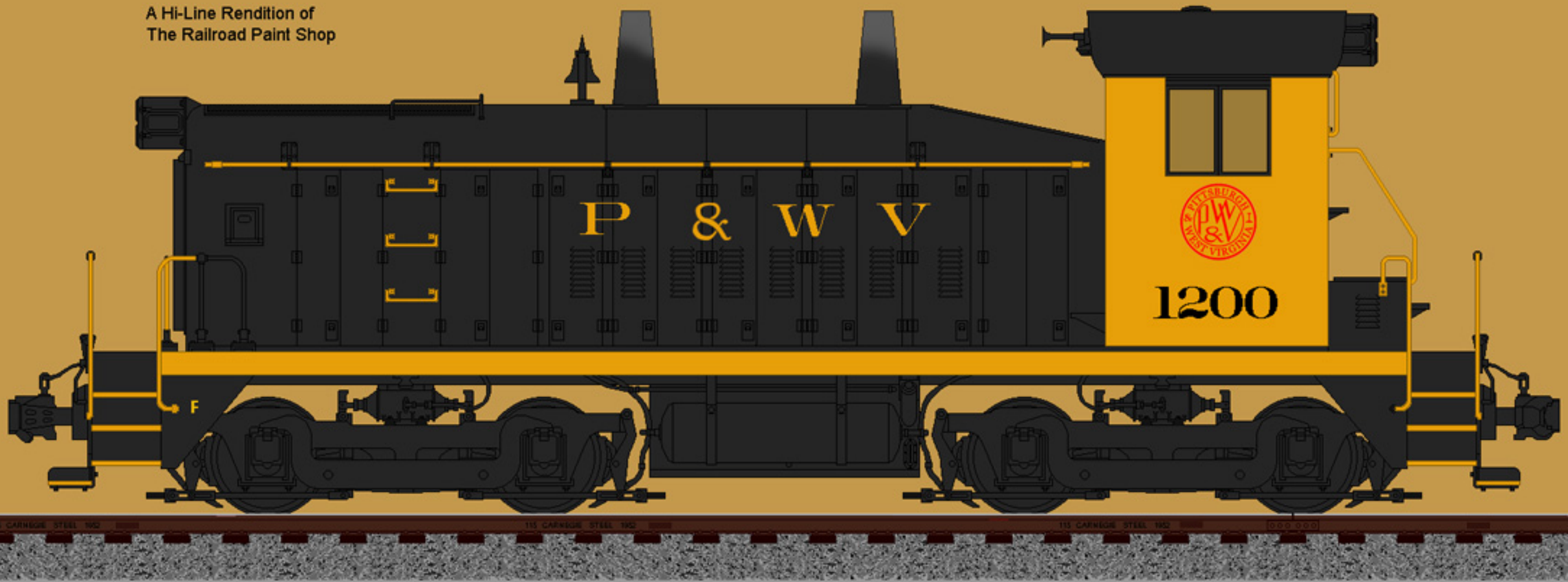
APPLICATION OF
GENERAL MOTORS
DIESEL MOTIVE POWER
ON THE
PITTSBURGH AND WEST VIRGINIA RAILWAY

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORPORATION
LA GRANGE, ILLINOIS

February, 1952

EMD SW9-A Unit

A Hi-Line Rendition of
The Railroad Paint Shop



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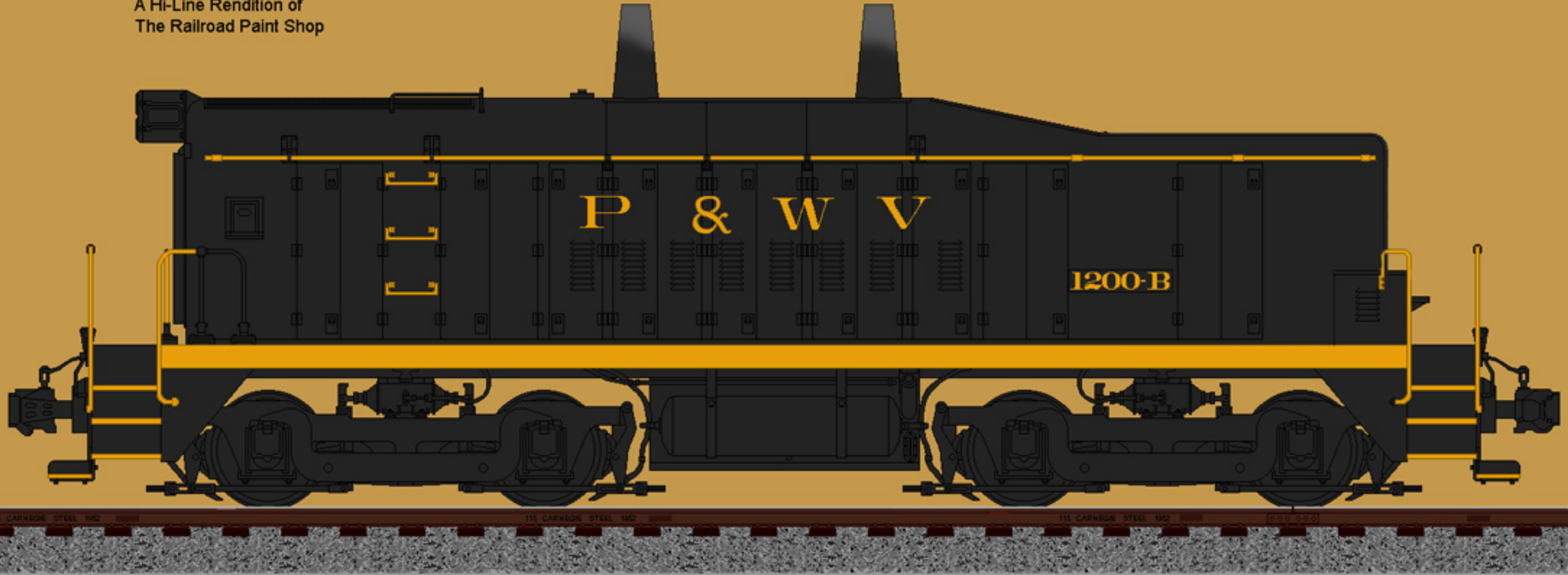
EMD SW9-B Unit

