

Surrey Energy Economics Centre

THE SECURITY OF BRITAIN'S SUPPLY,
GOVERNMENT POLICY AND THE
PROPOSED HINKLEY POINT 'C'

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THE SECURITY OF BRITAIN'S ENERGY SUPPLY, GOVERNMENT POLICY AND HINKLEY POINT 'C'

1. Introduction

We are concerned in this proof with the CEGB's "security" case for Hinkley Point 'C'. An integral part of the Board's case for the construction of Hinkley Point 'C' is that it is consistent with, or even required by the government's policy of encouraging diversity in fuel sources so as to promote security of the country's energy supply. For example, para 1.13 of the CEGB's Statement of Case claims that

"...the policy for diversity justifies consent for and the construction of generating plant which would be needed to meet the requirement for non-fossil-fuelled capacity...Hinkley Point 'C' is essential to meet that requirement."

In paras. 1.32 and 1.33 the CEGB goes on to estimate the "shortfall" of non-fossil-fuelled generating capacity in the year 2000, concluding that it will be 3.12 GW (measured in "sent out" terms) and stating (para. 1.35) that there is "...no reason to prefer any source which is likely to be available to a PWR at Hinkley Point".

2. What is meant by energy security and how can it be enhanced?

2.1 Whether or not the construction of Hinkley Point 'C' by the CEGB or its direct successor ("G1") would enhance the security of Britain's energy supplies is clearly one of the most important issues at this Inquiry. Therefore we begin by clarifying what is meant by security of energy supplies ("energy security" for short) in the electricity supply industry.

2.2 The industry uses primary energy (fossil fuels, nuclear and hydro power and renewables) as an input to its generating capacity, along with labour and non-energy materials, so as to produce "secondary energy" in the form of electricity for consumers. Energy security therefore implies that primary fuels should be available, that generating capacity in total should be adequate to meet demand and that such generating plant as has been installed should be available for use (that is, plant should not be out of action because of technical troubles, industrial disputes, sabotage or other reasons). Security relates not only to the supply side but also to expected demand. Demand is not given, but is influenced (among other things) by the pricing and advertising policies of the industry; thus electricity suppliers can, in meeting their security obligations, choose to encourage the conservation of electricity and operate pricing policies which smooth out what would otherwise be peaks in demand. As we explain in 3.6 below, there is likely to be increased emphasis on conservation when the electricity supply industry is privatised.

2.3 Energy security can only be defined in relative rather than absolute terms. No form of energy and no source of supply can offer complete security. In a book published in 1984 - The Economics of Energy Self-Sufficiency, (ref.1), Chapter Five - we defined security of the country's energy supply as "...relative freedom from sudden physical shortages and any resultant short-term price increases which disrupt the economic and social life of the country." Therefore, improving security of supply "... means reducing the number of such disruptions and the impact on society of any which still occur". Security of supply relates essentially to such short run changes, though it is often confused with attempts to protect a country from the effects of long run energy price increases. The distinction is important since the policy measures required in the two cases are not identical.

2.4 Government has a role in promoting energy security rather than leaving it entirely to markets because of its "public good" aspects. If one organisation or individual provides security (for instance, by installing a standby electricity generator) there are spillover benefits for others. Because the providers of security cannot appropriate all the benefits, there may be less investment in security than is socially desirable. Hence, action by government may be required to ensure adequate security provision.

3. Why has the government imposed a non-fossil-fuelled proportion on electricity distributors?

3.1 The government's decision to impose a statutory non-fossil-fuelled (hereafter nff) proportion on distributors is evidently an attempt to provide protection against interruptions in primary fuel supply. The objective is to diversify by "...using a number of fuels from which to generate electricity" (para.46 of the White Paper on Privatising Electricity, Cm 322, Inquiry Document S69, ref.2, hereafter referred to as the "White Paper").

3.2 We have no doubt that diversification of supply sources is an appropriate means of enhancing security. Labour disputes, technical difficulties, monopolistic action by suppliers, natural catastrophes and other events which affect one source are unlikely to affect others at the same time; thus they become manageable events. To reduce the impact of any disruptions which still occur, appropriate policies include holding stocks of fuels in excess of normal commercial requirements. The presence of such stocks may also help prevent actual and threatened disruptions since it will be clear that the country will be more able to withstand them.

