform the analyses.

Previous experience with the technique indicates that it is accurate to within about 10 percent of what would be obtained with more detailed estimates, and that there are not any consistent biases in the results. Therefore, even though estimates of capacity for individual lines may be in error by some amount, it is likely that for the entire network most of the errors cancel and the estimates for the entire system are close to what would be obtained with more detailed analysis.

CAPACITY ANALYSIS OF CURRENT LINE CONFIGURATIONS

A total of 6,788 miles of BN lines was analyzed to determine their capacity as they are currently configured and operated. The lines were broken into 58 segments generally at crew change points. Three criteria were used to determine the most likely practical operating capacity of the line segments. The three criteria were:

- Crew hours-of-service limitations - By federal law, railroad operating crews may not work more than 12 hours without rest. It is quite expensive to relieve crews whose time has expired, but who have not reached the next crew change point. Therefore, one criteria used was that virtually all trains must be able to reach the next crew change point within 11 hours (allowing one hour for origination and terminating delays).

¹ Parametric Analysis of Railway Line Capacity, prepared by Peat, Marwick, Mitchell & Co., for the Federal Railroad Administration, U.S. Department of Transportation, Washington, D.C. 20590, August 1975.

- . Minimum Economic Speed - Based upon the rates at which train crews are paid (eight hours pay for the first 100 miles, and pro rata beyond that), it is uneconomical use of crews to average less than 12.5 miles per hour of crew on-duty time. The railroad would end up paying the crew more on a time basis than on a mileage basis. Therefore a second criteria used was that the slowest trains must average at least 12.5 miles per hour. Note that this criteria implies a considerably higher minimum average speed of about 20mph.
- . Minimum Level of Service - Especially for higher speed lines, a minimum level of service should be obtained from a line for economic use of equipment and facilities. Based on examinations of many rail operations, a criteria was established that rail lines should be able to operate at least 45 percent of the average "free" speed (without traffic or work delays) of the line. For example, the slowest train on a line capable of providing an average operating free speed of 35 miles per hour should be able to average at least 15.75 miles per hour or the line is not being used efficiently.

In application, the most restrictive criteria was used in determining the practical capacity of the line. In many cases, the lines are capable of carrying more trains than the capacity so determined. The cost, however, of operating at high train volumes would be substantially greater than operating below that capacity threshold. Economic studies have shown that at that threshold, it is usually less costly on a present value basis to add capacity than it is to operate above it.

For each of the line segments analyzed, the physical and operating characteristics were developed from information included in the Timetables and Operating Instructions supplied by the BN. For many lines, additional information was obtained from the BN to carefully identify other capacity factors and constraints of the lines. This information was used to prepare parametric analyses of the capacity in terms of trains for each line segment of the year 1980. The factors and assumptions used in estimating current line capacity were:

- . length of crew districts;
- . number of tracks;

- . number of sidings long enough for coal trains and, on double track, number of crossovers between tracks;
- . type of signalling and control systems;
- . maximum train speeds and speed restrictions as specified in the operating instructions;
- . uniformity of siding spacing;
- . significant grades; and
- . mix of train speeds and priorities.

The capacity estimates were compared to the actual number of trains operated over the lines. Although many line segments were assessed to be close to capacity, in only one case was the segment assessed to have slightly less capacity than the traffic currently operating over it. This discrepancy may be due in part to the accuracy of the estimates; however, the BN is in the process of substantially increasing the capacity of this segment because of the operating difficulties.

ASSIGNMENT OF ESTIMATED FUTURE TRAFFIC FLOWS TO LINES

The future coal traffic origin-destination distributions for each scenario, as described in the previous section, were assigned to specific rail lines based upon current patterns of flow and available capacity. In many cases only one route between the mines and the consuming zones was reasonable. Little redundancy exists in the BN network. For those few cases where optional routes exist, other considerations were generally overriding, such as shortest distance, better grades, or legal restrictions on trains.

For each study year and traffic level, the estimated coal flow between each origin and destination was added to the other traffic expected to flow over the line. The tons of coal to be moved each year over a line segment were converted to coal trains per day by dividing by 1.5 million tons. This allowed a 25 percent margin for traffic peaking due to the random mix of equipment cycles on a line, and delays due to bad weather, accidents, or other major disruptions. The capacity estimate from the parametric analysis already allowed for delays because of track maintenance. To the coal traffic were added estimates of other trains which would be operated over the line. By BN's estimates, other traffic is not expected to grow significantly during the next five years on most of the lines studied in terms of number of trains. Beyond 1985, the number of trains on the lines was

increased by 20 percent in the high traffic scenario for both 1990 and 1995, and for 1995 in the medium traffic scenario. For most of the major coal lines which would need increases in capacity to accommodate the higher coal volumes, the trains carrying other products are not major users of line capacity. Typically the other trains are less than 50 percent of the traffic on lines with significant coal traffic.

