5393

Displacing Oil Power Plants with Coal: An Economic Analysis

EPA cost estimates indicate that utilities can convert many oil-fired plants to coal or even replace existing oil plants with new coal plants and reap economic savings to their customers while complying with applicable pollution standards.

Table I below demonstrates that converting to coal is economical even under the assumption that the plant undergoes a high cost boiler conversion, and builds a 90% effective SO2 scrubber. The saving in this case is 4.9 mills/kwh. With less stringent control equipment, which can be applied in many cases under existing state emissions limitations, the analysis shows an even greater saving from a coal conversion, in this case 15.0 mills/kwh. It should be noted that in many cases state emissions limitations can be met without an SO2 scrubber. In those cases the conversion savings will be even higher than those described in the attached tables.

Table II illustrates that retiring a modern oil plant and replacing it with a new coal facility can result in electricity cost reductions, due to the substantial differences between the price of coal and oil. The capital cost estimate for the new coal facility assumes expenditures for pollution control equipment to meet EPA's New Source Performance Standards (NSPS), including a 90% effective SO2 scrubber and a baghouse for particulates. To the extent that many plants will require less controls, the advantage of coal-fired plants is greater.

The analysis assumes an oil price of $20 per barrel and a coal cost of $30 per ton. The results are sensitive to the price of oil, as illustrated in Table III.

Table IV estimates the capital costs and operating savings for a 500 megawatt powerplant under the three conversion assumptions. Each megawatt of capacity costs $95,000, $470,000 and $740,000 for low cost conversions, high cost conversions and new coal plants, respectively. The net present value of the savings per megawatt is $824,000, $784,000 and $808,000 for the three cases, respectively.

How the benefits from reduced electricity costs would accrue to consumers depends upon the regulatory policies of individual states. Many public service commissions charge capital expenses at a higher rate in early years, and less in later years of an investment rather than charging capital costs evenly over the life of an investment. (See Table V, which illustrates two methods for allocating capital expenses to ratepayers over time.) It is possible that in some cases, coal conversions will add to electric rates in the early years, even though consumers benefit over the life of the investment.

In summary this analysis indicates that the U.S. can substantially reduce oil dependency while cutting electric rates and while meeting applicable environmental standards.

TABLE I

COMPARISON OF ANNUALIZED COSTS OF AN OIL PLANT CONVERTED TO COAL WITH THE OPERATING COSTS OF AN EXISTING OIL PLANT 1/

(Mills/Kwh)
(Mid-year 1979$)

	Existing Oil	Low Cost Coal Conversion 3/	High Cost Coal Conversion 4/
Annualized Capital Costs 5/			
Scrubber	0	1.4	2.4
Boiler Conversion	0	.4	7.7
ESP Upgrade	0	.2	.2
		2.0	11.3
Fuel Cost	32.2 2/	13.0	13.0
Operating and Maintenance	.5	2.7	3.5
Total (Mills/Kwh)	32.7	17.7	27.8

1/ Assumes a 12.5% capital charge, a 20 year amortization period and a 65% capacity factor.

2/ Assumes oil cost of $20/bbl and a coal cost of $30 per ton.

3/ Based on these capital cost estimates:

Scrubber - 50% Control	$65/kw
Boiler Conversion	20/kw
ESP Upgrade	10/kw
	$95/kw

4/ Based on these capital charge estimates:

Scrubber - 90% control	$110/kw
Boiler	350/kw
ESP Upgrade	10/kw
	$470/kw

5/ Capital costs are converted to annualized costs using the formula:

Capital costs x capital charge/5694

(5694 is the total operating hours per year at 65% capacity factor)

TABLE II

COMPARISON OF TOTAL ANNUALIZED COSTS OF A NEW COAL PLANT AND OPERATING COSTS OF AN EXISTING OIL PLANT

(Mills/Kwh)
(Mid-year 1979 $)

	Existing Oil	New Coal
Annualized Capital Costs	0	13.0 1/
Fuel Costs 2/	32.2	13.0
Operating and Maintenance	.5	4.7
	32.7	30.7

1/ Assumes a capital cost for the coal plant of $740/kw of capacity.

2/ Assumes oil cost of $20/bbl and coal cost of $30/ton.

TABLE III

COMPARISON OF ANNUALIZED COSTS OF AN OIL PLANT CONVERTED TO COAL WITH THE OPERATING COSTS OF AN EXISTING OIL PLANT AT VARIOUS OIL AND COAL COSTS

Existing Oil Plant		High Cost Coal Converted Plant	
Oil Cost ($/Bbl)	Mills/Kwh*	Coal Costs ($/ton)	Mills/Kwh
$10	16.6	23	24.8
12	19.3	25	25.8
14	23.0	27.6	26.8
16	26.3	30	27.8
18	29.5	32.2	28.8
20	32.7	34.5	29.8
22	35.4		
24	39.2		

* Based on 5.8 million Btu/Bbl of oil and 23 million Btu/ton of coal

TABLE IV

COAL CONVERSION CAPITAL COSTS AND OPERATING SAVINGS
FOR A 500 MEGAWATT PLANT
(Million $)