3.3 Nevertheless, although we support the principle of

diversification to improve security, setting a nff proportion is an inappropriate means of pursuing the diversification objective. Indeed, imposing such a proportion on distributors is probably neither sufficient nor necessary to enhance security. In some circumstances (see 3.7 and 3.8 below), it may hinder achievement of the energy security objective.

3.4 The energy security problem results from the concentration of power in a few hands. Consequently, in The Economics of Energy Self Sufficiency, (ref.2), we argued for a "judicious mix" of supply sources so as to avoid over-dependence on particular sources, whether home or foreign. In the case of electricity supply, the judicious mix argument implies a mixture of primary fuels (both indigenous and imported), of generators (both at home and overseas) of technologies and of scales of operation.

3.5 Seen in this light, the nff proportion is not a genuine instrument of diversification. Its categorisation of energy sources - into fossil and non-fossil - is too simplified and too arbitrary to promote adequate diversity. It assumes a degree of homogeneity among the fossil fuels which does not, in practice, exist. Coal, oil and natural gas have quite different security and other characteristics which vary not just according to type of fuel but according to the source from which the fuel comes; security characteristics may vary also over time as technology changes. Classifying all such fuels as "fossil" and separating them from "non-fossil fuels" is unhelpful as a classification for security purposes. Fossil fuels are heterogeneous, just as the non-fossil fuels are. Any given fuel from a given source at a given time has its own potential for insecurity, but the case for diversity is that security of the system as a whole can be increased by having a mix of fuels. Fuel diversity is, however, not enough in an electricity supply system; different sources of generation and different technologies are also important. If, for example,

fuels from diversified sources were all channelled into the same supplier or the same production technology a security bottleneck could be created.

3.6 Not only is there a flaw in the concept of the nff proportion, there appears to be some inconsistency between the government's perception of the future, privatised electricity industry and the view that such a proportion needs to be set. Under the new regime, distributors will have a statutory obligation to supply consumers which clearly implies that, quite apart from the normal commercial incentive to maintain service, they will have the strongest possible reason to provide security by diversifying by types of fuel, by technology, by scale, by generator and by promoting energy conservation so as to reduce demand on their systems. They are likely to invest in technologically up-to-date fossil fuel generation, in non-fossil fuel generation including renewables and in small scale methods of generation in their efforts to meet their statutory obligation. Moreover, after privatisation, the electricity supply industry should have much more choice of sources of fuel than it has had in the past as numerous restrictions, mainly imposed by governments, disappear. The industry will presumably be able to burn natural gas in power stations, should it wish to do so; it will be able to import coal more freely; it should be able to use oil at times when it is cheaper than alternative fuels; there may well be more than one British coal supplier as the government realises its stated "ambition to privatise coal"; and electricity imports may also be increased. In short, the removal of past government constraints will permit the diversification in terms of primary fuels which, under the new regime the distributors will seek.

3.7 It is not clear why, given that increased choice of fuels and the statutory obligation to supply will encourage the

diversification process we have just outlined, there should in addition be a statutory non-fossil-fuel proportion. Energy security will increase naturally under the new regime. If energy markets are dominated by monopolistic suppliers, governments may need to intervene on behalf of consumers to promote security. But, with the imminent demise of generator dominance, the government intends to reduce monopoly power in electricity supply. A statutory nff, in addition to a statutory obligation to supply, is unnecessary in the context of the new regime in electricity. Distributors will make their own judgments about the reliability of different sources of supply so they can build up portfolios of contracts which protect their consumers. Since there will be a number of distributors, whose judgments may well differ, that in itself will promote diversity. Instructing them to contract for given amounts of "fossil" or "non-fossil" generated electricity is more likely to constrain than to help them. Severe penalties for breaches of the obligation to supply would be more appropriate.