A Hi-Line Rendition of
The Railroad Paint Shop



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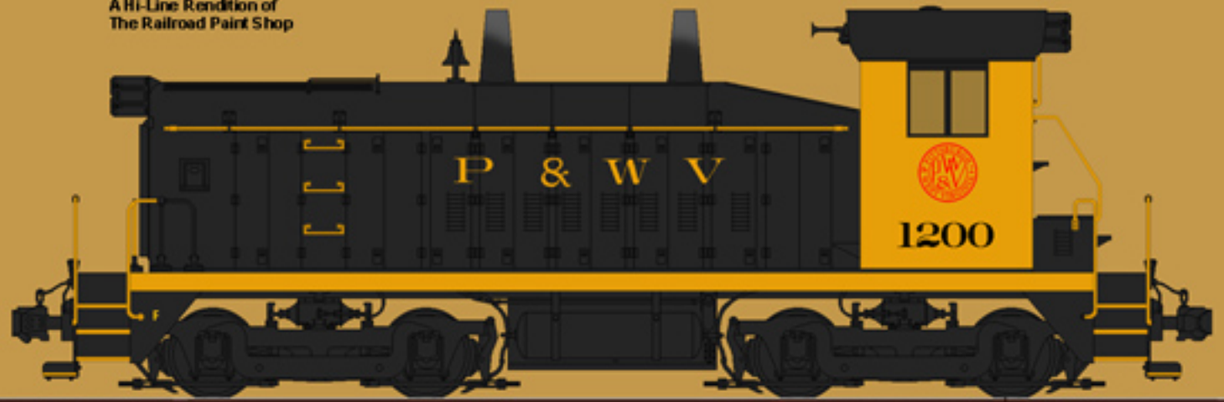


EMD SW9-B Unit

INTRODUCTION

At the request of the Pittsburgh and West Virginia Railway, a study has been prepared to evaluate the economic advantages that could be anticipated if the Railway were to acquire a sufficient number of General Motors Diesel locomotives to completely Dieselize their present Steam operations.

Appreciation is expressed for the assistance of the Railway staff in making available the information required to prepare this report.

GENERAL SUMMARY

A study of the application of General Motors Diesel motive power to the remaining Steam services on the Pittsburgh and West Virginia Railway has produced a number of significant conclusions:

1. Five 3600 HP and four 1200 HP Diesel locomotives will replace twenty Steam locomotives having an average age of twenty-seven years.
2. It is estimated that the nine additional Diesel locomotives will require an investment of $2,044,122.
3. Modification of existing maintenance facilities and the additional facilities recommended by the Railway for Diesel maintenance at Rook and Avella will cost approximately $136,500.
4. The total investment required for the additional Diesel locomotives and new facilities is $2,180,622.
5. Deducting the return from disposal of the displaced Steam locomotives will result in a net cash outlay estimated to be $1,976,502.
6. A saving of 28,894 miles of helper service will be realized annually with the Diesel locomotives recommended.

7. The following tabulation shows annual primary savings, number of locomotives, locomotive investment and return on investment for the various services on the Pittsburgh and West Virginia Railway:

Service	Annual Diesel Saving	Number and Size of Locomotives	Locomotive Investment	Percent Return on Investment
Freight Trains	$362,751	5 - 3600 HP	$1,610,570	22.5
Work Trains	18,793)	4 - 1200 HP	433,552	10.6
Yard Switching	27,243)			
	$408,787		$2,044,122	20.0

8. The estimated total annual saving of $426,151, which includes primary savings of $408,787 and secondary savings of $17,364, will produce a return of 21.6 percent on the net cash outlay before depreciation.

SECTION I

OPERATING CHARACTERISTICS

The Pittsburgh and West Virginia operates approximately 110 miles of main line track and 20 miles of branch lines within the states of Pennsylvania, West Virginia and Ohio. The main line extends from Pittsburgh Junction, Ohio on the west to Connellsville, Pennsylvania on the east. A map of the Railway is shown on the following page.