IDENTIFICATION OF CAPACITY INSUFFICIENCIES

By comparing the expected demand for train movements in each scenario and year to the 1980 estimates of capacity on each line segment, the expected shortfall in capacity can be determined. Since the low scenario was not expected to require any significant increases in capacity until 1995, it presented a different set of financial problems and was not further analyzed in terms of line capacity requirements. For the other two scenarios, the expected capacity deficiencies are tabulated below:

Lines With Expected Capacity Investment Requirements Scenario

	Medium		High	
	<u>Line</u>		<u>Line</u>	
	<u>Segments</u>	<u>Miles</u>	<u>Segments</u>	<u>Miles</u>
1990	27	3,596	33	4,004
1995	32	3,889	41	4,927

ADDITIONAL FACILITIES REQUIRED

To assess the amount of additional facilities required to supply the necessary capacity, a graphical technique was used. Based on a series of parametric analyses on typical line configurations, a set of curves was developed (see Figure 6). This allowed for an easy conversion from the number of trains required to be handled to the additional number of sidings or second track required. The main parameters used were the average siding spacing or the proportion of second track, since these are the main factors which can be varied to increase the capacity of a line. Capacity along the left axis was expressed in arbitrary units. For example, if a line currently had a siding spacing of 12 miles and required an increase of 50 percent in capacity, the line would currently have a relative capacity of 25 units, and increasing it to 37.5 units would require an average siding spacing of about 7.3 miles. Therefore, the additional number of sidings required to provide adequate capacity would be that number that would improve the siding

FIGURE 6
IMPROVEMENT REQUIRED TO INCREASE CAPACITY

spacing from 12 to at least 7.3 miles. For a 100 mile line, this would be an increase from eight sidings to 14 sidings. By the time sidings are spaced as close as five to six miles, a line would be effectively 20 to 30 percent second track and the second curve would be used. (There is no significance to the point at which the lines cross since the capacity units are relative.)

Using this graphical technique, the number of additional sidings or miles of second track required for each line segment for each year and scenario was determined. In addition, those lines that are not currently signalled, or that do not have remote traffic control systems (CTC) were assumed to need them to achieve projected capacity. On a few lines, the capacity of a completely double track line would be insufficient to accommodate the projected demands of the higher scenario years, and some additional trackage would be required. To estimate the amount of third track required, the rate of capacity addition with increased trackage was extrapolated beyond the 100 percent mark. Thus, a line requiring 120 percent second track to attain the required capacity was assumed to require full double track plus 20 percent third track. The parametric analysis was not designed for more than two tracks and therefore is not directly usable.

It may be noted that per track mile, the addition of sidings is a lower cost way of increasing capacity than adding sections of second main track. This is generally true until spacings in the range of four to six miles are obtained, whereupon the additional costs associated with constantly starting and stopping trains at sidings becomes very significant, and second main track becomes more effective. Therefore, if siding spacings of five miles or so do not provide sufficient capacity, it becomes necessary to start converting a line to double track rather than continuing to reduce siding spacing. The practicality of continuing to reduce siding spacing also becomes a problem, since it is not usually possible to respace the other sidings every time a siding is added to a line. These factors were taken into account when assessing the additional track required to obtain the requisite capacity.

CAPITAL INVESTMENT REQUIREMENTS

Major capital expenditure requirements as a result of the movement of coal fall roughly into three categories:

- . additions to physical facilities,
- . replacement of track components, especially rail, and

- . additions of train equipment, especially locomotives.

The investment required in additional physical facilities was based on the incremental capacity needed as determined in this study. The replacement of track components is primarily related to the usage and characteristics of the track and was based on the projected traffic levels described previously. Investment in train equipment or rolling stock -- locomotives, freight cars, and cabooses (crew-cars) -- is a combined function of incremental and cumulative traffic level (the total amount of equipment needed at any given time, and the rate at which it wears out). Most of the coal carrying cars are acquired and owned by the receivers of coal and as such are not a financial requirement for the BN. Virtually all the other rolling stock, and in fact some of the other investments required as well, can be obtained through leases and, as such, do not require financing by the BN. Consequently, no effort was made to estimate the investment requirements for rolling stock.

To permit costing the additional facilities which were determined to be required to accommodate the increases in coal traffic, it would be necessary to assess the specific projects in terms of where and when they would be built. The BN will undoubtedly place the additional facilities in the locations which are most cost effective in terms of both construction cost and the additional capacity provided. Without performing the detailed studies required to specifically locate those facilities and to determine the engineered cost of constructing them, generalized costs must be used.

Costs for Additional Facilities

The following outlines the costs in 1980 dollars of facilities assumed for this analysis:

- . Add CTC (existing signals) \$100,000 per track-mile¹
- . Add CTC and signals \$150,000 per track-mile¹
- . Add Sidings @ 6000' \$900,000 each ¹
- . Add Second main track, \$800,000 per mile¹
including signalling,
CTC, and crossovers

¹ Developed by PMM&Co. from multiple sources.

