



**INDEPENDENT ASSESSOR'S  
REPORT ON PLANT CLOSURE**

**April 1998**

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**STATEMENT BY THE DIRECTOR GENERAL  
OF ELECTRICITY SUPPLY ON THE  
INDEPENDENT ASSESSOR'S  
REPORT ON PLANT CLOSURES**

1. In September 1997, National Power and PowerGen notified me of their intention to close certain coal-fired generating units on 31 March 1998. I appointed Merz & McLellan as Independent Assessor to evaluate those decisions in line with Condition 9A of the generators' licences.
2. The units in question were, in PowerGen's case, Unit 4 at Ferrybridge power station and, in National Power's case, Unit 5 at Willington B and Units 7 and 10 at Tilbury.

**THE ASSESSOR'S CONCLUSIONS**

3. The Independent Assessor concluded that the closures of the units at Ferrybridge and Willington were reasonable, given the likely future revenue and costs of these units. He considered that continued operation at Ferrybridge Unit 4 might be of interest to a third party, and that the Willington site (were the whole station to close) might be of interest to a third party for the development of a new station or some other development. He was not convinced by National Power's argument for not closing the whole station.
4. The Assessor concluded that the closure decision in respect of Tilbury Units 7 and 10 was reasonable only if the units were assumed to operate at low load factors (below 10 per cent). He said that it would be reasonable to expect a third party to be interested in continued operation of the units at higher load factors.
5. The Assessor considered that it would generally be impracticable for different owners to operate different units within the same power station. However, he said that it could be possible for a third party to own or lease a unit and for operation to be retained by the incumbent generator through a tolling arrangement.
6. The Assessor said that it might be expected that all units at one station would close before closures of units at another station began. Partial closure of two or more stations simultaneously might only be expected in exceptional circumstances at each of the stations. In particular, it might have been expected that the whole of Willington power station would close before the closure of any units at Tilbury. He said that the closure of some but not all units at a station could reflect a reluctance by incumbent generators to relinquish claims to existing power station sites in order to retain their market position.

7. The Assessor said that the closure decisions in respect of the Ferrybridge and Willington units may have been made 18 months before the closure date. He said that, if the formal notification of closure is given only six months in advance, the incumbent generator has an information advantage over its competitors in the market, and an advantage in the development of new plant over new entrants, given that new generating plant could be developed within the 18 month period. The Assessor said that there might be benefit in extending the notice period for closure and in requiring the generators to submit with their notification of closure the supporting economic analysis both for the unit(s) concerned and for the station as a whole.

## DISCUSSION

8. The purpose of introducing Condition 9A into the licences of National Power and PowerGen was to enable the Director to keep under review the behaviour of the licensee to ascertain whether the licensee is pursuing a course of conduct, in making or declining to make available Generating Units, which is intended or likely to have the effect of restricting, distorting or preventing competition in the generation or supply of electricity. Closure of stations with a view to restricting output or increasing capacity payments is one such possibility; adopting methods of closure designed to keep the resulting closed plant out of the hands of potential competitors is another such possibility.
9. Environmental constraints, and the relative costs of coal and gas-fired generation, are likely to result in a reduction of output in older power stations over the next few years compared to levels in the recent past, and some closures must therefore be envisaged. However, I am concerned that, under their present owners, older existing plants are not competing as actively as they might do. In consequence, electricity prices are higher than they might otherwise be, and closures might be occurring sooner than they otherwise would.
10. The Independent Assessor has concluded that National Power has closed two units that could potentially be operated profitably at a higher load factor by or on behalf of, a different company, and that PowerGen has closed a unit that could potentially be of interest to a third party. He reported that both National Power and PowerGen have been approached by third parties, but that National Power has been unwilling to negotiate tolling arrangements for the closure units, pending the outcome of the Assessor's report.
11. In an effective competitive market, a decision to close single units would not affect the prices a company would obtain on the rest of its generation activities. The company would also be indifferent to the source of any offer that improves cash flow, and would actively seek such offers. Such a competitive company would also order the timing and nature of the closure so as to maximise the scope for profitable sale to another party.

