A

GLOBAL WARMING: POWER STATION EFFICIENCY

1. The CEGB has steadily and significantly reduced its specific CO_2 emission rate, that is, the amount of CO_2 emitted per unit of electricity supplied. In the years 1950, 1970 and 1987 it emitted 68.7, 184.1 and 182 Mt of CO_2 in supplying 48.9, 186 and 228 TWh of electricity respectively. This translates to 1.4 kgCO_2 per kWh in 1950, 1.0 in 1970 and 0.8 in 1987 respectively. Between 1970 and 1987, the emission of CO_2 has fallen by over 2 Mt per year whilst the number of units of electricity supplied has increased by nearly 23%.

Past Performance

2. Thermal Efficiency. The thermal efficiency of CEGB plant has steadily increased over the last two decades. In 1956, the highest thermal efficiency obtained by a coal-fired CEGB unit was 30.8%. Currently, Drax Power Station is on target to increase this figure beyond 38.4% for 1989. These improvements have resulted from a variety of factors, including improvements in control and instrumentation and in metallurgical technologies enabling high steam temperatures and pressures to be used. The CEGB has been recognised as a world leader in these fields of technology. Such changes are substantial in terms of reducing coal usage and hence CO_2 emissions. For Drax, the increase in efficiency over last year's performance is likely to be only 0.4% but this implies a reduced yearly coal consumption of over 125,000 tonnes: a reduction of 0.27 $MtCO_2$.

Future Performance

3. Future Fossil Fuel Technology. Whilst the CEGB's present projections assume a continuing improvement in the efficiency of use of fuel, there is a limit which is now being approached. Existing technology, conversion of heat into steam which subsequently drives turbines, has a theoretical maximum

efficiency of just over 40% irrespective of the type of fuel used.

4. Extensive research is being carried out by the CEGB into areas where plant efficiency can be increased at the margin. Typical is research into changes to the blades in low pressure cylinders which drive the alternators, changes in boiler parts, low pressure heaters making better use of the steam, the introduction of different types of condensers, modifications to cooling towers and improvements to burner design.

5. Alternative forms of generation, such as combined cycles (either coal or gas) offer the prospect of a more significantly reduced specific CO_2 emission rate through the use of a gas turbine in conjunction with a standard steam turbine. This increases thermal efficiency to a maximum of about 48%.

Planned Projects

6. The National Power Division of the CEGB announced on 20 April that they had submitted planning applications for two gas-fired plants using this technology, at Killingholme on Humberside and Little Barford in Bedfordshire. The applications are for plant totalling 1.6GW.

Independent Generators

7. The structure planned for the electricity supply industry in the private sector is encouraging the adoption of new technology: the 15 major private generation projects known to my Department, totalling some 6.5Gw, all envisage the use of combined cycle gas turbines.

Department of Energy

24 April 1989

GLOBAL CLIMATE: METHANE FROM WASTE/CHP

1. The table attached at Annex A shows the number of landfill gas commercial projects in existence at December 1988, those under construction, and those proposed for completion by December 1990. Of the 21 projects currently operating, 9 generate electricity only, with one using CHP. The remainder use the gas for boilers, kilns or other applications.

2. The normally remote location of landfill waste sites militates against CHP because to be economic CHP requires a suitable heat load in the vicinity. This pattern is unlikely to change significantly in the future.

3. Estimates by the Energy Technology Support Unit of the technical potential for landfill gas recovery by the year 2000 indicate that 3 mtce pa might be available. If it is assumed that only 50% of this potential is suitable for economic development and two thirds (66%) of this is used for electricity generation, some 225 MW could result.

4. The non-fossil fuel obligation (NFFO) will require all public electricity suppliers (the successors to the Area Boards) to purchase a minimum level of electricity capacity to be generated from non-fossil fuel sources. We have designated landfill gas as non-fossil, and so electricity generated by this means will be capable of contributing to the NFFO.

5. Projects which are currently generating or which are in a position to contract with Area Boards by the end of the year will be able to contribute to the initial obligations placed on the public electricity suppliers. We are conscious that there may be other renewable energy projects which will not be ready in time. The Secretary of State therefore announced on 5 April that the

obligations would be extended during the 1990s by up to 600 MW in a number of tranches which would only be capable of being fulfilled by renewables. This should boost the prospects for landfill gas as well as other renewable sources. The fossil fuel levy, designed to spread the cost of the NFFO to all electricity customers, will also be imposed on sales of fossil-generated electricity only. This will give non-fossil generated projects a price advantage.

Department of Energy

ANNEX A

LANDFILL GAS PROJECTS: STATUS REPORT

Date	No of Projects	Status	Energy Utilisation thousand tce/pa (cumulative)	No of power generators	Of which CHP	CHP generating capacity MW	Total generating capacity MW
Dec 88	21	Operational	106.6	10	1	3.5	14.4
Dec 89	6	Under Construction	161.5	4	3	8	10
Dec 90	19	Proposed	311.6	7	1	2	16.5
Total	46	---	311.6	21	5	13.5	40.9