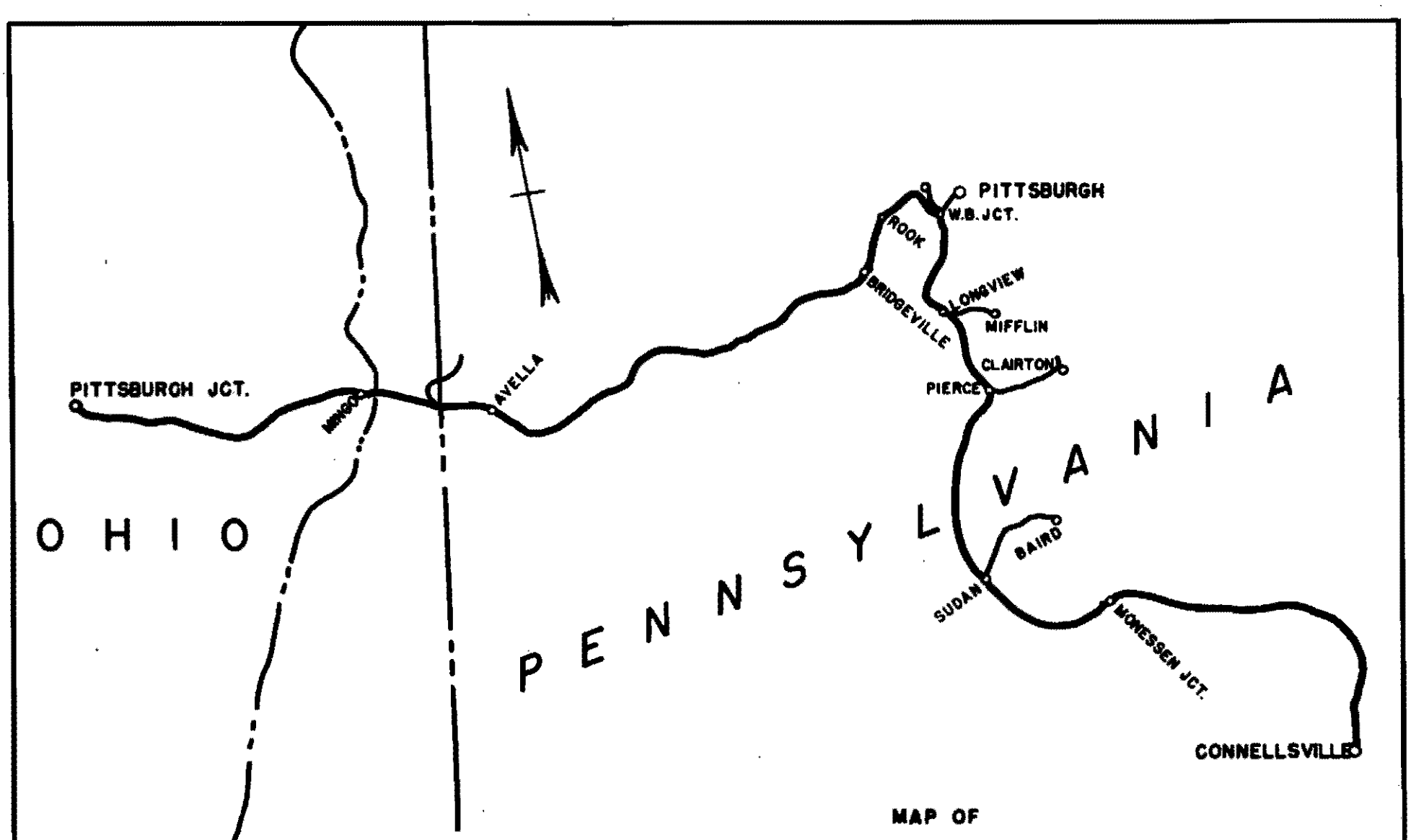
The Railway operates freight service only, handling coal and ore as the chief commodities. Main line freight traffic is handled between Connellsville, Pennsylvania and Brewster, Ohio. An operating agreement with the New York, Chicago and St. Louis Railroad allows joint operation between Rook, Pennsylvania and Brewster, Ohio.

The principal connections are with the New York, Chicago and St. Louis Railroad at Pittsburgh Junction, Ohio and with the Western Maryland Railway at Connellsville, Pennsylvania.

Yard switching operations are performed at Rook and Avella. A Rook yard crew fills an industrial switching assignment at Bridgeville six days a week. Another Rook crew makes the run to McKees Rocks, where interchange is made with the Pittsburgh and Lake Erie Railroad. All crews and locomotives, except those located at Avella, are assigned to Rook.

The Avella operation consists of collecting coal cars from the mines and taking them to Avella or west to Pittsburgh Junction. One local per day runs from Rook to Avella and return in order to collect eastbound coal cars.

All other switching assignments are handled by road crews.


PITTSBURGH
W.B.JCT.
ROOK
BRIDGEVILLE
LONGVIEW
MIFFLIN
CLAIRTON
PIERCE
PITTSBURGH JCT.
AVELLA
OHIO
PENNSYLVANIA
BAIRD
SUDAN
MORESSEN JCT.
CONNELLSVILLE
W.VA.
MAP OF
THE PITTSBURGH & WEST VIRGINIA
RAILWAY

SECTION II

STEAM MOTIVE POWER

The Pittsburgh and West Virginia Railway owned 23 Steam locomotives as of December 1, 1951, of which 20 are presently being used. The average age of these 20 locomotives is 27 years. The characteristics of the Steam locomotives are as follows:

Locomotive Number	Wheel Arrangement	Number Owned	Weight on Drivers (Pounds)	Tractive Effort* (Pounds)	Average Age (Years)
920, 922	2-8-0	2	209,000	58,620	34
923 - 926, 928	2-8-0	5	213,000	58,620	31
1000	2-8-2	1	226,157	54,724	34
1010	2-8-2	1	218,000	65,724	34
1050 - 1053	2-8-2	4	208,500	62,949	34
1100 - 1102	2-6-6-4	3	397,300	97,500	18
1103 - 1106	2-6-6-4	4	394,040	97,500	16
Total		20			27

* Theoretical maximum tractive effort.

SECTION III

REQUIRED DIESEL MOTIVE POWER

The motive power requirements to completely Dieselize all services of the Pittsburgh and West Virginia Railway were determined from an analysis of the operation for the eight day period, June 12 through June 19, 1948. This period was selected as representative of the Railway's anticipated peak traffic volume.

THROUGH AND LOCAL FREIGHT TRAIN OPERATION

Dispatchers' train sheets covering the eight day test period were reviewed. All through and local operations shown on the train sheets were analyzed from the standpoint of tonnages handled and schedules to be made to determine the size and type of Diesel locomotives required to replace the Steam locomotives.

This analysis shows that the General Motors 3600 HP locomotive, consisting of two 1200 HP SW-9 "A" units coupled in multiple with a 1200 HP "B" unit between, and equipped with 62:15 gearing, can satisfactorily handle all freight trains that were operated during the eight day peak period of 1948. All units would be completely interchangeable and when desired, a further combination of 2400 HP could be attained by coupling two "A" units or one "A" and one "B" unit together. This flexibility will greatly increase the utilization of the Diesel locomotives recommended.

A general description of the General Motors 1200 HP and 3600 HP locomotives is shown on pages 17 and 18 at the end of this section.