12. The Independent Assessor's report suggests that National Power and PowerGen have not approached the situation in this way. Although PowerGen has expressed a willingness to discuss toll processing with other parties, National Power has said that it does not consider it practicable to take forward such discussions in respect of Tilbury. Moreover, given the difficulties of buying or leasing individual units in a station owned by a competitor, both companies have reduced the prospect of a successful sale by closing units separately from the whole plant. National Power has in fact closed separate units simultaneously in two different plants. The Independent Assessor has not identified any exceptional circumstances to justify this. The Independent Assessor has also not been convinced by National Power's argument for not closing both units at Willington, which would have facilitated a disposal of the whole station.
13. This suggests that the actions of both companies, but particularly National Power, are more plausibly explained by their ability and intentions to exercise market power. Keeping plant off the market will prevent the entry of competitors by this route, restrict the output by others, and thereby facilitate keeping up the price of electricity and the revenues received from the other plant owned by the two companies.

## **NEXT STEPS**

14. The Independent Assessor's report raises concerns about the way the companies have proceeded with respect to closures. I am therefore considering ways of dealing with this situation.
15. The Independent Assessor has concluded that it would be impracticable for different owners to operate different units within the same power station. However, he noted the possibility of a third party owning or leasing units within a station, and of the incumbent generator operating those units on behalf of that third party through a tolling agreement. I have therefore asked National Power and PowerGen to explore this possibility with interested parties.
16. The Independent Assessor drew attention to the fact that the companies had decided to close units, rather than entire stations. He said that this could reflect a reluctance by incumbent generators to relinquish claims to existing power station sites in order to retain their market position. He also said that partial closures of two or more stations simultaneously might only be expected in exceptional circumstances at each of the stations.
17. Paragraph 2 of licence Condition 9A requires the licensee to prepare a statement specifying in reasonable detail the criteria upon which the licensee will, amongst other things, determine its policy regarding the closure and reduction in capacity of any generating units. The statements provided by the companies do not take

adequate account of the considerations relevant to partial closure. I have therefore asked National Power and PowerGen:

to explain and justify their policies with respect to partial closure in the light of the Independent Assessor's report, in particular how they take into account the impact of partial closure on sale value;

to revise their paragraph 2 statements to explain explicitly how partial closures and potential sale value are taken into account;

to explain now what steps they have taken and intend to take in future to assess the potential sale value of stations or units where closure is proposed or under consideration;

to explain at the time of any subsequent closure proposal what steps they have actually taken to assess the potential sale value both of individual units and the particular station as a whole, and how this has been taken into account in their calculations and decisions.

- 18 The Independent Assessor indicated that the decisions to prepare for the closure of Willington Unit 5 and Ferrybridge Unit 4 may have been made 18 months before the closure date. He suggested that this would give the incumbent generators an advantage over competitors and that there might be benefit in extending the notice period. The licence condition presently requires the generators to use reasonable endeavours to give not less than six months' notice. That provision no longer seems adequate. I have therefore asked the generators for their views on why an extension of the notification period would not be appropriate.
- 19 On 27 March, PowerGen notified me that it intended to close a 675 MW unit at Grain on 31 March. The explanation which PowerGen has provided so far for its failure to give six months' notice does not seem consistent with using reasonable endeavours. Its failure to give six months' notice would seem therefore to constitute a breach of its licence.
- 20 On 30 September 1997 National Power notified me that it intended to close any uneconomic OCGT plant on 31 March 1998 but the detail of which units would be involved would not be known until after the contract negotiations with NGC had been completed. On 31 March 1998 National Power notified me that the plant it was closing, on that day, was a 35 MW unit at Littlebrook.
- 21 Giving short notice reduces the regulator's ability to scrutinise the companies' actions fully. Closure of units, particularly of large units such as PowerGen's unit at Grain, and particularly when added to the closures previously notified, could have significant effects on capacity payments. I have therefore asked the companies to undertake, for six months, to keep the Grain and Littlebrook units in

a fit state to be restored to service at short notice, while I consider their decisions further. I have also asked the companies to ensure that when, exceptionally, they notify me of possible, rather than firm, closures they identify more specifically which plant is likely to be affected and how the various elements in the calculation will influence their subsequent decision.

22. I have asked the companies to respond on these matters by 14 May 1998.

PROFESSOR S C LITTLECHILD  
**Director General of Electricity Supply**

# **INDEPENDENT ASSESSOR'S REPORT ON PLANT CLOSURE**



## EXECUTIVE SUMMARY

Merz and McLellan has acted as Independent Assessor for proposals to close down nominated units in National Power's Wellington B and Tilbury power stations and PowerGen's Ferrybridge C power station. The terms of reference are to consider whether the proposed closure decisions are reasonable.