To avoid having to determine specifically when the improvements would have to be constructed, all analyses were made in 1980 dollars. The above costs do not allow for purchase of right-of-way, since in most cases the BN's right-of-way should be adequate to add a second track. The track costs do include grading, rail, ties, ballast, and bridgework where required. All signalling, switches, and controls are also included. The costs for adding second main track are slightly higher per mile than for adding sidings because there is less flexibility to avoid expensive grading and bridge sites. In addition, ancillary expenses such as shops, yards, communications facilities, maintenance facilities, and maintenance equipment are assumed to be an additional 25 percent above the main line costs.

Capital investments in line capacity improvements are summarized by direction of move in Table 8.

Track Replacement Requirements

The rate at which track components need to be replaced as a result of use in heavy tonnage unit train rail lines is a highly complex and controversial issue. The most costly and hence most important item to be replaced is the rail. Rail life in unit train service is a function of a variety of interactive factors, and the interactions and the resulting function is not yet well understood. Among the factors influencing rail life are:

- . type of rail (heat-treated, alloyed, non-hardened);
- . total gross tonnage moved over the rail;
- . mix of tonnage (light or heavy axle loadings);
- . tangent or curved track (and sharpness of curve);
- . quality of track maintenance; and
- . bolted or welded joints.

TABLE 8

**BN INVESTMENT REQUIRED
BY DIRECTION OF MOVE
(Cumulative from 1981 in 1980 \$s)**

	Medium			High		
	1985	1990	1995	1985	1990	1995
North Central	*	189	531	*	637	800
East	*	186	309	*	418	537
South	*	117	167	*	177	291
North West	*	235	362	*	404	475
Total	375	727	1369	*	1636	2103

* Not Developed

Many subtle factors are also suspected of influencing rail life. One of the key BN criteria for change out rail line on coal routes is when a certain number of defects per mile have been detected. While this is probably highly appropriate from an engineering and safety standpoint, it provides little indication of the economic life of the rail since there may be no strong correlation between the usage of the rail and the number of defects. Axle loadings, train speeds, quality of maintenance, and quality of steel may also affect the incidence of defects.

Based on a review of available literature and discussions with railway engineers, a likely life of new rail in coal unit train service with a moderate mix of other traffic, and assuming a second use of the rail in branchline or yard service, a reasonable estimate would be about 500 million gross tons moved over the rail (or equivalent economic value from a second use). Therefore rail replacement requirements were estimated from the annual coal tonnage plus the associated equipment tonnage times the average haul, to obtain annual gross-ton miles. The annual gross-ton miles of coal trains divided by 500 million gross tons gives the miles of track to be replaced that year. Average length of coal hauls were not expected to change significantly from their 1980 values. It should be noted that this does not include the investment required to renew track due to wear caused by traffic other than coal.

An average cost of \$250,000 per mile was used to replace the entire track structure. This does not include the cost of maintaining track between renewal periods, nor the cost of replacing any related roadway features, such as bridges or signals as they wear out.

Comparison with BN Estimates

The results of the medium case analysis compare closely, when adjusted for inflation, to the investment levels projected by the BN in their 1979 10-K report (see the chart below). The BN projected the investment requirements relating to coal movement through 1984. In the latter years their investment requirements projection falls off, apparently because it is based on known committed movements, and not all traffic likely to move in those years has been committed. The total investment in CTC, additional track, and replacement of rail is just slightly less than the medium case, apparently because of the reduced investment projected by BN in the latter years. The number of miles of facilities also agrees closely with that estimated for the medium case during the first five years. Note that some BN rail replacement is necessitated because of lighter rail weights on some lines, a factor not examined in this study.

COAL-RELATED ROADWAY EXPENDITURES

	BN						Medium Case
	1980	1981	1982	1983	1984	Total	1981-1985
Miles of new track and sidings	82	78	54	26	31	271	305
Track - miles of rail relay	415	514	461	533	651	2574	1744
Track - miles of new CTC	316	210	266	120	0	912	1377
Total cost (millions)	\$159.5	\$186.1	\$187.4 (inflated)	\$187.4	\$208.3	\$928.7	\$811 (not inflated)

IV. ASSESSMENT OF FINANCIAL NEEDS

Financial analysis is an art, not a science, that concerns itself with future occurrence, based on prior historical performance and changing capital market requirements. It must be noted that financial management is a dynamic process, and financial decision makers will approach each situation differently depending upon capital market requirements and the economic environment. Although a historical track record provides indications of future trends, it by no means provides a definite pattern that the BN will follow in future years.