Diesel Locomotive Tonnage Ratings

Tonnage ratings for various combinations of recommended Diesel locomotives operating over the same districts that are used in Pittsburgh and West Virginia Railway General Notice No. 943, this notice describing tonnage ratings for present motive power, are listed below:

	Maximum Tonnage Ratings			Rating At 15 MPH	
WESTWARD	1200 HP	2400 HP	3600 HP	2400 HP	3600 HP
West Belt Junction to Rook	1980	3960	5940	2130	3200
Rook to Hickory	2230	4470	6700	2940	4400
Mingo to Pittsburgh Junction	-	4260	6400	2830	4250
Connellsville to Pierce	-	3600	5400	2410	3170
Clairton to Longview	1630	3260	-	-	-
EASTWARD					
Pittsburgh Junction to Wayco	-	6000	8250	3720	5580
Mingo to Hickory	2180	4360	6530	2900	4360
West Belt Junction to Longview	1500	3000	4500	1440	2170
Pierce to Alto	1730	3450	5180	1980	2970
Alto to Connellsville	-	6000	8250	4090	6140
West End to West Belt Junction	1980	3960	-	2920	4380

The above tonnage ratings have been adjusted to include a factor of six tons per car to conform to the system currently in effect on the Pittsburgh and West Virginia Railway.

These tonnages are based on 60 ton cars and require an adhesion of 18 to 22 percent. An analysis of operating conditions on U. S. railroads indicates that the usable adhesion may vary from 25 percent to as low as 5 percent of the weight on the locomotive drivers. With very favorable conditions and the addition of sand, the adhesion factor may temporarily reach as much as 35 percent. If poor rail conditions should prevail, then tonnage will have to be reduced accordingly.

Diesel Locomotive Running Time

Running time, with various consists, has been calculated for the 3600 HP General Motors locomotive, as well as the 4000 HP Fairbanks Morse locomotive. A comparison of this calculated running time for the 3600 HP and 4000 HP locomotives handling representative tonnages on the main line is shown below:

From	To	Trailing Tons	3600 HP Hrs:Min.	4000 HP Hrs:Min.
EASTWARD				
Pittsburgh Jct.	Rook	2500	1:42	1:35
		4500	2:21	2:07
Rook	Connellsville	2500	2:43	2:30
		4100	3:32	3:13
WESTWARD				
Connellsville	Rook	2500	2:40	2:29
		4500	3:38	3:18
Rook	Pittsburgh Jct.	2500	1:50	1:43
		4500	2:43	2:26

The above calculations are based on strict adherance to the prescribed speed

restrictions and do not contain any time for intermediate delays or contingencies. The 3600 HP locomotive will have the distinct advantage of 50 percent more weight on the drivers than the 4000 HP Fairbanks Morse locomotive. As a result, it is believed that all helper operations, with the exception of that help required by the Nickel Plate locomotives, can be eliminated. This reduction in helper locomotive mileage is estimated to be 28,894 miles annually.

Graphic Train Sheet

The Railway owned two 2000 HP Fairbanks Morse road switcher type locomotives in 1948, which were operated in multiple as a 4000 HP locomotive in road freight service. Since 1948, eight more of these 2000 HP units have been acquired so that ten are presently owned. Since 1948, one 1600 HP Baldwin road switcher has been purchased. This locomotive is operating in both local freight and yard switching service.

Inasmuch as the eight day period in June, 1948 was chosen to determine the number and size of locomotives required to complete the Dieselization of the Pittsburgh and West Virginia Railway, the present Diesel power, as well as proposed Diesel power, had to be assigned and cycled to this operation.

All through and local trains operated on the main line from June 16 to June 18, 1948, with the exception of trains handled by the Nickel Plate locomotives, were plotted on the graphic train sheet shown on the opposite page. The dashed line depicts a locomotive helping a Nickel Plate locomotive.

After careful consideration, it is recommended that the present 4000 HP Diesels be assigned to the Pittsburgh Division where the grades are less

severe, and that the new General Motors 3600 HP Diesel locomotives be for the most part assigned to the Connellsville Division where the grades are more severe. This arrangement will make it possible to use the heavier 3600 HP locomotive to its full advantage. Trains #95 and #92 on the Pittsburgh Division would be handled by a new 3600 HP locomotive.

Two of the existing two-unit 4000 HP Diesels would be assigned to main line operation between Rook and Brewster. A third 4000 HP would be assigned to Rook where it would fill the daily local assignment to Avella. Three of the remaining four single-unit 2000 HP locomotives would cover the Avella switching operation. The fourth unit would serve as protection power and would also act as a helper for the Nickel Plate locomotives when required.

All local and through freight trains on the Connellsville Division would be handled either by new three-unit 3600 HP or new two-unit 2400 HP Diesel locomotives, depending on tonnage requirements and power available.

Required Additional Diesel Locomotives

As shown on the graphic train sheet, five 3600 HP Diesel locomotives are required, in addition to the present complement of ten 2000 HP Diesel units, in order to completely Dieselize all main line, local and through freight traffic that was handled on the Pittsburgh and West Virginia Railway during the period June 12 to June 19, 1948.

YARD SWITCHING OPERATION

All switching assignments other than those at Avella are made from Rook Yard. Two Diesel switching locomotives are presently owned by the Pittsburgh and

West Virginia Railway, one Baldwin rated at 1000 HP and the other at 1600 HP. The 1600 HP switcher would continue to handle the daily assignment to Mifflin and return. The 1000 HP switcher has been assigned to work in Rook Yard.

Required Diesel Locomotives

Four additional 1200 HP SW-9 Diesel locomotives will be required to complete the Dieselization of yard switching service. These four locomotives will work the Pittsburgh and Lake Erie connection at McKees Rocks, will handle the Bridgeville industrial assignment, serve on work trains, and will protect the fifteen units assigned to main line operation.

MAINTENANCE POWER

As all locomotives, with the exception of the Avella switchers, would operate out of Rook, no additional units are needed to replace power out of service for maintenance. Routine inspections and maintenance can be performed during the layover period at Rook, and due to the interchangeability of the units, the yard switchers of the 1200 HP class could replace any one of the units of the three-unit locomotive when heavier maintenance is required.

The 2000 HP switchers at Avella could also be interchanged with the 4000 HP road locomotives on the Pittsburgh Division, allowing a complete maintenance schedule for these locomotives.