The previous Independent Assessor's Report in 1992 concluded that the decision-making process used by National Power and PowerGen to justify the proposed plant closures was a reasonable one, but that neither company had made sufficient endeavours to sell or lease the stations to a third party. While the previous report focused on the proposed closure of whole stations, this report needs to focus on the proposed closure of part stations or individual units. The Independent Assessor has assessed each proposed closure against the (necessary) economic criterion of whether prospective costs outweigh prospective revenues and considered the case for sale or lease of part station or individual units to a third party.

For the closure notifications the Independent Assessor concludes that:

- the necessary economic criterion underpinning the closure decisions by PowerGen and National Power is satisfied for Unit 4 at Ferrybridge Power Station and Unit 5 at Wellington Power Station. For Wellington Power Station, the Assessor considers the owner's analysis to have understated the costs of continued operation and concludes that the closure criterion is satisfied not only for Unit 5 but also for the whole power station. For Tilbury Units 7 and 10 the closure criterion is satisfied only when the units are assumed to operate at low load factors (ie below 10 per cent).
- in general the economic viability of one unit is closely linked to the other units at the station. Hence, all units at one station may be expected to close before the closure of units at another station. Partial closure of two or more stations simultaneously may only be expected in the presence of exceptional circumstances at each of the stations.
- there are some grounds for (a) an extension to the notification period to be provided in respect of any proposal to close down generating units and (b) including within the notification for closure the economic analysis (including the impact of any exceptional circumstances), both for the unit(s) notified for closure and for the power station as a whole.

For sale or lease of part stations or individual units to a third party, the Independent Assessor concludes that:

- it is impracticable for an incumbent generator and third party jointly to operate units at a power station. It is considered to be more practical for a third party to own or lease a unit and for operation to be retained by the incumbent generator through a tolling agreement. The negotiations required to form a tolling agreement may be involved and prolonged.

- there is an economic case for a tolling arrangement for some of the units notified for closure, and entry of a third party may increase competition in the market for generation; but the details of the tolling contract may erode some of these opportunities and benefits: Hence the Assessor would expect a third party to consider a tolling agreement for part operation of a coal-fired station as a 'second best' alternative when compared to an option to re-develop a whole coal-fired station.
- the option of continued operation of Ferrybridge Unit 4 and Tilbury Units 7 and 10 may be of interest to a third party but continued operation of Willington Unit 5 or Willington Power Station as a whole is relatively less attractive. However, if it were to be made available, the Assessor recognises that the Willington site may be of interest to the incumbent generator or a third party, whether for the development of a new station or some other development.

Subject to the points above the Independent Assessor concludes that:

- the closure of Unit 4 at Ferrybridge Power Station is reasonable. The continued operation of the unit may be of interest to a third party. PowerGen has granted third-party access to the site to enable a third party to develop a proposal for continued operation of the unit. No firm proposal from a third party has been forthcoming to date (April).
- the closure of Unit 5 at Willington Power Station is reasonable. Continued operation of the unit is not expected to be of interest to a third party.
- the closure of Units 7 and 10 at Tilbury Power Station is reasonable on the basis of the low load factor of operation assumed by National Power. It would be reasonable to expect a third party to be interested in continued operation of the units at higher load factors. National Power has been unwilling to negotiate tolling arrangements for the units notified for closure on the basis that National Power is awaiting the outcome of this 'Independent Assessor' report.
- National Power's approach has been less open to third-party interests than that of PowerGen following the notification for closure.

## 1. INTRODUCTION

### 1.1 Background

Merz and McLellan Ltd was appointed as Independent Assessor of proposals to close down nominated units in certain power stations:

- National Power submitted a notification for the permanent closure of Willington B Unit 5 and temporary closure of Tilbury Units 7 and 10 on 30 September 1997 in accordance with Condition 9A of the Generation Licence.
- PowerGen submitted a notification for the permanent closure of Ferrybridge C Unit 4 on 24 September 1997 in accordance with Condition 9A of the Generation Licence.

The provision for the appointment of an Independent Assessor was made in a licence modification (Licence Condition 9A) following OFFER's Pool Price Inquiry Report of 1991. The modification was intended "... to prevent monopolistic or anti-competitive behaviour in relation to the availability of plant and the closure or mothballing of stations" (OFFER 1991). Through the provision OFFER may appoint an Independent Assessor to review any permanent or temporary power station closure proposals made by National Power or PowerGen, or material reductions in the registered capacity at any of their power stations.

