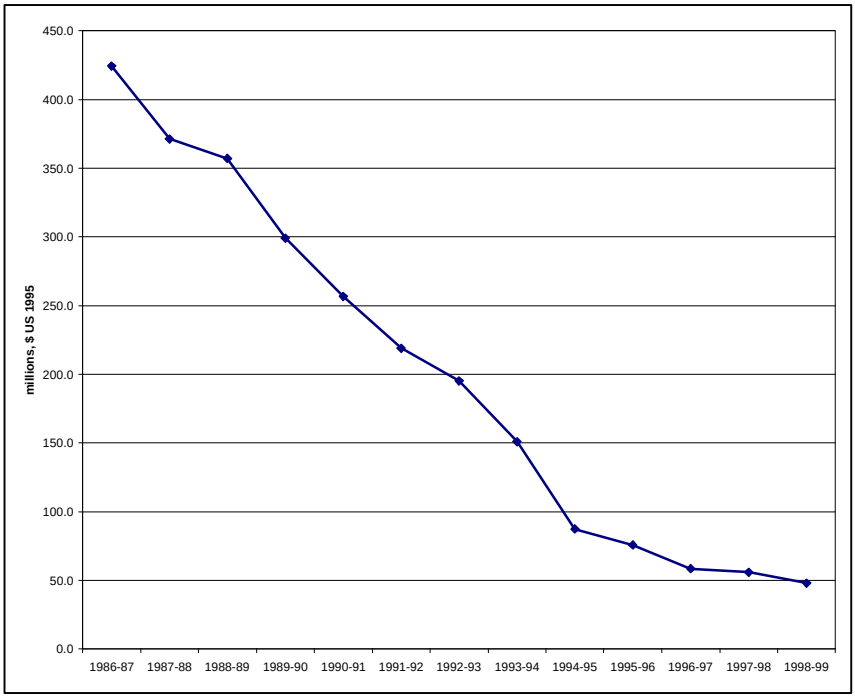
Energy R&D

Figure 6 shows the British government's recent investments in energy R&D. The decline in energy R&D support between 1996 and 1998 is consistent with the broader trend of the past decade, during which the U.K. public energy R&D expenditures have fallen by more than 90%.

Figure 6. Total Government Energy R&D Expenditures 1986-1999[i]



In recent years, government investments in energy R&D have been small and growing smaller--amounting to less than 1% of total civilian R&D expenditures in 1997. Energy R&D constitutes a sharply declining share of a declining overall civil R&D budget. Government funding for energy R&D now focuses to some extent on efforts to finalize development of technologies that are thought to have commercial promise, but that are not yet ready for introduction to the market. Primarily, however, the government R&D program emphasizes industry and international collaboration, and the removal of barriers to the commercialization and deployment of new technologies developed by the private sector, rather than on the direct sponsorship of energy R&D. With the exception of nuclear fusion, those energy R&D programs still receiving government support tend to emphasize technologies and projects that are likely to realize short-term returns.[ii]

For example, the United Kingdom's cleaner coal technology R&D program, funded at approximately $5 million in 1998, aims mainly to position UK industry to exploit the growing world market for clean coal technologies and expertise. The UK's small

remaining public oil and gas research program focuses mainly on offshore geology and offshore supplies and services R&D.[iii]

While the government previously funded nearly all renewable energy R&D in the UK, its investments in this area have steadily declined; the government now heavily leverages industry funding with its own R&D investments (in a ratio of approximately $2.5 to $1) and relies primarily on the non-fossil fuel obligation mechanism as a means of stimulating private sector improvements in renewable energy technologies.[iv]

The government has also withdrawn its support for nuclear fission R&D, leaving this work to the privatized nuclear generating companies. The majority of government resources in the nuclear fission area ($352 million in 1998) are devoted to nuclear decommissioning and radioactive waste management. Funding for fusion research, which supports both the Joint European Torus Project and a domestic fusion program, has fared better than all other public energy R&D programs, with a funding increase of 40%--to $23million--between 1997 and 1998.[v]

Energy R&D Programs

Government-sponsored energy R&D programs in the UK have been drastically downsized or eliminated outright over the past decade. This section provides detailed descriptions of the government's remaining energy-related investments and activities, which collectively added up to approximately $478 million in 1998. While this figure may suggest, at face value, that the health of the UK's energy R&D enterprise is may not be as dire as claimed elsewhere in this report, it is important to note that the vast majority of these funds are not directed to energy R&D, even if they are classified as such. Nearly 90% ($418 million) of these funds is devoted to nuclear decommissioning and radioactive waste management programs, while many of the resources in the remaining programs areas (energy efficiency, fossil energy, and renewable energy) are directed toward energy technology demonstration and deployment activities. In short, with regard to energy R&D, few resources are expended on the "front end" of the innovation process, consisting of the basic and applied research foundations for novel energy technologies, while the majority of the available funds are used to spur the commercial viability of technologies already in the development process.