ASSUMPTIONS

In the steady state financial analysis prepared by PMM&Co., the following assumptions were made:

- . The merger of the SLSF and BN would not result in material financial concessions to parties opposing the merger, and there would be no cross subsidization of operations of the former properties. Savings estimated at approximately \$50 million would accrue equally to the BN and SLSF, in proportion to their respective revenues.
- . Public debt markets would be available at rates not to exceed 12 to 13 percent for long-term debt. Current lines of credit would be expanded or extended through the period of this study.
- . The BN would be taking full advantage of the partial deregulation bill and increase rates to the maximum percentages of variable costs.
- . The return on investment (ROI) on new coal movements would approximate the cost of capital on the incremental investment required for additional capacity.
- . The earnings of the nonrailroad operations could be used to support the capital expansion program required by the railroad to meet the high demand scenario.
- . The Chicago Northwestern/Union Pacific connector line would be approved by the Federal Railroad Administration.

- . National energy policy would encourage coal development.

Since 1975, the nonrailroad operations have provided substantially greater returns on investment than the railroad, as illustrated in Table 9. It should be noted that rail operations required a substantial investment program to meet increased service demands. These investments were made at a current cost of capital, which is substantially greater than rail earnings. Since coal demands required the greatest investment at the current cost of capital, it is apparent that the coal investment earned substantially less than the current cost of capital on new facilities.

ELEMENTS IN EVALUATING THE ABILITY OF THE BURLINGTON NORTHERN TO FINANCE CAPITAL PROGRAMS

The evaluation of the BN's ability to finance capital programs through 1995 is based upon the assumption of long-run investment decisions. There are a number of important elements involved in the evaluation of the long-run ability to generate capital. For this analysis, PMM&Co. reviewed three key factors, or measures of corporate performance. The analytic indicators that were reviewed are:

- . earnings;
- . capital structure; and
- . fixed charges coverage.

While any single factor is not significant in itself, the combination of these three provide strong indicators for future financial growth. For the purpose of this report, the earnings of all BN activities were measured since lenders consider the resources of the corporation, rather than one of it's components.

Earnings

On a long-term basis, earnings and earning power indicate financial strength. Earnings are the most desirable and reliable source of funds for the long-term payment of interest and the repayment of principal on monies borrowed to finance expansion. As a surrogate for funds generated by operations, earnings are the yardstick against which the coverage of interest and other fixed charges can be measured. A reliable and steady growth of earnings assures BN's ability to borrow. The chart shown below compares the growth in railroad earnings with that of nontransportation earnings for the period 1975 to 1979.

Since the nonrailroad operations provide a greater ROI, the BN may divert capital to nonrailroad operation to improve earnings and ROI, but PMM&Co. has not adjusted the financial indicators for this possible shift, since no BN policy has been established at this time.

TABLE 9
RETURN ON INVESTMENT¹

	1980 ²	1976	1977	1978	1979	1975
RAILROAD OPERATIONS (ROI) % ³	6.9	2.7	2.1	2.7	3.8	2.7
TOTAL ENTERPRISE (ROE) % ⁴	9.8	4.3	4.2	6.0	8.7	3.2

Some data and information contained in this table is based on secondary data supplied to PMM&Co. and not verified by PMM&Co. The achievement of any financial projection may be affected by fluctuating economic conditions and is dependent upon the occurrence of future events which cannot be assured. Therefore, the actual results achieved may vary from the projections and such variations could be material.

¹ The BN calculate separate rates of ROI for its railroad operations. The BN as a total enterprise (ROE) is computed for all operations.

² PMM&Co. estimated.

³ Return on Investment Railroad.

⁴ Return on Enterprise (including railroad).

CONTRIBUTION TO OPERATING INCOME

(millions)

TOTAL \$255.6

1979	\$143.6	\$112.0	
1978	\$94.6	\$97.4	\$192.0
1977	\$67.0	\$77.8	\$144.8
1976	\$81.2	\$68.4	\$149.6
1975	\$75.6	\$48.8	\$124.4

TRANSPORTATION
 NON-TRANSPORTATION

SOURCE: Annual Report 10-K, Burlington Northern

The second illustration depicts the Capital Expenditures Program of the BN with regard to transportation operations and nontransportation operations.

CONSOLIDATED CAPITAL EXPENDITURES

(including cost of leased equipment)

(millions)

TOTAL \$541.6

TRANSPORTATION

NON-TRANSPORTATION

SOURCE: Annual Report 10-K, Burlington Northern

The third illustration depicts the revenue associated with coal operations.

COAL TRANSPORTATION REVENUES

(millions)

As shown in Table 10, the BN's earnings have increased steadily since 1975, despite the high capital spending programs for new facilities and maintenance required to meet transportation demands.

TABLE 10
COMPARATIVE STATEMENT OF CONSOLIDATED EARNINGS
(Thousands of Dollars)

	6/30/80	1979	1978	1977	1976	1975
REVENUES	\$1,501,242	\$2,635,846	\$2,110,293	\$1,801,702	\$1,642,207	\$1,408,234
EXPENSES		2,511,955	2,026,818	1,741,471	1,565,759	1,334,238
OPERATING INCOME		123,891	83,475	60,231	76,448	73,996
INCOME BEFORE TAXES	79,913	40,978	9,131	(10,745)	11,940	7,934
OTHER CORP. INCOME BEFORE TAXES	66,151	134,395	114,321	91,666	75,632	59,232
TOTAL CORP. INCOME BEFORE TAXES	146,064	175,371	123,452	80,921	87,572	61,166
NET INCOME	\$ 117,977	\$ 175,621	\$ 114,496	\$ 76,853	\$ 73,029	\$ 52,943

Some data and information contained in this table is based on secondary data supplied to PMM&Co. and not verified by PMM&Co. The achievement of any financial projection may be affected by fluctuating economic conditions and is dependent upon the occurrence of future events which cannot be assured. Therefore, the actual results achieved may vary from the projections and such variations could be material.