3.8 It may appear that the nff obligation, though unnecessary, is harmless. We can, however, see serious difficulties in prospect if governments set the nff proportion or influence fuel choice within that proportion in such a way that they hinder the distributors' ability to meet their statutory obligation to supply. For example, if a government were to insist that distributors contracted for a substantial amount of new nuclear capacity as part of the nff proportion and the resulting nuclear plants were as long in construction and as unreliable as some of the CEGB's existing plant, the distributors might be unable to fulfil their statutory obligation to supply. A very difficult dilemma would then be posed as to legal liability for the default. Similarly, if distributors were constrained to contract with a dominant nuclear generator, they might face security problems - for instance, from industrial action aimed against that generator.

In practice, it may be that such potential conflicts will be resolved by governments' ensuring that the nff proportion is set sufficiently low that it does not interfere with the choices which distributors would have made anyway.

3.9 As explained in 2.4 above, there is a case for government action to enhance energy security. In The Economics of Energy Self Sufficiency (ref.2) we discussed various forms of such action, including efforts to maintain into the long run future a judicious balance between imported and home produced primary fuels and diverse sources of both home and overseas supplies. But that is a different matter from the target nff proportion which the government has proposed. The government is to place on distributors a legal obligation to supply which, along with the freer choice of generators and fuels which they will enjoy, will encourage diversification and promote security of supply. Overlaying that obligation with an nff proportion, which embodies a distinction (virtually meaningless in security terms) between fossil and other fuels, is both unnecessary and undesirable. To go further, committing to an expansion of indigenous nuclear power on the basis of the nff proportion, would appear not only anachronistic in the context of the new regime in electricity, it might even be inimical to security improvement (see 5 below).

4. Is the CEGB correctly interpreting government policy?

4.1 The next question we address is whether it is justifiable for the CEGB's Statement of Case to attach such weight to apparent government support of an expansion of its nuclear capacity on energy security grounds.

4.2 A statement of the present government's view is in paras. 44 to 49 of the White Paper ("Security of supply and the need for nuclear power"). After mentioning the case for diversifying fuel sources for power generation and the protection (against

short lived interruptions) which high fuel stocks can provide, the White Paper states (para.46) that there should not be "...too much reliance on fossil fuels". Though renewables have a part to play, "...there remains a vital strategic need for the significant non-fossil-fuelled contribution that can only be made by nuclear power". Then, in para.49, the government explains its intention to impose on the new electricity distribution companies a statutory obligation to "...contract for a specified minimum proportion of non-fossil-fuelled generating capacity." This proportion "...will be fixed at a level achievable at the time of privatisation"; the government "...will have powers to vary the specified level after consultation with the industry". The obligation can be met by "...contracting for nuclear capacity (or) contracts for renewable sources of energy... The distribution companies will be able to seek capacity from any source... The two main generating companies, Scotland, France, the Atomic Energy Authority (AEA) and British Nuclear Fuels plc (BNFL) are all potential sources of supply."

4.3 At the time of the White Paper, the popular assumption seemed to be that the nff proportion would be in the range of 15 to 20 per cent and be mainly British-generated nuclear power. For example, an article in The Observer of 28th February 1988 (ref.3) said the following

"Parkinson was deliberately vague in his White Paper on the precise proportion of generation to be provided in future by nuclear power but this will be retained at present levels, some 18 per cent of output"

The reason why 18 per cent is quoted is presumably because that is approximately the proportion of electricity generated from nuclear sources by power stations in Great Britain in 1987.

4.4 Then, in a speech to the British Nuclear Forum on 20th April 1988 (Inquiry Document S83, ref.4), Mr Michael Spicer (Parliamentary Under Secretary of State for Energy) said that, while the nff proportion had "...not yet been settled" , it would "...reflect the CEGB's existing plans for non-fossil capacity, which currently amount to about one fifth of supplies." It would be for the electricity distribution companies "...to decide how to meet their obligation".

4.5 A later Parliamentary statement by Mr Parkinson on 11th May (Inquiry Document S106, ref.5) seemed less definite. He said that the precise level of the nff proportion "...is still under consideration". He explained that the distribution companies would be able to seek nff capacity from any source (including own generation, within the limits to be prescribed); in other words, nff capacity would not necessarily be provided by the CEGB's successors. He went on to say that "...the Government's present intention is that, when it is set, the figure for the year 2000 will not be below the present level of existing and committed nuclear and renewable generating capacity."