Energy Efficiency *$20 million [£ 15 million] (1998)*[vi]

The government's investment in energy efficiency is consolidated within the Energy Efficiency Best Practice Programme (EEBPP), administered by the Department of the Environment, Transport, and the Regions. The overall objective of EEBPP is to stimulate annual energy savings in excess of $1 billion (equivalent to an estimated carbon emissions reduction of 5Mt/year) thereby improving industrial competitiveness and reducing environmental impact. The program promotes the adoption of energy-efficient technologies and techniques across the industrial, commercial and public sectors. One of

the program's primary activities is its collection of benchmark information on the energy use of selected UK industries. EEBPP studies the practices of the most efficient companies and shares its findings with all companies in each selected industry. A few years later, the study is repeated and the results are compared with those of the previous survey. The results typically show a shift toward more efficient practice.[vii]

Currently, the EEBPP focuses its R&D efforts on the industrial and buildings sectors. The industrial energy efficiency R&D program, funded at $1.2 million in 1998, provides design advice and information on energy efficient equipment, such as motors and drives, and works with energy-intensive industries such as the chemical industry, to reduce energy consumption.[viii] In recent years, the program's small R&D effort in the buildings area, which focuses on both the commercial and residential sectors, has been scaled down significantly, from just over $700,000 in 1996 to approximately $200,000 in 1998.[ix]

The program also co-funds projects with European Union energy efficiency programs including the EU's best practice SAVE program, the research-oriented JOULE program, and applied technology THERMIE program. In addition to supporting these European Union R&D programs, EEBPP sets energy performance benchmarks, identifies important knowledge gaps, and provides information and advice to industry and government. The EEBPP program is currently phasing out its funding for ceramics research, since the government has deemed rate of return on its investment in this area of energy efficiency investment to be low compared with the returns on its investments in other industrial areas.[x]

New and Renewable Energy Sources *$20 million [£ 15 million] (1998)*[xi]

Renewable energy currently accounts for 2% of the UK's electricity consumption. The government aims to increase renewables' share to 5% by 2003 and 10% by 2010. To achieve these targets it will apply a variety of measures, including the removal of barriers to entry for renewable energy technologies, for instance by separating the electricity generation and distribution businesses and creating a new wholesale electricity trading regime. The government will also use market stimulation measures such as the provision of guaranteed markets for non-fossil fuel generators (via the Non-Fossil Fuel Obligation), and direct support for renewable energy technology R&D.

The government gives priority to support for renewables R&D projects in technology areas that are likely to have the greatest impact, in the short term, in both domestic and export technology markets. Currently, technologies considered closest to being competitive in the UK or abroad, in the government's estimation, include waste-to-energy and biomass electricity generation, landfill gas, onshore wind, and passive solar technologies. Additional technologies that are being considered both for their export potential and for their potential contributions to the UK's 2010 target of 10% renewables include fuel cells, photovoltaics, offshore wind, and energy crops. Research supported by this program aims to make cost-reducing improvements that will enable the commercial deployment of renewable energy systems on a significant scale.

The government funds renewable energy R&D on a cost-share basis with UK companies and seeks to leverage its resources with those of EU energy R&D programs such as SAVE and THERMIE. In addition, Britain's Engineering and Physical Sciences Research Council has launched an expanded $5 million/year fundamental R&D program focusing on renewable energy.[xii] Current projects sponsored by the Council focus on the enhanced use of solar energy systems in urban buildings, the improvement of power conversion efficiency in commercial wind turbines, and on the development of planning tools to assess offshore wind potential in the UK.[xiii]

Fossil Energy *$10 million [£ 7.5 million](1998)*[xiv]

The British government's investment in fossil energy R&D consists mainly of activities in three areas: clean coal technology development, offshore geology, and hydrocarbon recovery. Each of these programs is described below.

The Cleaner Coal Technology program formerly supported technology R&D, but its main emphasis now is the promotion and worldwide commercial deployment of UK-developed clean coal technologies, with emphasis particularly on developing country markets. The Program's budget has declined sharply over the past decade, to a level of $5 million in 1998. Through the Cleaner Coal Technology program, the government provides support to UK industry to secure funding from European Union programs to help develop UK-based clean coal technology manufacturing and service industries. In addition it provides support to UK industry in developing collaboration with the US Department of Energy's Clean Coal Technology Demonstration Program and related R&D program, and with US industry.[xv]

Through the Department of Trade and Industry, the government also funds two programs in support of its regulatory activities in the oil and gas field. The Hydrocarbons Additional Recovery Programme (HARP) provides technical advice and research concerning the exploration and production of oil and gas on the UK continental shelf. The Offshore Geology Programme provides support for independent geological analyses of the UK continental shelf, and the extraction of cores and cuttings from hydrocarbon wells. These government-sponsored oil and gas programs were funded at a level of approximately $4 million in 1998.[xvi]

Fission Energy *$4 million [£ 3 million] (1998)*

The UK government has largely withdrawn its support for nuclear fission R&D, leaving the sponsorship of research to the private sector. The remaining research program sponsored by the government focuses on nuclear safety and accountability. That said, DTI provides a significant amount of non-R&D funding ($228 million in 1998) for a decommissioning, radioactive waste management, and fuel reprocessing program focusing on sites owned or operated by UK Atomic Energy Authority (UKAEA) and

