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CABINET

MINISTERIAL COMMITTEE ON ECONOMIC STRATEGY

RAILWAY POLICY - MAIN LINE ELECTRIFICATION

Memorandum by the Secretary of State for Transport

1. The attached note summarises for the information of the Committee the main points in the published report on the case for electrification of the main lines of railway. It also gives the most recent forecasts of fuel prices.

2. The note concludes with my assessment of the practical choices on going ahead with electrification. I am circulating separately a paper setting out my conclusions on how we should now develop our policies for the railway, including electrification.

N.F.

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3 April 1981

RAILWAY POLICY - MAIN LINE ELECTRIFICATION

1. A major proportion of British Rail's diesel traction and rolling stock requires replacement during the next 10-15 years. Assuming that the railway network remains roughly at its present size, we have to decide whether to re-invest in diesel equipment or to invest in electrification of the main line services.

2. The review of the case for a main line programme of electrification was carried out jointly by my Department and the British Railways Board. The steering group included representatives from the Treasury and the Department of Energy, and other Government Departments, notably the Departments of Trade and Industry, contributed. The review did not evaluate the future of the rail businesses that would mainly benefit from electrification - Inter-City and freight; that would have been a very much wider and different task. Essentially, a financial appraisal was done of an electrified railway as compared with maintaining a diesel railway; this showed that electrification would earn a 11% real rate of return. The additional cost of constructing and maintaining the fixed electrification works would be more than offset by the cost savings - on fuel, on traction and rolling stock maintenance and capital costs, and on crew costs - and by the additional passenger revenue that would be earned as a result of faster services.

3. An electrification programme would bring benefits to private manufacturing industry. At least 80% of the additional investment in the fixed equipment (about £620m in the case of Option III) would be carried out by private sector firms. A continuous work level in the home market should assist the UK railway manufacturing industry to update its technology and so compete more effectively in the expanding international market for railway electrical engineering. It is forecast that 40% of world rail systems will be electrified by the end of the century, compared to only 18% in 1978.

THE ELECTRIFICATION OPTIONS

4. The smallest option (Option II) costing £282m net (1980 sur prices) could be completed in about 15 years. It would extend electrification up the East Coast Main Line to Leeds and Newcastle, to Sheffield on the Midland Main Line, and from York to Birmingham. In Scotland, Edinburgh to Glasgow and Edinburgh to Carstairs (on the West Coast Main Line) would be electrified. There would be no electrification in Wales. The medium Option (Option III) costing £572m net would extend electrification to include London to Bristol, South Wales and Plymouth; Birmingham to Taunton; Newcastle to Edinburgh; and Liverpool to Leeds. The largest option (Option V) costing £691 to £751m net depending on the rate of implementation would include, in addition, Edinburgh Aberdeen and Doncaster to Hull; Plymouth to Penzance; and Crewe to Holyhead. Different rates of progress were appraised for Options III and V.

THE MAIN CONCLUSIONS

5. The review showed that all of the electrification options gi a reasonable rate of return. The results are summarised in the following table -

Option	Completion Date	% of traffic Electrically Hauled Pass	Freight	Internal Rate of Return %	Net Prese Value £m (1980 Sur Prices)
I (diesel base)		52	23	-	-
II	1995	62	38	9.9	84
III slow	2005	75	54	11.0	202
III fast	1995	75	54	11.0	239
V slow	2010	83	68	11.1	249
V fast	2000	83	68	11.1	305

- the Internal Rates of Return and Net Present Values are measures of the return from electrification compared to the diesel base case (Option I)
- The NPVs quoted are discounted at 7% and are at 1980 Survey Price levels.

6. The cash flow effects of each option compared with the diesel base case are as follows -

£m a year average (1980 Survey Prices

	1981-85	1986-90	1991-95	1996-2000	2001-2005	2006-2010
Option II	- 14.3	- 11.3	- 1.8	+ 30.4	+ 35.4	+ 41.2
Option III Slow	- 12.6	- 16.4	- 28.3	+ 12.4	+ 86.8	+ 101.9
Option III Fast	- 22.8	- 26.9	- 29.8	+ 88.8	+ 103.9	+ 92.9
Option V Slow	- 15.2	- 15.5	- 31.3	+ 10.3	+ 70.3	+ 129.7
Option V Slow	- 23.9	- 33.5	- 40.9	+ 87.7	+ 130.0	+ 129.8

The larger, faster options produce the largest cash flow requirement in the first 15 years, but generate the largest cash flow improvement in the second half of the assessment period.

7. The standard passenger traffic forecasts used in the Electrification Review are the same as those used in the Department's appraisal of the Corporate Plan. Alternative forecasts of traffic levels and costs were tested to determine their effect on the financial results. These tests were stringent. For example, the lower passenger traffic forecast, which incorporates a downwards exogenous traffic trend, lower journey time elasticities and higher fares elasticities, assumed a fall of 40% in passenger mileage by the year 2010. This low forecast reduces the return from 11% to 9%. The Report concluded that it would take an unlikely combination of adverse factors to undermine the prospect that electrification would earn a real rate of return of at least 7%.

8. Since the report was completed, the Department of Energy ha made revised forecasts of the sterling price of diesel oil and electricity, following the inter-Departmental report on the Planning Price of Oil to the Year 2000 and, in the case of electricity, reflecting present prospects for the nuclear power programme. These new forecasts project higher prices than those used in the review for both diesel oil and electricity and sugges a somewhat greater absolute advantage for electricity in the late years of the assessment period. However, post 2000 the assessme is particularly sensitive to the share of nuclear power in opera capacity. The new energy price forecasts raise the NPVs of Optio III slow and fast to £251m and £290 respectively. A fuller note the energy forecasts used is appended.