4.6 Subsequently, there were indications that the nff proportion, and in particular the place of nuclear power within that proportion, were indeed "...still under consideration". A report in The Financial Times ("Move to allay nuclear fears", 9th August 1988, ref.6) stated that official views had changed since earlier in the year because "The Government is seeking to allay City fears that an excessive commitment to nuclear power by the privatised electricity industry could weaken its attraction for investors." The FT report went on to say that officials are "...anxious to dispel the assumption that between 17 and 20 per cent of electricity would have to come from non-fossil sources, primarily nuclear". Because of the problems the CEGB has experienced with its AGRs, the nuclear-generated proportion of electricity supplied by power

stations in England and Wales has fallen from 17.3 per cent in 1984-85 to 14.4 per cent in 1987-88. In the light of this (and presumably also the fears of investors), the FT report says that the initial obligation is "...likely to fall short of the percentage indicated by Mr Spicer". The report goes on to point out that the nff proportion includes renewables and that "Civil servants are considering whether it could also include small power stations powered by urban refuse, and fossil-fuelled plants based on efficient new technologies" (our underlining). This last point suggests the government may have come to accept that the initial distinction between fossil and non-fossil fuels was indeed too narrow.

4.7 That such reports should appear is hardly surprising. They suggest that government views on the nff proportion are evolving and consequently that it is dangerous to take a particular statement made at a particular time as the definitive view on the size and composition of the proportion. The approach of flotation was bound to make the government give more weight to City opinion, especially given the uncertain state of stock markets. In a paper written before the electricity privatisation scheme was announced, (Allen Sykes and Colin Robinson, Current Choices, ref.7) the difficulties of floating a generator with substantial nuclear capacity were pointed out:

"Because of their large risks of operations, the immense costs and uncertainties involved in their construction, and their doubtful profitability if coal is privatised effectively, neither the ownership of existing (or shortly to be completed) nuclear power stations nor the building of new ones, is likely to attract the private sector on a risk capital basis."

4.8 The City is, of course, well aware of the CEGB's recent unsatisfactory operating experience with nuclear plant which has been widely discussed in the Press and is outlined in the

Board's 1987-88 Annual Report and Accounts (ref.8) - for example, paras 65, 81 and 82. A report in The Financial Times of 20th September 1988 ("Nuclear costs warning over electricity sale", ref.9), remarks on "...the abysmal performance record of the Central Electricity Generating Board's Advanced Gas-cooled Reactors" and "...growing anxiety in the City about how investors would react to the enormous potential risks of runaway costs of nuclear power plant, poor performance or unforeseen safety costs". In such circumstances, it is only to be expected that the government should seek sources other than nuclear power stations built by the CEGB's successors to meet the nff proportion - even to the extent, if the August FT report is correct, of including new technology fossil fuel plants in the nff proportion. As time passes and the issues become clarified, the government's views on how best to promote security in electricity supply may evolve further.

4.9 The proof by Mr Wilcock of the Department of Energy, dated August 1988 (ref.10) , can be seen as part of the evolutionary process. It attempts to justify use of the nff proportion but it so intermingles arguments about energy security, protection against long run price increases and environmental issues (for each of which different policies are relevant) that it does not help to clarify the objectives of the nff policy. It confirms our belief that there has not been established a clear and lasting commitment to a particular size or a particular composition of future non-fossil capacity.

4.10 To summarise, so far as we can see, contrary to the interpretation in the CEGB's Statement of Case, the government's "commitment" to an expansion of indigenous G1-generated nuclear power for security reasons is neither specific nor fixed. The White Paper merely says there will be a statutory nff proportion, as yet unspecified but "achievable at the time of privatisation", which will include nuclear power

plant. As Mr Parkinson made clear on 11th May, contracts to achieve the specified proportion can be made by the distributors, not just with the CEGB's successors but with any generators they choose, at home or abroad; distributors may also decide to build capacity themselves. Their fuel choice can be nuclear (from plant owned by G1, other specialist generators or distributors) or some other non-fossil fuel. Recent reports suggest they may even be able to select "efficient new technologies" to meet the statutory proportion from fossil fuels. It is probably to be expected that distributors will wish to choose such up-to-date technologies; Kennedy and Donkin argue in their Proof on Need and Plant Selection (ref.11) that much of the CEGB's present steam plant represents a technological level well below what can be achieved today. The nff proportion set initially can be varied thereafter by this or a subsequent government. Thus the "commitment" is no more than a general expression of a desire to diversify fuel sources by providing a specified but variable amount from non-fossil sources. Moreover, as explained in 3.8 above, governments will have to be very cautious that any nff proportion they set does not preclude the distributors from fulfilling their statutory obligation to supply.