British Nuclear Fuels. UKAEA manages the Decommissioning and Radioactive Waste Management Operations Programme (DRAWMOPS) for DTI. UKAEA owns and is legally responsible for the nuclear sites, the facilities being decommissioned and the associated wastes. Five sites are currently in the decommissioning process. The 1998 estimate of the total DRAWMOPS liabilities is about $10 billion. The planned program will extend over at least 100 years, the aim being to ensure that the liabilities are managed and dealt with in safe and environmentally responsible way while minimizing the associated costs.[xvii]

Fusion Energy *$23 million [£ 17 million] (1998)*

The UK's fusion energy program is funded through the Department of Trade and Industry and operated by UKAEA. The program funds UKAEA's contribution as host to the Joint European Torus (JET) and the UK national program that is part of the EU's fusion research program.[xviii] The UK national program focuses on the development and construction of a Mega Amp Spherical Tokamak reactor for magnetic confinement of high-temperature plasmas. The UK's fusion program resources are split roughly equally between the national and JET activities.[xix]

Energy Assistance to Developing Countries *$4.6 million [£ 3.2 million](1996)*

The Department for International Development provides some technical assistance to developing countries in the energy and power areas. Funding aims to promote better access to energy services by encouraging restructuring of the power sector to reduce waste of both energy and financial resources. The program also encourages the use of renewable sources of energy (including hydropower) in developing countries by providing funding for feasibility analyses of renewable energy projects and for the development of local capacity to operate and maintain energy systems. The Department for International Development coordinates its efforts in the energy area with those of the European Union and the World Bank. A major objective of its collaboration with developing countries in the energy area is to reduce the environmental impacts associated with energy use, particularly emissions of carbon dioxide and other greenhouse gases.[xx]

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[i] Department of Trade and Industry, Office of Science and Technology, *Science, Engineering, and Technology Statistics 1998*, Office of Science and Technology, http://www.dti.gov.uk/ost/SETstats98/

[ii] International Energy Agency, *Energy Policies of IEA Countries: The United Kingdom 1998 Review* (Paris: OECD, 1998), pp. 97-98.

[iii] International Energy Agency, *Energy Policies of IEA Countries: The United Kingdom, 1998 Review* (Paris: OECD, 1998), p. 98.

[iv] International Energy Agency, *Energy Policies of IEA Countries: The United Kingdom, 1998 Review* (Paris: OECD, 1998), pp. 100-101.

[v] International Energy Agency, *Energy Policies of IEA Countries: The United Kingdom, 1998 Review* (Paris: OECD, 1998), pp. 98-99; Department of Trade and Industry, Office of Science and Technology, *Science, Engineering, and Technology Statistics 1998* (July 1998), p. 101.

[vi] Department of Environment, Transport, & the Regions, http://www.research.detr.gov.uk/strat1999.htm#1

[vii] Alliance to Save Energy, *Update* (Spring 1999), p. 10.

[viii] Energy Efficiency Best Practice Programme, http://www.energy-efficiency.gov.uk/index.htm

[ix] International Energy Agency, *Energy Policies of IEA Countries: The United Kingdom, 1998 Review* (Paris: OECD, 1998), pp. 100.
[x] Department of Environment, Transport, & the Regions, http://www.research.detr.gov.uk/strat1999.htm#1
[xi] This figure includes the renewable energy R&D budgets of the Department of Trade and Industry ($15 million) and the Engineering and Physical Sciences Research Council ($5 million).
[xii] Department of Trade and Industry, *New and Renewable Energy: Prospects for the 21st Century* (London: Department of Trade and Industry, 1999), pp. 27-29, 68.
[xiii] Engineering and Physical Sciences Research Council, http://www.epsrc.ac.uk/epsrcgrants/portfolio.asp
[xiv] This figure includes the Department of Trade and Industry's budgets for clean coal technology ($5 million), offshore geology ($1.5 million), and the Hydrocarbons Additional Recovery Programme ($3.3 million).
[xv] Department of Trade and Industry, http://www.dti.gov.uk/public/frame1.html
[xvi] Department of Trade and Industry, Office of Science and Technology, *Science, Engineering, and Technology Statistics 1998* (July 1998), p. 101.
[xvii] Department of Trade and Industry, http://www.dti.gov.uk/drawmops/backgrnd.html
[xviii] Department of Trade and Industry, http://www.dti.gov.uk/drawmops/backgrnd.html
[xix] International Energy Agency, *Energy Policies of IEA Countries: The United Kingdom, 1998 Review* (Paris: OECD, 1998), pp. 98-99; Department of Trade and Industry, Office of Science and Technology, *Science, Engineering, and Technology Statistics 1998* (July 1998), p. 99.
[xx] Department for International Development, *Departmental Report 1998-1999* (London: The Stationery Office Limited, 1998), p. 37.