TOTAL NUMBER OF DIESEL LOCOMOTIVES REQUIRED

The total number of General Motors Diesel locomotives required to complete

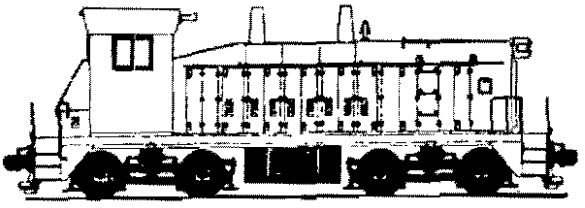
the Dieselization of the Pittsburgh and West Virginia Railway is shown below:

Service	Number of Locomotives	Size	No. of Units
Local and Through Freight Trains	5	3600 HP	15
Yard Switching and Work Trains	4	1200 HP	4
Total	9		19

GENERAL INFORMATION AND DESCRIPTION

MODEL SW-9 LOCOMOTIVE

1200 H.P. 125 TON SWITCHER

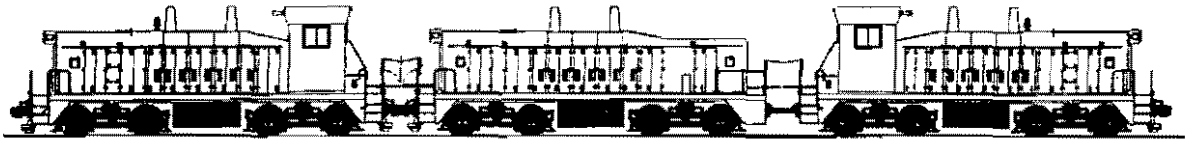


Major Dimensions	Length over coupler pulling faces	44' 5"
	Width over side sills	10' 0"
	Maximum height above rail	14' 6½"
	Platform height above rail	4' 8-3/4"
	Height of cab floor above rail	6' 10-3/4"
	Length of operator's cab	6' 6"
	Width of operator's cab	9' 11-1/2"
	Height of power plant hood roof above rail	11' 9-1/4"
	Width of power plant compartment	7' 0"
	Wheelbase - truck	8' 0"
	Truck centers	22' 0"
	Number of drivers	4 Pairs
	Diameter of drivers	40"
	Size of journals	6½" x 12"
	Minimum curve radius	100' 0"
Weights and Supplies	Total weight, fully loaded (approx)	248,000 lbs.
	Total weight, light (approx)	241,000 lbs.
	Journal load per driving axle (approx)	55,500 lbs.
	Fuel oil	600 gals.
	Cooling water	223 gals.
	Lubricating oil	165 gals.
	Sand	28 cu.ft.

GENERAL MOTORS
LOCOMOTIVES

GENERAL INFORMATION AND DESCRIPTION

3600 H.P. 375 TON TRANSFER



Major Dimensions	Length over coupler pulling faces	133' 3"
	Width over side sills	10' 0"
	Maximum height above rail	14' 6½"
	Platform height above rail	4' 8-3/4"
	Height of cab floor above rail	6' 10-3/4"
	Length of operator's cab	6' 6"
	Width of operator's cab	9' 11½"
	Height of power plant hood roof above rail	11' 9¼"
	Width of power plant compartment	7' 0"
	Wheelbase - truck	8' 0"
	Truck centers	22' 0"
	Number of drivers	12 Pairs
	Diameter of drivers	40"
	Size of journals	6½" x 12"
	Minimum curve radius	100' 0"
Weights and Supplies	Total weight, fully loaded (approx)	744,000 lbs.
	Total weight, light (approx)	723,000 lbs.
	Journal load per driving axle (approx)	55,500 lbs.
	Fuel oil	1,800 gals.
	Cooling water	669 gals.
	Lubricating oil	495 gals.
	Sand	84 cu.ft.

SECTION IV

DIESEL FACILITIES

The Pittsburgh and West Virginia Railway plans to construct additional Diesel locomotive facilities and to improve existing Diesel facilities prior to the delivery of the locomotives required for complete Dieselization. The Railway has completed its own facility survey and estimates that a capital expenditure of $119,500 and an operating expenditure of $17,000, or a total of $136,500, will be required to complete this construction and improvement program.

Since it is difficult to ascertain the portion of this expenditure that is solely applicable to the existing Diesel operation, it will be assumed for report purposes that the entire amount is applicable to the additional Diesel locomotives recommended in this report.

The following tabulation, furnished by the Railway, details the capital expenditure for each facility presently being considered under the new construction and improvement program:

Rook Machine Shop	$27,800
Rook Roundhouse	25,500
Rook Oil and Fuel Facilities	25,000
Avella Fuel, Sand and Storage	41,200
Total	$119,500

For report purposes, the $17,000 operating expenditure has been added to the

$119,500 capital expenditure to obtain a Diesel facility investment total of $136,500. This has been done because of the fact that the $17,000 expenditure is non-recurring and can most conveniently be handled when treated as an investment.

SECTION V

INVESTMENT

The investment necessary to complete the Dieselization of the Pittsburgh and West Virginia Railway can be separated into two major parts: investment in Diesel locomotives and investment in supporting facilities. The expenditures involved in making this investment can be reduced through the return on salvage of replaced Steam motive power and facilities.

NEW DIESEL LOCOMOTIVES

The estimated locomotive investment required to complete the Dieselization of the Railway is $2,044,122. This investment is predicated on the base price of General Motors locomotives plus the extras listed below:

1200 HP SW-9 LOCOMOTIVE

Basic Locomotive	$102,500
M. U. Controls	2,300
WXO Air Compressor	48
24 RL Brake Schedule	2,190
Traction Motor Field Shunt (2 step)	850
Combination Pilots (Both Ends)	500
Total Locomotive	$108,388

3600 HP LOCOMOTIVE

"A" Unit Complete	$108,388
"A" Unit Complete	108,388
Basic "B" Unit	101,000
Train Line (Approx.)	1,000
WXO Air Compressor	48
24 RL Brake Schedule	2,190
Traction Motor Field Shunt (2 step)	850
Combination Pilot (One End)	250
Total Locomotive	$322,114

Following is a summation of the required investment in new Diesel locomotives:

Five 3600 HP @ $322,114	$1,610,570
Four 1200 HP SW-9 @ $108,388	433,552
Total	$2,044,122

NEW DIESEL FACILITIES

The estimated investment in new Diesel facilities as outlined in Section IV of this report is $136,500.