4.11 The commitment to specify a nff proportion is therefore consistent with many different nuclear programmes, each of which could be carried out by G1, other generators or distributors. It might even be possible, within the terms of the White Paper, to close all existing nuclear capacity (Magnox and AGRs) and the Sizewell PWR over a period of years and for no more nuclear plant to be built by G1. We are not commenting on the merits of such a plan, but merely pointing out that the "commitment" is sufficiently general to include such an outcome. If the government wished to halt nuclear building entirely, it could do so by changing the nff proportion. Or the distributors might effectively halt nuclear building by G1 by

deciding to meet a given nff proportion by contracts other than with G1's nuclear power stations.

4.12 For the reasons explained above, we can see no direct link between the government's commitment to a nff proportion of generating capacity and the construction of a nuclear power plant by the CEGB and its successor. There is certainly no direct link between the nff proportion and the construction of the proposed Hinkley Point 'C'. That no such direct links exist is hardly surprising. It would not be prudent for the government to commit itself firmly to a programme of constructing more PWRs, given the uncertainties which at present exist in many countries about the wisdom of pursuing nuclear power plans and the uncertainty the government must feel over whether energy security would be increased by expanding CEGB nuclear capacity. The government seems to us to be taking the wise course of keeping its options open.

4.13 Not only may more nuclear power plant be unnecessary to fulfil the nff requirement, but the idea that the CEGB should decide the industry's priorities appears inconsistent with the government's policy of giving more weight to the wishes of consumers. Para. 1.101 of the CEGB Statement of Case says that the nff proportion can only "Realistically...be met with confidence" by Hinkley Point 'C' and two further PWRs. Such a statement clearly prejudices the choices of generators (and, by implication, of fuels and technologies) which electricity distributors will decide to make in the future; it is evidently assumed that distributors will choose to contract with the CEGB's successor for nuclear power. The case, as presented, might have seemed appropriate when the Board effectively controlled the quantity and type of generating capacity. But it is inappropriate under the new post-privatisation regime, as set out in the White Paper, which says of the distributors (para.31):

"It is these companies who deal direct with the industry's 22 million customers; they are best able to judge their customers' requirements; and it is therefore right that they should have more say in the industry's investment decisions."

4.14 The White Paper expresses great concern about the existing structure of the industry which "Gives the CEGB too much influence in power station investment decisions...and too little say to the Area Boards whose customers have to meet the costs" (para 16). Similarly, it says (para 18) that "...power station investment decisions...are effectively taken by the producer and are not necessarily driven by the needs of the customer". Yet the application to build Hinkley Point 'C' springs directly from the existing industry structure of which the White Paper is so critical, and it is made by the CEGB, using estimation methods which appear indistinguishable from those it has used in the past (see Colin Robinson, Principles of Electricity Demand Forecasting: Establishing the "Need" for the Proposed Hinkley Point 'C' (ref.12).

4.15 Under private ownership the incentives and procedures of the electricity supply industry will change. But although the Hinkley Point 'C' application is for a post-privatisation power station, it comes from a pre-privatisation organisation using the methodology of forecasting and planning appropriate to the monopolistic structure of the industry which will be superseded before another power station at Hinkley could be built. The White Paper lays great stress on the change in decision-making in the electricity supply industry which will occur after privatisation when the distributors are expected to become much more powerful than they are now (see 4.13 above). But that change in the nature of the industry is not reflected - and indeed cannot be reflected - in an application from the CEGB that a successor company should be permitted to build another nuclear power station at Hinkley. Allowing the CEGB's application to proceed on the eve of privatisation would, in

effect, prolong the situation of generator dominance which the government so obviously seeks to end. A time when the industry is on the verge of such radical change seems a most inauspicious occasion for the CEGB's application.