Capital Structure

The capital structure of the BN consists primarily of equity funds and debt. The capital structure is a measure of the relative size of the various sources of BN funds, and its ability to attract additional funds. The inherent financial stability of the BN, the risks associated with additional capital programs as well as the type of assets it holds are important determinants of the source of funds. Table 11 presents the steady state capital structure of the BN while Table 12 presents the capital structure adjusted for leases under FASB #13.

As shown in Table 11 and Table 12, the BN has maintained a relatively conservative capital structure during periods of high capital expenditures. Table 13 illustrates the effect of BN long-term debt and the interest associated with the existing obligations. Table 14 depicts the long-term debt portion of leases associated with BN operations.

The equity section is comprised of the following items, as taken directly from Annual Report 10-K, Burlington Northern.

TABLE 11

CAPITAL STRUCTURE

(Before allotment's required by FASB #13 ¹
(Thousands of Dollars)

	6/30/80	%	1979	%	1978	%	1977	%	1976	%	1975	%
LONG-TERM DEBT	\$1,210,079	34.9%	\$1,100,094	33.9%	\$1,036,688	34.7%	\$ 978,901	34.4%	\$ 964,046	36.0%	\$ 947,782	36.5%
PREFERRED STOCK	175,264	5.1	184,708	5.7	135,699	4.5	137,325	4.8	39,339	1.5	30,363	1.2
COMMON STOCK EQUITY	2,082,706	60	1,962,424	60.4	1,814,996	60.8	1,729,038	60.8	1,678,000	62.6	1,621,563	62.4
	<u>\$3,469,049</u>		<u>\$3,247,226</u>		<u>\$2,987,363</u>		<u>\$2,845,264</u>		<u>\$2,681,385</u>		<u>\$2,599,798</u>	

¹ FASB #13, Financial Accounting Standards Board Pronouncement #13, addresses the issue of lease payments either capitalized or expensed.

Some data and information contained in this table is based on secondary data supplied to PMM&Co. and not verified by PMM&Co. The achievement of any financial projection may be affected by fluctuating economic conditions and is dependent upon the occurrence of future events which cannot be assured. Therefore, the actual results achieved may vary from the projections and such variations could be material.

TABLE 12
ADJUSTED CAPITAL STRUCTURE
(Thousands of Dollars)

	6/30/80 ⁽⁵⁾ (1)	1979	%	1978	%	1977	%	1976	
LONG-TERM DEBT (2) & (4)		\$1,619,928	42.4%	\$1,412,132	41.5%	\$1,234,633	39.5%	\$1,258,022	11.8%
PREFERRED STOCK		184,708	9.8	135,699	4.0	137,325	4.4	39,339	1.3
COMMON STOCK EQUITY (3) & (4)		2,020,183	52.8	1,856,714	54.5	1,757,453	56.2	1,710,664	56.8
		<u>\$3,824,819</u>		<u>\$3,404,545</u>		<u>\$3,129,411</u>		<u>\$3,008,025</u>	

- (1) Reflects Sale of \$125 million (Aug. 80) 12 7/8% bonds
- (2) Adjusted by adding (.675) x total operating leases to long-term debt
- (3) Adjusted by adding (.075) x total operating leases to common stock equity
- (4) Factors for (3) & (4) were developed by assuming (.25) of operating leases (31) is interest. If the .75 capitalized long-term debt; 10% by equity
- (5) Leases not disclosed in 6-30-80 Financial statements, therefore 6-30-80 not restated for in the effect of FASB #13.

Some data and information contained in this table is based on secondary data supplied to PMM&Co. and not verified by PMM&Co. The achievement of any financial projection may be affected by fluctuating economic conditions and is dependent upon the occurrence of future events which cannot be assured. Therefore, the actual results achieved may vary from the projections and such variations could be material.