RETIREMENT OF STEAM LOCOMOTIVES AND ROADWAY FACILITIES

Locomotive Retirement

It is assumed that the twenty Steam locomotives displaced by this Dieselization program will be retired. The ledger value of these locomotives is $1,235,004.

Facility Retirement

Steam locomotive facilities having a ledger value of $211,137 can be retired under the proposed plan for complete Dieselization.

Details of the proposed facility retirement are shown below:

Account	Ledger Value	Amount To Be Retired
Shops and Enginehouses	$715,338	-
Shop Machinery	322,681	$23,495
Water Stations	121,444	121,444
Fuel Stations	81,604	66,198
Total	$1,241,067	$211,137

TOTAL ESTIMATED EXPENDITURE AND NET CASH OUTLAY

TOTAL ESTIMATED EXPENDITURE		$2,180,622
Estimated Cost of New Diesel Locomotives	$2,044,122	
Estimated Cost of New Diesel Facilities	$136,500*	
NET ADDITIONAL INVESTMENT		$734,481
Total Estimated Expenditure	$2,180,622	
Less Ledger Value of		
Retired Steam Locomotives	$1,235,004	
Retired Roadway Facilities	187,642	
Retired Shop Machinery	23,495	
NET CASH OUTLAY		$1,976,502
Total Estimated Expenditure	$2,180,622	
Less Estimated Salvage Value of Retired Steam Locomotives	204,120	

* Includes $17,000 estimated expense incidental to the installation of new facilities, but not capitalized.

DISPOSAL OF REPLACED EQUIPMENT AND ROADWAY FACILITIES

The Steam locomotives and roadway facilities replaced by Dieselization can be disposed of either through sale as used equipment or as scrap. Since the return from the sale of equipment would be dependent upon market conditions at the time of disposal, it is assumed in this report that most of the equipment will be sold as scrap.

Steam Locomotives

The complete Dieselization of the Railway will permit the retirement of 20 Steam locomotives. The total light weight of these locomotives with tenders is 3780 gross tons. Applying the current scrap price of $54.00 per gross ton, the scrap value of the locomotives is estimated to be $204,120.

Shop Machinery and Roadway Facilities

The Pittsburgh and West Virginia Railway have made their own survey and estimate of the amount of salvage to be realized from the retirement of shop machinery and roadway facilities. As this survey indicates that the cost of salvage operations will exceed the amount of the proceeds to be realized from salvaged material, it is possible that these operations may not be carried out. Therefore, no credit has been taken for facility salvage in this report.

NET ADDITIONAL INVESTMENT AND NET CASH OUTLAY

The tabulation on the opposite page summarizes the total expenditure for locomotives and facilities, the net additional investment and the net cash outlay.

SECTION VI

UNIT OPERATING COSTS

The Steam locomotive unit operating costs used in this report, with the exception of repairs, were derived from the monthly operating expense and mileage statistics reported by the Railway for the ten month period, January through October, 1951.

Steam locomotive unit repair costs were compiled from Pittsburgh and West Virginia Railway statistics covering the five year period from 1946 through 1950. These costs were adjusted to reflect 1951 wage levels.

The Diesel locomotive unit operating costs are based on data furnished by a large group of railroads operating similar types of equipment.

A brief explanation of the unit operating costs used in this report follows.

REPAIRS

The Steam repair costs were furnished by the Railway. A five year period was used to reflect both running and heavy repairs. Diesel repair costs for labor are predicated on average manpower requirements to maintain a Diesel unit according to the maintenance procedure outlined in Electro-Motive Division service bulletin #1704. Costs for materials, based on an average for a large group of railroads, were then added to the labor costs. In addition to these labor costs, 25 percent of direct labor costs were included to cover burden expense.

FUEL

Steam locomotive fuel costs per mile were developed from mileage and consumption figures for the ten month period ending October, 1951. The average cost of coal per ton, excluding freight and handling charges, averaged $4.75 during this period. The total cost of coal for each service, including freight and handling charges, was prorated among the various classes of Steam locomotives on the basis of heating surface ratios.

The fuel consumption rates for the Diesel locomotives are based upon the experience of other railroads operating the same type of power. A fuel price of $.11 per gallon was applied against these consumption rates.

LUBRICANTS

Steam locomotive lubricant costs per mile, based upon the Railway's lubrication expense for the ten month period ending October, 1951, were so high that it was felt that arbitrary costs should be used. These costs are based on the average expense for a group of representative railroads.

Diesel lubrication consumption rates are based upon the experience of a large group of railroads operating the same type of motive power. A lubricating oil price of $.45 per gallon has been applied to these consumption rates.

WATER

The expense used to compute Steam locomotive water unit operating costs was based upon total cost for the first ten months of 1951. This cost was prorated to the various locomotive classes on the basis of heating surface ratios.

Water costs per locomotive mile for Diesel locomotives are negligible and have, therefore, not been included.

OTHER SUPPLIES

An arbitrary cost based upon previous experience has been applied to the cost of other supplies for the Steam locomotives in yard service. This procedure was followed because of the excessively high costs recorded for the first ten months of 1951.

Since the "other supplies" account for train service reflected average expense, the amount shown for the ten month period ending October, 1951 was utilized in computing the unit cost figure for this service.

Diesel "other supplies" cost has been assumed to be the same cost per unit as the Steam cost, although experience has shown this expense to be somewhat less for Diesel locomotives than for Steam.

ENGINEHOUSE EXPENSE

This expense for Steam locomotives was based on the cost reported for the ten month period ending October, 1951, distributed over the total miles operated.

Previous experience has shown that enginehouse expense for Diesel locomotives is approximately 25 percent of that for Steam locomotives. The enginehouse expense for Diesel units was therefore taken to be one-quarter of the Steam locomotive enginehouse expense.

ENGINEMEN

Enginemen's wages for both Steam and Diesel locomotives were taken from the

table of Standard Rates of Pay for the Eastern Territory, dated October 1, 1950, and applied on the basis of weight on drivers.