5. Would building Hinkley Point 'C' promote energy security?

5.1 An issue to which we now turn is whether building Hinkley Point 'C' would, in practice, be likely to enhance the security of Britain's energy supplies.

5.2 We believe that the case for investing in another nuclear power station on security grounds is weak for the reasons which are set out below. Those reasons are presented in the context of privatisation but they are not specific to a privatised industry; they would apply even if the industry remained nationalised.

5.3 A major problem in trying to enhance energy security by granting permission to build another nuclear station is that, as has been demonstrated in reactions to the two serious civil nuclear accidents of recent years, an accident anywhere affects public attitudes towards nuclear power almost everywhere. Given the strength of public reaction to accidents and feared accidents - not just in reactors but in transportation, fuel processing and waste disposal - and anxieties about the effects of "routine" radiation, introducing more nuclear power into an electricity supply system may reduce rather than enhance security. Although primary fuel supplies may appear secure and generating capacity may appear to be available, the danger is ever-present that, because of events at home or abroad, future building might be deferred, some existing capacity might be shut down or derated and stricter regulatory requirements might lead to increased costs.

5.4 A policy of clustering nuclear units, such as the CEGB is pursuing at Hinkley, carries security disadvantages too since an accident at one unit may cause the shutdown of other units close by. Similarly, a nuclear building programme which relies on one technology or a so-called "family" of PWRs is vulnerable on security of supply grounds. A major accident, either in Britain or abroad, in a reactor of related design could result in a sudden and significant loss of generating capacity: to continue the "family" analogy, all generators within the family - perhaps even somewhat distant relations - might be perceived as suffering from a genetic fault or be tainted with a family social stigma.

5.5 Apart from accidents, security problems can arise if there are long delays in building nuclear plant or if nuclear plans are based on exaggerated claims which are not fulfilled: Appendix A gives some details of the massive shortfall of nuclear capacity as compared with nuclear plans, both in Britain and elsewhere, in the 1970s and 1980s. Security is also reduced if there are technical problems in operation such as the CEGB's nuclear plants have suffered in recent years. The House of Commons Energy Committee, in its July 1988 report on electricity privatisation (The Structure, Regulation and Economic Consequences of Electricity Supply in the Private Sector, ref. 13, para 152) commented as follows on the view that nuclear power is a secure source of energy supply:

"The Committee is also concerned that nuclear power should be perceived by the Government as such a reliable source of supply. Earlier reports by the Energy Committee have expressed severe concern about late construction of AGR plant, operating uncertainties (in terms of annual plant availability of both Magnox and AGR plant), and huge cost escalation (not only in the UK but also in the USA)."

5.6 A policy of promoting nuclear power - whether the electricity supply industry is nationalised or in private hands - may therefore provide insecurity. That is especially so if the policy involves large scale plants, based on a single technology, clustered together, owned and operated by a single generator and vulnerable to industrial disputes. The UK electricity supply system as a whole already has a substantial nuclear element. But it does not follow that the present proportion of nuclear capacity in the total should be maintained into the future; the recent loss of some Magnox capacity earlier than expected hardly suggests that vulnerable gigawatts of generating capacity should automatically be replaced by additional nuclear plants. We can see no case on security grounds for building Hinkley Point 'C' in present circumstances, especially since the British electricity supply industry is on the verge of radical change which, inter alia, will alter the way in which security is provided.

6. Conclusions.

Our conclusions are as follows:

6.1 In a policy of enhancing security of energy supply the crucial aim on the supply side is diversity - in terms of fuels, technologies, sources of fuel supply and sources and ownership of generation. Demand-side conservation can also play a significant part in reducing the demand for energy and alleviating the effects of any interruptions which occur.

6.2 The government is very concerned in its privatisation scheme to reduce generator dominance of the electricity supply industry, placing decisions much more in the hands of electricity distributors. Yet acceptance of the CEGB's proposal for Hinkley Point 'C' would effectively perpetuate generator dominance of the industry beyond the period of nationalisation.

Consequently, it would pre-empt the choices of generators, technologies and fuels which the government intends electricity distributors to make after privatisation. The CEGB's application stems directly from the industry structure of which the White Paper is so critical and which has in the past resulted in huge over-estimates of the "need" for nuclear capacity.