TABLE 13
LONG-TERM DEBT
(BEFORE APPLICATION OF FASB #13)
(Thousands of Dollars)

	December 31, 1979	1978
Northern Pacific Railway Company:		
Prior Lien Mortgage Bonds, 4%, due 1997	\$ 82,779	\$ 83,805
General Lien Mortgage Bonds, 3%, due 2047	52,733	53,586
St Paul-Duluth Division Mortgage Bonds, 4%, due 1996	245	245
Collateral Trust Bonds, 4%, due 1984	11,146	11,199
Great Northern Railway Company - General Mortgage Bonds, 2 5/8 % to 3 1/8 %, due 1982 to 2010	150,000	150,000
Chicago, Burlington & Quincy Railroad Company - First and Refunding Mortgage Bonds, 3% to 3 1/8 %, due 1985 to 1990	16,187	20,106
Consolidated Mortgage Bonds, 8 1/2 % to 9 1/4 %, due 1996 to 1999	165,552	166,926
Fort Worth and Denver Railway Company - First Mortgage Bonds, 4 3/8 %, due 1982	4,935	5,143
Mortgage Note, 8 5/8 %, due serially to 2018	25,855	12,886
Equipment and Other Obligations, 3 7/8 % to 11 %, due serially to 1994	500,036	447,937
Revolving Credit Agreements	15,000	—
Capitalized Lease Obligations	83,104	89,962
Convertible Debentures, 5 1/4 %, due January 15, 1992	64,647	65,000
Total	1,172,219	1,106,795
Less Current Portion	72,125	70,127
Long-Term Debt	\$ 1,100,094	\$ 1,036,668

SOURCE: Annual Report 10-K, Burlington Northern

TABLE 14
LONG-TERM DEBT AND CAPITALIZED LEASES
(Thousands of Dollars)

Dec. 31	Funded Debt	Equipment and Other Obligations Including Capitalized Leases	Total
1978	\$565,655	\$471,013	\$1,036,668
1979	571,147	528,947	1,100,094
Long-Term Debt ⁽¹⁾ Capitalized Lease and Operating Maturities			
1980	\$ 72,125	\$ 51,123	
1981	66,983	60,285	
1982	103,683	57,936	
1983	68,637	56,239	
1984	85,594	53,974	

⁽¹⁾ Including sinking fund requirements

SOURCE: Annual Report 10-K, Burlington Northern

'10 Par Value 5 1/2% Preferred Stock
Each year we are required to retire 4% or 123,458 of our \$10 Par Preferred shares and may retire another 4% if we wish to do so. We may do this by redeeming shares at \$10 or purchasing them on the open market and canceling them. All remaining shares are subject to redemption at our option, at prices declining from 103% of par in 1980 to par in 1985 and thereafter.

No Par Value, Series A, Convertible Preferred Stock
The Preferred Stock, designated "No Par Value, Series A Convertible", has a stated value of \$30 per share, voting rights, and 7 1/4% cumulative dividends. We have voluntary redemption privileges at stated value in 1980 and thereafter. We are required to redeem, at stated value, 25% of the outstanding shares each year from 1983 to 1986. In addition this stock is convertible at any time into an aggregate of 287,375 shares of Common Stock.

\$9, No Par Value, Cumulative Preferred Stock
On May 19, 1979, we issued 495,000 shares of \$9 No Par Value Preferred Stock, and on November 1, 1979, the remaining 15,000 shares were issued. The owner of each share has a liquidation right of \$100 per share, no voting rights unless dividends have not been declared for a total of six quarters, and is entitled to receive \$9 per share in annual cumulative dividends. We may redeem the stock at prices declining from \$108 per share in 1980 to \$100 per share in 1988. Beginning in 1985, we are required to purchase each year 20% of the shares originally issued until the series is fully redeemed.

No Par Value, \$2.85 Convertible
Preferred Stock

The owner of each share of \$2.85 Convertible Preferred Stock has a liquidation right of \$50 per share, no voting rights unless dividends have not been declared for a total of six quarters, and pays an annual cumulative dividend of \$2.85 per share. We may redeem such stock at a price of \$52.10 per share in 1980 and thereafter at prices declining to \$50 per share in 1988. In addition, the stock is convertible at any time by the holder at a rate of .8889 share of Common Stock for each share of \$2.85 Convertible Preferred Stock.

No Par Value Preferred Stock -
Unissued

At December 31, 1979, we have available for issuance, 4,645,150 shares of No Par Value Preferred Stock. The Board of Directors has the authority to provide for the issuance of such Preferred Stock from time to time in series and to fix before issuance the number of shares, preferences, rights and other restrictions and qualifications of each series, subject to a maximum liquidating value of \$300 million of all no par value preferred shares outstanding, of which \$105 million remains available.

\$10,000 Par Value Redeemable
Preference Shares

We have available for issuance 10,000 shares of \$10,000 Par Value Stock. These shares may be sold only to the United States Government. At December 31, 1979, no such shares had been issued.

Fixed Charges

Interest on long-term debt is the most direct charge associated with fixed-charge coverage. For computing fixed charges, interest expense should include all interest applicable to the current period which has been paid or accrued by the company on its total debt structure, including amounts of interest that have been capitalized. FASB #13 now requires that most financing leases be capitalized. When a lease is capitalized, the interest portion of the lease payment is designated as such and it is included in fixed charge expense. Table 15 illustrates the fixed-charge coverage ratio. Fixed-charge coverage for BN has increased substantially from 1975, when 1.87 times charges were earned. In 1980, PMM&Co. estimates that BN will have a coverage ratio of approximately 3.15 times fixed charges.

