

1975. The forward projections are carried on several assumptions—the rate of growth of the economy, the future relationship between coal and oil prices, and the rate at which natural gas is put to use. So far, no attempt has been made to apply similar techniques to the supply side of the equation, but this will follow. Meanwhile, the author expresses the hope that the model so far developed can be used to examine the implications of different fuel policies. It is unfortunately unlikely that the principal antagonists in the arguments about fuel policy will possess the mathematical equipment necessary for this, because the argument is a highly sophisticated one.

The first thing the survey reveals is the danger of making predictions on the basis of simple trends. Mr Wigley shows that the growth of oil consumption since 1948 and the decline of coal both follow cubic curves very well, but that if these curves are extrapolated the results are absurd. Both curves reach turning points before 1970 and rapidly reverse the trend, with coal consumption soaring away beyond even Lord Robens's wildest dreams, and oil dropping away almost to nothing by 1977. Quadratic curves produce equally absurd results. The mathematical model which has been developed, though it fits the observations less well in the early fifties, produces much more convincing forward projections.

The most interesting question, of course, is whether the calculations produce results which agree with the Government's fuel policy. This depends on the assumptions made about the impact of natural gas from the North Sea, which in turn depends on the relative prices of gas and coal in 1972. Two prices for gas are taken and fitted into the model; one, the "low gas" assumption, applies if gas prices fall to the level reached in 1958. The "high gas" assumption applies to a situation in which the price of gas has fallen even more abruptly than this. The first tentative conclusion is that even if gas does reach its 1958 price level, it is unlikely to sell in anything like the quantities assumed by the Ministry of Power. To reach the figure of 4,200 million therms contemplated by the ministry for 1972, the price of gas would have to decline to 30 per cent less than its 1958 value.

From this conclusion, which the author warns may be an exaggeration, it can be seen that the ministry's projections for coal can only be reconciled with the less likely "high gas" assumption. When this is used, the agreement between the model and the Fuel Policy White Paper is very close. But if the "low gas" assumption is used, much higher coal consumption is indicated for 1972—152.6 million tons, against the ministry's estimate of 133.2. Oil consumption would also be higher.

WATER RESOURCES

Too Much Rain, Too Little Water

THE Water Resources Board is confident, in its report for 1967-68 (HMSO, 8s 6d), that it can meet the demand for water in England and Wales by the end of the century without dramatic increases in the cost of water and in spite of the daunting prospect that the demand for water will have doubled by then. In effect this means that the equivalent of water-works carried out in the past hundred years will have to be undertaken

in the next thirty years. Surprisingly, the report says that the run-off water available per head of population in England and Wales is one of the lowest in Europe, but this is more the result of the density of population than the scarcity of rain. The board's difficulties are not made any easier by the fact that about a quarter of the population of England and Wales is concentrated in the South East, the area with the lowest rainfall.

It hardly needs to be said that this year the rainfall was above average—particularly during the summer—but it is pleasant to have statistics to prove that the weather was as bad as it seemed at the time. In a chapter on rainfall, river flow and ground water, the board reports that the figure of 21.6 inches of rain in the summer was the highest since 1931 (22.8 inches) although the 1946 figure was about the same. The exceptionally high figure of 5.7 inches for September has not been exceeded since 1918 when the amount was 7.2 inches, but similar figures were recorded in 1927 and 1965. The seasonal and annual rainfall for the past ten years as an average for England and Wales is shown in the accompanying table.

SEASONAL RAINFALL OVER ENGLAND AND WALES

	Winter		Summer		Year	
	(in.)	(per cent of average)	(in.)	(per cent of average)	(in.)	(per cent of average)
1958-59	16.4	85	10.3	63	26.7	75
1959-60	24.6	128	18.6	113	43.2	121
1960-61	25.1	131	15.7	96	40.8	115
1961-62	18.1	94	16.7	102	34.8	98
1962-63	13.7	71	17.5	107	31.2	88
1963-64	15.5	81	13.4	82	28.9	81
1964-65	15.7	82	20.0	122	35.7	100
1965-66	20.3	106	19.1	116	39.1	110
1966-67	20.6	107	18.2	111	38.8	109
1967-68	19.8	103	21.6*	132	41.4*	116

* Provisional figures.

One important programme undertaken by the board in cooperation with the Trent River Authority hopes to find out whether the River Trent could be made suitable as a source of drinking water. Because of pollution in its upper reaches, the river is almost useless as a source of water except for cooling at power stations. If it could be made cleaner, this would ease water resource problems over a large area of the country.

It is inevitable that some of the board's plans for reservoirs and barrages should come in for criticism, and it may therefore be some comfort that the board accepts that "decisions which involve loss of amenity should not be taken until all reasonably practicable alternatives have been explored". On the other hand, it points out that "we must have regard also to the large number of people who flock to reservoirs to enjoy the new amenities provided and to future generations who will expect an ample water supply. These seem to have no public advocate during the controversies which surround the planning of schemes".

COMPUTERS

Diplomas for Programmers

THE City and Guilds Institute recently convened a meeting to discuss the need for a national qualification for students of private computer schools. The seven