For yard switching, straight time hourly rates of pay were used direct from the wage table.

The enginemen's wages for through freight locomotives on the Connellsville Division were computed by dividing the rate of pay for one day by the mileage accumulated on one trip from Rook to Connellsville.

All other enginemen's wages were based on the daily rate. This rate is based on one eight hour day and 12½ miles per hour, or one hundred miles per day.

Since the proposed Diesel application will eliminate 28,894 helper miles and thus save the wages currently paid to the brakemen assigned to this service, Steam helper locomotive unit operating costs include brakemen's wages.

A comparison of these Steam and Diesel unit operating costs is shown on page 29.

STEAM AND DIESEL
LOCOMOTIVE UNIT OPERATING COSTS PER MILE

PITTSBURGH AND WEST VIRGINIA RAILWAY

Service	Class	Repairs	Fuel	Lubri-cants	Water	Other Supplies	Engine-house Expense	Engine-men	TOTAL Unit Costs
Through Freight - Pittsburgh Div.	Mikado	$.9056	$.7281	$.0250	$.0737	$.0152	$.2018	$.2596	$2.2090
	3600 HP	.3300	.4983	.0076	—	.0456	.1514	.2980	1.3309
Connellsville Div.	Mallet	.9997	1.0992	.0300	.1113	.0152	.2018	.3939	2.8511
	3600 HP	.3300	.4983	.0076	—	.0456	.1514	.4045	1.4374
Local Freight	Consolidation	.7421	.5677	.0200	.0575	.0152	.2018	.2688	1.8731
	Mikado	.9056	.7281	.0250	.0737	.0152	.2018	.2688	2.2182
	Mallet	.9997	1.0992	.0300	.1113	.0152	.2018	.2902	2.7474
	3600 HP	.7800	.4983	.0231	—	.0456	.1514	.3072	1.8056
	2400 HP	.5200	.3322	.0154	—	.0304	.1009	.2902	1.2891
	1200 HP	.2600	.1661	.0077	—	.0152	.0505	.2720	.7715
Helper	Consolidation	.7421	.5677	.0200	.0575	.0152	.2018	.3835	1.9878
	Mikado	.9056	.7281	.0250	.0737	.0152	.2018	.3835	2.3329

STEAM AND DIESEL
LOCOMOTIVE UNIT OPERATING COSTS PER HOUR

Switching	Consolidation	4.4526	4.9499	.1400	.1100	.0600	.3192	3.3975	13.4292
	Mikado	5.4336	6.3486	.1600	.1200	.0650	.3192	3.3975	15.8439
	1200 HP	1.1800	.7700	.0738	—	.0300	.0798	3.4350	5.5686

SECTION VII

DIESEL OPERATING ECONOMIES

Diesel locomotive operating economies can be divided into two major categories, namely Primary and Secondary. Primary savings result from lower operating costs and reduced locomotive mileage. Secondary savings are principally derived from reduced maintenance charges on supporting facilities, the retirements made possible by Dieselization accounting for the expense reduction.

Any fair appraisal of Diesel economies must also take into account the net difference in the annual depreciation charge for Diesel as compared with Steam locomotives. As the Diesel depreciation rate is usually higher than the rate for Steam locomotives, the net effect of a higher depreciation rate and ledger value is an increased annual depreciation charge for Diesel locomotives. This increase in annual depreciation is charged against the Primary and Secondary Diesel savings.

PRIMARY SAVINGS

The Steam locomotive miles and switching hours, against which the respective Steam and Diesel unit operating costs were applied to determine estimated annual Diesel Primary savings, were based on statistics for the first ten months of 1951. These were extended to a full year.

While Diesel motive power recommendations have been based on an analysis of the traffic conditions prevailing during a portion of 1948, annual Steam locomotive mileage statistics for this year could not be utilized because of

the fact that part of this mileage is now accumulated by Diesel locomotives.

The total annual mileage for 1948 was compared with total 1951 mileage, however, and found to be approximately the same. A comparison of June 1948 and June 1951 dispatchers' train sheets also showed close agreement with respect to the total number of trains operated. A further comparison of these train sheets, however, showed that the tonnage handled in 1948 was considerably larger than that handled in 1951.

The 3600 HP Diesel locomotives recommended in this report can handle the heavy Pittsburgh and West Virginia trains operated in 1948 without helper assistance. Nickel Plate locomotives, however, will continue to require helper assistance.

For purposes of this report it has been assumed that the Diesel helper and light miles recorded in 1951 were accumulated while assisting the Nickel Plate locomotives. For that reason only Steam locomotive helper and light mileage has been eliminated.

It is estimated that the lower operating cost of the Diesel locomotive, as well as the elimination of helper service, will result in an annual direct operating saving of approximately $408,787. The total savings are listed by services below:

Through Freight	$217,598
Local Freight	82,732
Helper and Light	62,421
Work	18,793
Yard Switching	27,243
Total	$408,787

STEAM AND DIESEL OPERATING COSTS AND DIESEL SAVINGS

ASSIGNMENT	PRESENT STEAM LOCOMOTIVES	LOCOMOTIVE MILES	UNIT OPERATING COST	ANNUAL OPERATING EXPENSE	PROPOSED DIESEL LOCOMOTIVE	LOCOMOTIVE MILES	UNIT OPERATING COST	ESTIMATED ANNUAL OPERATING COST	ESTIMATED ANNUAL SAVING	INVESTMENT	PERCENT RETURN ON INVESTMENT
PRINCIPAL FREIGHT (THROUGH FREIGHT)	MIKADO	124,465	$2.2090	$274,943	3600 HP	124,465	$1.3309	$165,650	$109,293		
	MALLET	76,611	2.8511	218,426	3600 HP	76,611	1.4374	110,121	108,305		
PRINCIPAL FREIGHT (LOCAL FREIGHT)	CONSOLIDATION	43,550	1.8731	81,574	1200 HP	11,978	.7715	9,241			
					2400 HP	31,572	1.2891	40,699	31,834		
	MALLET	54,256	2.7474	149,063	3600 HP	54,256	1.8056	97,965	51,098		
HELPER AND LIGHT	CONSOLIDATION	14,447	1.9878	28,718							
	MIKADO	14,447	2.3329	33,703					62,421		
										$1,610,570	22.5
WORK	CONSOLIDATION	17,060	1.8731	31,955	1200 HP	17,060	.7715	13,162	18,793		
YARD SWITCHING (HOURS)	CONSOLIDATION	3,271	13.4292	43,927	1200 HP	3,420	5.5686	19,045	27,243		
	MIKADO	149	15.8439	2,361						433,552	10.6
TOTAL				$864,670				$455,883	$408,787	$2,044,122	20.0