BN Growth Indicators

Since 1975, the BN has experienced substantial growth in the company's key financial indicators. The BN has expended large sums of new plant and equipment to prepare the railroad for expansion in the coal markets. Table 16 illustrates these indicators.

As Table 16 shows, the BN has made substantial improvement in its financial indicators. In the evaluation of this growth pattern, it should be noted the BN was involved in a substantial spending program during the 1975-1979 period. Since 1972 the BN has spent substantial sums for fixed plant and equipment to accommodate the increased demands of rail transportation. Table 17 illustrates the growth by various segments.

BN Capital Programs

PMM&Co. developed the necessary costs for proposed capital programs from 1980 through 1995 for high and medium market scenarios. The medium growth case capital program is illustrated in Table 18. The high growth case investment is illustrated in Table 19 and the method for estimating the additional capital programs is reviewed earlier in this report.

TABLE 15
FIXED-CHARGE RATIO
(Millions of Dollars)

	6/30/80	1979	1978	1977	1976	1975
Operating Revenue	\$	\$3,205.00	\$2,530.00	\$2,109.00	\$1,896.00	\$1,595.00
Operating Income	195.00	258.00	197.00	149.00	152.00	131.00
Add: Interest Leases ¹	19.00	25.00	23.00	16.00	13.00	13.00
Minority Interests ²	.21	.39	.15	.31	.19	.22
Equity in Undistributed						
Less: Income of affiliated Companies	.245	.42	--	.38	.37	1.4
Total Earnings	\$ 214.46	\$ 283.97	\$ 220.15	\$ 164.93	\$ 164.87	\$ 145.67
FIXED CHARGES	6/30/80	1979	1978	1977	1976	1975
Interest Expense	\$ 49.98	\$ 583.12	\$ 73.58	\$ 68.10	\$ 65.27	\$ 64.39
Interest Lease ¹	19.43	25.00	23.00	16.00	13.00	13.00
Interest Capitalized	.267	--	--	.28	.162	.614
Total Fixed Charges	\$ 69.68	\$ 108.12	\$ 96.58	\$ 84.38	\$ 78.432	\$ 78.004
FIXED CHARGE RATIO ³	3.08	2.62	2.28	1.96	2.6	1.87

¹ Portion of rent under long-term operating leases representative of an interest factor

² Minority interests in net income of subsidiaries.

³ Fixed Charge Ratio = Total Earnings ÷ Total Fixed Charges

Some data and information contained in this table is based on secondary data supplied to PMM&Co. and not verified by PMM&Co. The achievement of any financial projection may be affected by fluctuating economic conditions and is dependent upon the occurrence of future events which cannot be assured. Therefore, the actual results achieved may vary from the projections and such variations could be material.

TABLE 16
BN GROWTH INDICATORS
1975 - 1979

Growth in Railroad Revenues	17.0%
Growth in Railroad Operating Income	13.8%
Income Before Taxes	50.8%
Other Corporate Income Before Taxes	22.7%
Total Corporate Income Before Taxes	27.1%
Net Income	35.0%
Earnings Available for C/S	34.0%
E. P. S. (Primary)	33.6%
Funds Provided by Operations	17.3%
Working Capital Y/E	9.9%
Return on Common Shareholders Equity	28.4%

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TABLE 17

COMPARATIVE REVENUE/EXPENSE BY SEGMENT
(Thousands of Dollars)