6.3 Setting a nff proportion for the privatised electricity supply industry is unlikely to further the diversification objective. Imposing such a constraint is both unnecessary and undesirable on energy security grounds. Most government restrictions on fuel choice will disappear on privatisation and distributors with a legal obligation to supply will have every incentive to diversify fuels, technologies and generators and to pursue energy conservation. To the extent that the nff proportion constrains distributors, it is likely to hamper their efforts to diversify. In some circumstances there may be conflict between the two objectives (achieving the nff proportion and fulfilling the obligation to supply).

6.4 We can find no basis for the CEGB's claim that the government's policy of setting a non-fossil-fuel proportion requires the construction of Hinkley Point 'C'. The government's policy towards non-fossil fuels in general, and towards nuclear power and Hinkley Point 'C' in particular on security grounds is neither fixed nor specific: the nff proportion is no more than a general expression of its desire to diversify fuel sources.

6.5 Building Hinkley Point 'C' is unlikely to promote security of supply. On the contrary, given public attitudes and recent experiences in building and operating nuclear power stations in England and Wales, added insecurity is the more likely result.

Appendix A

THE CONTRAST BETWEEN NUCLEAR PLANS AND SUBSEQUENT EVENTS.

A.1 This Inquiry is concerned with a plan to build a nuclear power station which the CEGB argues is consistent with government policy. It is therefore relevant to consider earlier views of the future of nuclear power, both by electrical utilities and by governments, and whether those views have been confirmed or contradicted by subsequent events. The evidence seems to suggest that, even if a particular utility at a particular time is apparently committed to a nuclear building programme, the programme envisaged is not necessarily translated into practice. Indeed, recent experience suggests that it most probably will not be.

A.2 British experience is obviously the closest analogue we have. But the industrial world's experience with nuclear power plans is worthy of mention, since there are common elements across all countries.

A.3 The clearest common feature is the massive shortfall of nuclear building programmes as compared with stated plans. As an example, consider the long term projections which were made in 1974 of nuclear capacity in the member countries of the Organisation for Economic Co-operation and Development (OECD) in the years 1985 and 1990, based principally on the plans of individual member countries. These projections are a useful basis for comparison of plans with achievements since we are past 1985 and near enough to 1990 to be able to determine to what extent the plans were fulfilled. The period ahead for which the projections were made (eleven to sixteen years) also centres around the thirteen years (1987-88 to 2000/01) which the CEGB uses in its Statement of Case.

A.4 In a document entitled Energy Prospects to 1985, (ref.14) published by the OECD in 1974, there is a discussion of nuclear power plans (Chapter 9, Volume 1). Of nuclear plans, it says that "the tendency for power programme slippages...will be less pronounced than in the past or could even be reversed in the near future". The authors therefore claimed that national nuclear programmes were more likely to be fulfilled than they had been in the past. These plans, summarised in Table 9-1 of the document, comprised a "basic programme" for the OECD area of 513 GW of installed capacity in 1985 and 982 GW in 1990. Table 9-2 of the same document set out an "accelerated programme" of 667 GW in 1985 and 1369 GW in 1990. Similar projections can be found in other documents of the time, based on the plans of national governments and electrical utilities. A convenient summary is in Nuclear Energy and its Fuel Cycle, (ref. 15) Table IV-5.

A.5 In the event, 1985 capacity was just over 200 GW - that is, less than 40 per cent of the "basic programme" anticipated only 11 years previously and about 30 per cent of the "accelerated programme". The latest estimate for 1990 (in Electricity, Nuclear Power and Fuel Cycle in OECD Countries, (ref.16) is about 260 GW net; that figure, which may well be on the optimistic side, is about one quarter of the 1974 "basic programme" projection and less than one fifth of the "accelerated programme".

A.6 These contrasts between projections and outcomes are not made here in order to criticise the authors of the projections. With the aid of hindsight one can always explain away such huge errors. For example, economic growth and electricity growth have been less than anticipated; there have been technical problems with nuclear plant; public opinion has turned against nuclear power in many countries because of accidents or for other reasons. It is not clear, however, that any of these factors will disappear in future. One should also bear in mind

that, in some respects, the 1970s and early 1980s should have been a particularly favourable period for nuclear construction since the prices of fossil fuels were rising fast.