The present Steam and proposed Diesel locomotive miles, unit operating cost, twelve month Steam and Diesel operating costs, direct operating savings, investment in new Diesel locomotives and return on investment are shown on the opposite page. It should be noted that this table has been arranged to show the above items for each class of service, thereby making it possible to determine which operation will provide the largest saving and return on investment.

SECONDARY SAVINGS

Diesel locomotives do not require the extensive supporting facilities ordinarily required by Steam locomotives, and it is therefore possible to eliminate a portion of these facilities, thus reducing the annual maintenance and depreciation charges thereon.

The charges recorded in the I. C. C. maintenance accounts for the first ten months of 1951 were obtained and used as a basis for estimating the savings on annual maintenance charges under complete Dieselization.

As all water stations are unnecessary, the entire maintenance charge for water stations becomes a saving.

As the investment in fuel stations was cut 50 percent, it was felt that the maintenance charge for fuel stations could be conservatively cut in the same ratio.

Although the investment in shop buildings was increased by 13 percent, it was considered that the maintenance charge for shop buildings need not be increased by this amount as this charge for buildings housing Diesel power should not average more than 75 percent of the maintenance charges for

buildings housing Steam locomotives.

The maintenance charge for shop machinery was reduced in direct proportion to the investment in shop machinery.

Based on the charges recorded in the various maintenance accounts by the Railway for the ten month period of January through October, 1951, the elimination of certain Steam facilities will reduce this maintenance by an estimated $17,364 annually. This expense reduction is considered to be a Secondary saving.

The following tabulation shows the various Steam facilities affected, the estimated annual maintenance charges on these Steam facilities, the estimated annual maintenance charges for Diesel facilities, and the estimated annual maintenance savings.

I. C. C. Account Number	Title	Estimated 12 Month Steam Facility Maintenance Charge	Estimated 12 Month Diesel Facility Maintenance Charge	Estimated Annual Savings on Facility Maintenance
231	Water Stations	$12,591	—	$12,591
233	Fuel Stations	7,806	$3,903	3,903
235	Shop and Enginehouse	51,201	51,201	—
302	Shop Machinery	11,954	11,084	870
	Total	$83,552	$66,188	$17,364

DEPRECIATION

Steam and Diesel Locomotives

The annual depreciation charge for Diesel motive power normally exceeds that

for Steam locomotives. This is caused by the higher investment and depreciation rate for the Diesel locomotives. The increased annual depreciation charge for the Diesel locomotives recommended for the Pittsburgh and West Virginia Railway over existing Steam motive power is estimated to be $38,680. This increase was determined from the basic data included on the following tabulation:

Steam Locomotives		Diesel Locomotives		
Ledger Value	Annual Depreciation Charge	Estimated Cost	Annual Depreciation Charge	Increased Annual Depreciation Charge
$1,235,004	$40,632	$2,044,122	$79,312	$38,680

The existing depreciation rate of 3.29 percent was used to calculate the annual depreciation charge for the Steam locomotives. The depreciation rate of 3.88 percent applied to the Diesel locomotives was also furnished by the Railway. This is the depreciation rate currently used by the Railway for their present Diesel power.

Roadway Facilities and Shop Machinery

The retirement of some of the physical properties, obsoleted by complete Dieselization, reduces the ledger value on which depreciation rates are applied.

The table on the following page has been prepared to show the net reduction or increase in ledger value of each facility and the reduced or increased depreciation charge which results from the application of appropriate depre-

ciation rates to the facility accounts affected. Based upon the retirement of Steam facilities having a total asset valuation of $211,137 and the acquisition of Diesel facilities costing $119,500, the net difference, $91,637, represents the total change in the ledger value of facility accounts. The total decreased depreciation charge, equivalent to a saving, amounts to $4,291 annually. The derivation of this saving is shown in the tabulation which follows:

Item	Steam Facilities Retired	New Diesel Facilities Required	Net Facility Reduction	Annual Depreciation Rate	Decreased Depreciation Charge
Water Stations	$121,444	—	$121,444	3.52	$4,275
Fuel Stations	66,198	$25,000	41,198	2.00	824
Shops and Enginehouse	—	94,500	94,500*	1.68	1,588*
Shop Machinery	23,495	—	23,495	3.32	780
Total	$211,137	$119,500	$91,637		$4,291

* Increase

Net Depreciation Increase

When the reduced depreciation charge on facilities, $4,291, is offset against the increased Diesel locomotive depreciation charge of $38,680, the net depreciation increase amounts to $34,389 annually.

OTHER SAVINGS

It is recognized that other savings, less evident and not considered to be within the scope of this report, will be realized from the proposed Dieseliza-

tion. These additional savings will be derived from reduced expense for payroll taxes, track maintenance, fire claims, freight damage claims, and for carrying material inventories. The determination of these savings will require special study and analysis by Railway management.

NET ANNUAL SAVING

Without giving consideration to the items mentioned in the foregoing paragraph, the net annual saving is as follows:

Primary Saving	$408,787
Secondary Saving	17,364
Total Saving	$426,151
Less Depreciation Increase	34,389
Estimated Net Annual Saving	$391,762

This estimated net annual saving of $391,762 represents a return of 19.8 percent on the $1,976,502 net cash outlay for Diesel locomotives and facilities.

The return on the net cash outlay before depreciation is 21.6 percent.