	1979	1978	1977	1976	1975
Operating Revenues and Sales:					
Railroad	\$ 2,635,846	\$ 2,110,293	\$ 1,801,702	\$ 1,642,207	\$ 1,408,234
Trucking	61,635	46,089	30,524	24,668	20,872
Air freight forwarder	236,775	154,745	103,410	72,214	45,219
Forest products	173,804	135,851	103,814	85,471	61,240
Oil and gas	86,323	35,488	26,925	30,445	20,839
Coal and minerals	9,701	6,287	7,148	7,358	8,112
Land and real estate	35,701	34,845	30,987	24,992	20,859
Other operations	10,710	8,541	4,932	8,777	9,843
Total	\$ 3,250,495	\$ 2,532,139	\$ 2,109,442	\$ 1,896,132	\$ 1,595,218
Operating Expenses and Cost of Sales:					
Railroad and Transportation	\$ 1,161,938	\$ 894,494	\$ 774,785	\$ 709,758	\$ 622,532
Way and structures	551,460	455,047	380,867	327,912	259,195
Equipment	591,587	478,671	418,484	365,602	299,092
General and administrative	206,970	198,606	167,335	162,487	153,419
Total	2,511,955	2,026,818	1,741,471	1,565,759	1,334,238
Trucking	60,588	43,656	28,298	23,384	20,691
Air freight forwarder	218,100	146,079	98,860	68,779	43,748
Forest Products	118,117	88,513	69,937	57,824	47,428
Oil and gas	64,683	18,454	15,038	16,215	9,365
Coal and minerals	1,989	1,352	1,367	1,568	1,106
Land and real estate	10,058	7,434	5,402	4,826	4,965
Other operations	9,373	7,892	4,276	8,226	9,295
Total	\$ 2,994,863	\$ 2,340,198	\$ 1,964,649	\$ 1,746,581	\$ 1,470,836
Operating Income:					
Railroad	\$ 123,891	\$ 83,475	\$ 60,231	\$ 76,448	\$ 73,996
Trucking	1,047	2,433	2,226	1,284	181
Air freight forwarder	18,675	8,666	4,550	3,435	1,471
Forest products	55,687	47,338	33,877	27,647	13,812
Oil and gas	21,640	17,034	11,887	14,230	11,474
Coal and minerals	7,712	4,935	5,781	5,790	7,006
Land and real estate	25,643	27,411	25,585	20,166	15,894
Other operations	1,337	649	656	551	548
Total	\$ 255,632	\$ 191,941	\$ 144,793	\$ 149,551	\$ 124,382
Income (Loss) Before Income Taxes:					
Railroad	\$ 40,978	\$ 9,131	\$ (10,745)	\$ 11,940	\$ 7,934
Trucking	(17)	1,792	2,610	1,237	70
Air freight forwarder	19,109	8,813	4,626	3,545	1,499
Forest products	56,046	47,804	33,885	27,703	13,907
Oil and gas	22,336	18,366	12,680	14,637	11,835
Coal and minerals	7,780	4,912	5,727	5,838	7,035
Land and real estate	25,907	27,501	26,013	20,262	18,845
Other operations	1,130	424	496	341	379
Corporate	2,102	4,709	5,629	2,069	5,662
Total	\$ 175,371	\$ 123,452	\$ 80,921	\$ 87,572	\$ 67,166

TABLE 18

**BN CAPITAL ADDITIONS
MEDIUM GROWTH CASE
(Thousands of Dollars)**

	CAPACITY INVESTMENT	TRACK REPLACEMENT	TOTAL¹
1980 Planned	\$ 95,000	\$ 65,000²	\$ 160,000
81	75,000	72,000	147,000
82	75,000	80,000	155,000
83	75,000	87,000	162,000
84	75,000	95,000	170,000
1985	75,000	102,000	177,000
86	77,000	108,000	185,000
87	77,000	113,000	190,000
88	77,000	119,000	196,000
89	77,000	124,000	201,000
1990	77,000	130,000	207,000
91	122,000	142,000	264,000
92	122,000	154,000	276,000
93	122,000	166,000	288,000
94	122,000	178,000	300,000
1995	122,000	190,000	312,000
Total Years	\$ 1,465,000	\$ 1,925,000	\$ 3,390,000

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1. 1980 Dollar Value
2. Estimate PMM&Co.

TABLE 19
BN CAPITAL ADDITIONS
HIGH GROWTH CASE
(Thousands of Dollars)

	CAPACITY INVESTMENT	TRACK REPLACEMENT	TOTAL¹
1980 Planned	\$ 95,000	\$ 65,000²	\$ 160,000
81	214,000	84,000	298,000
82	214,000	103,000	317,000
83	214,000	122,000	336,000
84	214,000	141,000	355,000
1985	214,000	160,000	374,000
86	194,000	173,000	367,000
87	194,000	187,000	381,000
88	194,000	200,000	394,000
89	194,000	214,000	408,000
1990	194,000	227,000	421,000
91	117,000	241,000	358,000
92	117,000	255,000	372,000
93	117,000	270,000	387,000
94	117,000	284,000	401,000
1995	117,000	298,000	415,000
Total Years	\$ 2,720,000	\$ 3,024,000	\$ 5,744,000

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- 1. 1980 Dollar Value
- 2. Estimate PMM&Co.

CONCLUSIONS

Coal traffic may account for approximately 50 percent of the BN revenue by 1990 if national energy policy continues to emphasize coal. The following chart illustrates the BN's growth in coal from 1975 to 1979 and PMM&Co.'s estimate of 1980.

CONTRIBUTION PERCENTAGE TO GROSS
REVENUE -- COAL

1. PMM&Co. estimate.

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Assuming the BN is able to take full advantage of the Staggers 1980 Rail Act, earnings accruing to the BN should be adequate to meet the debt service requirement for BN capital programs and insure adequate capital structure and fixed-charges coverage to maintain a satisfactory debt rating.

The BN is capable of generating sufficient capital to meet the requirements of the low and medium growth cases. The capital requirements can be met by internally generated funds and longterm debt issues. Convertible debentures or equity issues may be used; however, it would be difficult under current market conditions to support an equity based issue. Under current conditions, it will be difficult to generate adequate capital for the high growth case. To meet the financial obligations of the high growth case, a substantial growth in earnings will be necessary, which can only be accomplished through substantial rate increases, which would be in excess of current regulatory provisions.