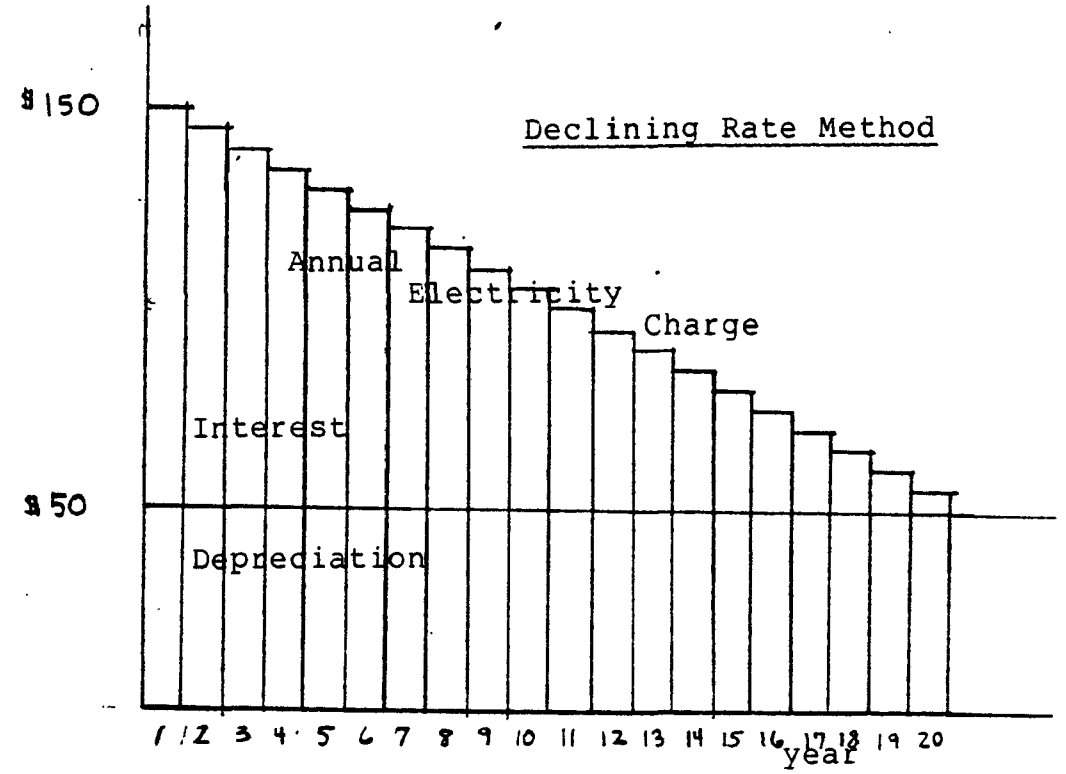
	Capital Cost	Annual Operating Savings	Present Value of Operating Savings 3/
Low Cost Conversion 1/	$47.5	48.4	412.0
High Cost Conversion 1/	235.0	46.1	392.0
New Coal Plant 2/	370.0	41.3	403.9

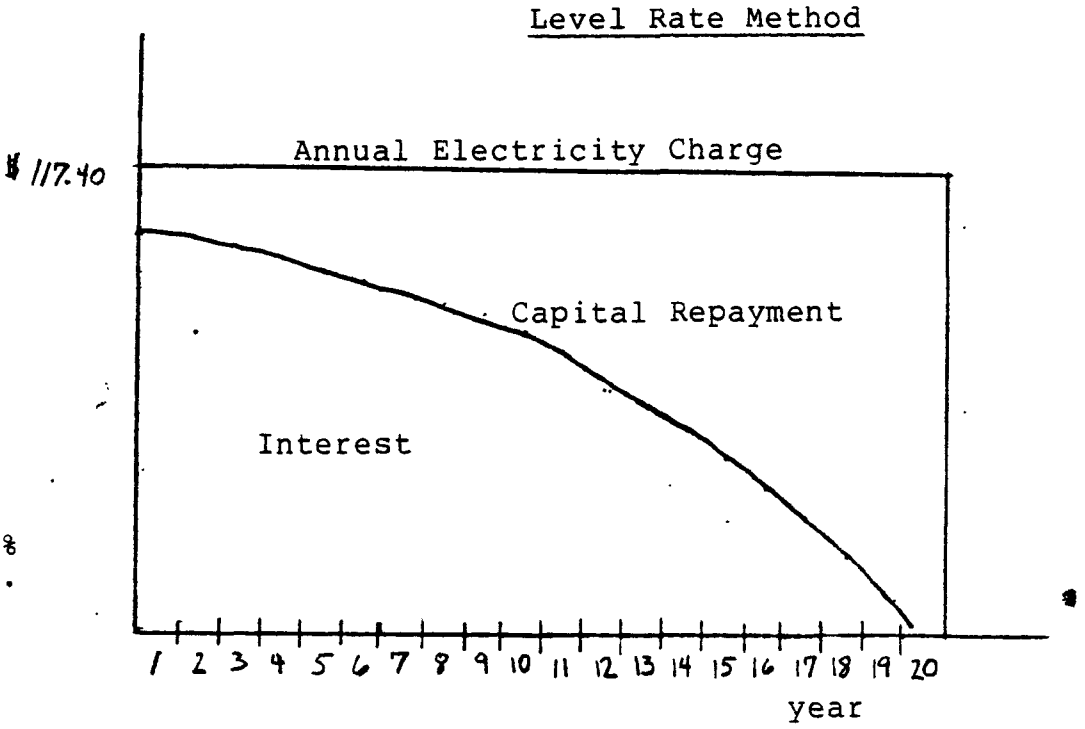
1/ Assumes 20 year remaining life on plant.

2/ Assumes 40 year coal plant life.

3/ Calculated at a 10 percent discount rate.

TABLE V.
COMPARISON OF TWO UTILITY COST ALLOCATION METHODS FOR A $1000 INVESTMENT WITH A 20 YEAR LIFE1/





1/ Assumes 10% interest rate.