CHOICES

9. The results indicate that electric traction would help to make the railways more cost-effective, and that it would be worthwhile going beyond the smallest option (Option II). On the other hand, it is unnecessary to define now the ultimate extent of an electrification programme. This points to consideri the medium option (Option III). The real choice now is between t fast and slow rates of implementation. The review showed that faster implementation would give a higher Net Present Value (£23 but the net cash requirement would be larger over the first 15 years. Going more slowly would reduce the NPV to £202m but would also reduce the cash demand over the first 15 years. The total additional investment requirement with Option III fast would be £572m with an average increase in the first 5 years of the programme of £22m a year. With Option III slow the total additional investment requirement would also be £572m, but with an average increase in the first 5 years of only £12m a year. The Internal Rate of Return is 11% for both on the standard assumptio

10. The Electrification Review assumed a start on electrificatio in early 1981. This is not now possible. The Board's 1980 Corporate Plan anticipated a delay in the implementation of an electrification programme, but in the Department's view over-estimated the investment requirement in the years 1984 and 1985. The Department estimates that the financial effects of the Optio

III Fast and Slow would now be as follows -

INVESTMENT, PSO AND EFL EFFECTS OF ELECTRIFICATION AT SURVEY 1980 PRICES

(£m at 1980 Survey Prices)

	1981/82	1982/83	1983/84	1984/85	1985/86
Option III Fast					
Extra Investment	+ 5	+ 10	+ 20	+ 25	+ 35
PSO requirement	0	+ 5	+ 10	+ 15	+ 20
External Financing Requirement	+ 5	+ 10	+ 25	+ 30	+ 40
Option III Slow					
Extra Investment	+ 5	+ 10	+ 20	+ 10	+ 10
PSO Requirement	0	+ 5	+ 5	+ 10	+ 10
External Financing Requirement	+ 5	+ 10	+ 20	+ 10	+ 10

APPENDIX

FUEL PRICE FORECASTS

1. The forecasts of energy prices required for the Electrification Review were provided by the Department of Energy in December 1979. The analyses incorporated in the Report were completed in October 1980, at which time the Department of Energy was reassessing its forecasts in the light of the Inter-Departmental report, chaired by the Treasury, on "Prospects for Oil Prices to the Year 2000", and the latest views within the Government on the electricity generation proposed.

2. In the event the estimated diesel oil prices for 1980 proved to be very close to the figure actually paid by British Rail, but the price paid by BR for electricity turned out to be 7% higher than predicted.

3. The standard forecasts provided by the Department of Energy in 1979 gave the following changes from the actual 1980 levels mentioned in paragraph 2 -

	1990	2000	2010
Diesel Oil	+31%	+59%	+90%
Electricity	+17%	+54%	+40%

These figures assumed -

a. that crude oil prices would rise in the year 2000 to 2½ times the 1977 real level, to a figure equivalent to $45 a barrel at 1980 prices;

b. that about 40 gigawatts of nuclear generation capacity would be installed by 2000.

4. The figures in the above table represented the best estimates at the time, but alternatives were considered. Advice from the Department of Energy in autumn 1980 was that the gap between electricity and diesel oil prices was likely to be wider than the above figures suggested. The following combination of diesel oil and electricity prices incorporating a wider gap suggested a significant increase in the NPV of the electrification options -

	1990	2000	2010
Diesel Oil	+45%	+86%	+131%
Electricity	+17%	+54%	+ 40%

It was concluded that the probability, if all other assumptions were to remain unchanged, was that later fuel price forecasts would raise the NPV of Option V fast from £255m and could even raise it to about £340m.

5. New Department of Energy estimates of diesel oil prices are now available, based on the projections of the interdepartmental report. This assumes that crude oil prices will rise to $65 a barrel by 2000. The Department of Energy also advise the following standard estimates of electricity prices to BR, based upon the centre of their range of projections -

	1990	2000	2010
Diesel Oil	+35%	+105%	+160%
Electricity	+30%	+ 95%	+ 80%

The electricity prices assumed 22 gigawatts of installed nuclear capacity by the year 2000 and that world coal prices will move broadly in step with world oil prices.

6. Compared with the previous forecasts the movement of electricity prices is adverse in the early years. The electricity prices have been raised by a higher percentage than have oil prices, but both oil and electricity prices are higher than the previous forecasts and therefore the absolute advantage of electricity has improved slightly in later years. The effect of these later forecasts is to raise the NPV of Option V fast to £317m. They therefore imply a larger financial benefit from electrification than that associated with the standard fuel price forecasts used in the review.

ESTIMATES PROVIDED IN DECEMBER 1979 AS INCORPORATED IN THE ELECTRIFICATION REVIEW

Year		1978	1980	1990	2000	2010
Diesel Oil:	Low	100	145	170	190	215
	Standard	100	145	190	230	275
	High	100	145	210	270	335
Electricity:	Low	100	100	110	120	105
	Standard	100	100	125	165	150
	High	100	100	140	210	195

REVISED ESTIMATES AS SUPPLIED IN MARCH 1981

Year		1978	1980	1990	2000	2010
Diesel Oil:	Low	100	145*	175	250	330
	Standard	100	145*	195	295	380
	High	100	145*	210	380	500
Electricity:	Low	100	107*	125	165	150
	Standard	100	107*	140	210	195
	High	100	107*	190	265	200

*Actual Prices Paid by BR