A.7 It would be wrong to conclude from these comparisons of plans versus outcomes that there will always and everywhere be an inherent tendency to over-estimate future nuclear capacity - that plans will inevitably run ahead of what the technology and public opinion will permit. Presumably, planners will learn from experience so that projections will eventually come into line with reality. But there is little evidence so far that nuclear plans have become more realistic. Estimates of OECD nuclear generating capacity from 1990 onwards are still being revised downwards from year to year. For example, in Electricity, Nuclear Power and Fuel Cycle in OECD Countries, (ref. 16), comparisons of OECD nuclear generating capacity projections made in 1988 with those made in 1987 show that the 1988 figures are lower by 8½ per cent for 1995 and by about 12 per cent for 2000.

A.8 Future nuclear capacity has also been over-estimated in Britain, most strikingly in the recent past. The first British civil nuclear power programme, using the Magnox reactors which the CEGB is now beginning to close, was begun in 1955 and expanded to 5 GW in 1957 after the 1956 Suez crisis raised fears of future oil shortage. Although some of the Magnox reactors had to be de-rated, the first nuclear programme was the one which came closest to being achieved in terms of capacity: the CEGB's Magnox reactors have an output capacity of about 3.5 GW and the SSEB's Hunterston 'A' 0.3 GW, making a total of 3.8 GW compared with the expectation in the 1957 programme of 5 GW.

A.9 The second nuclear programme (of Advanced Gas Cooled Reactors) was originally planned in the mid-1960s to provide 8GW by 1975. This programme fell far behind schedule, is still

incomplete and some of the reactors which have been completed have suffered operating difficulties. The output capacity of AGRs now operating is only about 2.7 GW (1.6 CEGB and 1.1 SSEB); three of the stations (Dungeness 'B', Hartlepool and Heysham I) are even now not fully commissioned; Heysham II is in the initial stages of commissioning; and in 1987/88 there was a serious breakdown at Hinkley Point 'B'.

A.10 By the late 1970s, when the Steam Generating Heavy Water Reactor seemed to be one of the available options and when fast breeder reactors were officially expected to enter commercial service within the foreseeable future, the Department of Energy was very optimistic about nuclear prospects. For example, in Energy Policy Review (ref.17) in 1977, it said:

"The fast reactor, with its high efficiency in uranium utilisation, could become particularly important for the United Kingdom in the 1990s, given that we have small or no indigenous reserves of uranium, As an upper limit of potential new nuclear capacity it is estimated that a high ordering programme might be built up to around 5-6 GW annually reaching a total of about 35-40 GW of new capacity being installed by the end of the century."

A.11 Towards 1980, when the CEGB was considering a third nuclear programme, it was expected - both by the Board and by the Department of Energy - that there would be many nuclear stations constructed in the 1980s and 1990s. For example, Mr David Howell (then Secretary of State for Energy) said the following in the House of Commons on 18 December 1979 (ref. 18):

"Looking ahead, the electricity supply industry has advised that even on cautious assumptions it would need to order at least one nuclear power station a year in the decade from 1982, or a programme of the order of 15,000 megawatts over 10 years.

The precise level of future ordering will depend upon the development of electricity demand and the performance of the industry, but we consider this is a reasonable prospect against which the nuclear and power plant industries can plan".

In the event, the assumptions were not "cautious" enough; the only order so far placed during the six years since 1982 is Sizewell 'B' (1175 GW).

A.12 Also in 1979, the Department of Energy published a document entitled "Energy Projections 1979" (ref.19) which foresaw a huge expansion of generating capacity in total and nuclear capacity in particular:

"To meet the projected growth of demand a further 40-50 GW of new plant would be required by the end of the century. Of this about 33-36 GW could be nuclear".

The Department expected end-century nuclear capacity to be around 40 GW. At the time we suggested (in What Future for British Coal?, ref.20) that nuclear capacity in the year 2000 was more likely to be in the range 15 - 25 GW (roughly half the Department of Energy's projection), but even that range now looks as though it will turn out to have been on the high side.

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