In September 1992 National Power and PowerGen announced their intention to close a tranche of generating capacity, the first plant closure programmes proposed since the introduction of Licence Condition 9A. The Director General subsequently appointed an Independent Assessor to examine and report to him on the plant closure programmes.

The Assessor in 1992 concluded that the decision-making process used by National Power and PowerGen to justify the proposed plant closures was a reasonable one, but that neither company had made sufficient endeavours to sell or lease the stations to a third party. Given the lack of marketing effort, the Assessor was unable to say whether in general terms the closure decisions were reasonable.

The closure announcements made in 1997 refer to individual units and not entire stations. In December 1997 OFFER appointed Merz and McLellan as the Independent Assessor for "*an assessment of whether the decision process and result were reasonable, taking into account all the circumstances and opportunities, identifying the direct and indirect financial implications for the licensee, and the amounts if any which third parties have offered or would be likely to pay to purchase or lease the plant or site and associated facilities whether or not for use as an operating Power Station*".

The issues addressed by the Independent Assessor in this report include:

- the economic reasonableness of the criterion underpinning the closure decision by National Power and PowerGen

- whether the closure criterion conforms to the statements specified by National Power and PowerGen under Paragraph 2(v) and 2 (vi) of Condition 9A
- whether the estimates of future costs, avoidable costs, revenues and lost revenues associated with each closure proposal are reasonable
- the technical viability of third party operation of individual station units
- the assessment of a reasonable market valuation of the unit closures and, in particular, the potential impact on electricity prices and possible profitability enhancement of National Power and PowerGen's other plant
- any additional information relevant to the closures.

The statements pursuant to Licence Condition 9A paragraphs 2(v) and 2 (vi) for PowerGen and National Power are included in Appendix A.

## 1.2 Closure proposals

Summary explanations for the decisions to close the units, as proposed, were made by National Power and PowerGen in their letters of closure notification.

National Power considered Willington Unit 5 to have *“suffered extensive damage to the HP/IP turbine which has adversely impacted on both capability and thermal efficiency and hence economic viability of the unit” (NP 30 September 1997).*

With respect to Tilbury Units 7& 10 National Power *“expect to have more than sufficient options for burning imported coal in 1998/9 and the units are not expected to cover the cost of keeping them operational. The plant may be required for operation beyond 1998/9 if the balance of coal supplies swings towards imports and away from UK coals. This is dependent on the outcome of negotiations for post-March 1998 coal supplies” (NP 30 September 1997).*

With respect to Ferrybridge Unit 4 PowerGen identified some damage to the unit in August 1996 which led to a de-rating of the unit in March 1997 and constraints to the number of starts and running hours. Another outage was scheduled to enable further metallurgical examination to take place. The outage commenced on 26 July and the unit was considered to require *“significant investment”* to return it to operation. In addition Unit 4 required the addition of ‘low NO<sub>x</sub>’ burners *“to comply with IPC authorisation for operation beyond 1 April 1998”* and also required *“a major upgrading of its precipitators to comply with New Plant Standards”* beyond 2001.

## 1.3 Report format

This report has been prepared following prepared responses to questions and discussions with National Power and PowerGen; visits to the power stations involved; and meetings with third parties who might be interested in the continued operation of the units, including RJB Mining and Celtic Energy.

The proposed closures involve technical, economic and strategic considerations. In Section 2 we summarise the criterion underpinning the closure proposals made by National Power and PowerGen. We undertake independent technical, economic and strategic reviews of the closure decisions of

National Power and PowerGen in Sections 3,4 and 5 respectively. In Sections 6 and 7 respectively, we undertake an independent technical and economic review for continued operation of the units notified for closure by third parties. In Section 8 we include some comments made by National Power and PowerGen following perusal of the draft version of this report. Finally, in Section 9, we present our **conclusions**.

## 2. ECONOMIC CRITERION FOR THE CLOSURE DECISIONS

### 2.1 Introduction

The general case for closure of the units may be outlined as follows:

- the supply-demand balance for England and Wales is expected to move in the direction of an increase in the reserve of generation capacity; this will have the effect of reducing revenue from capacity payments
- the units notified for closure require major overhauls within the next two years and the overhaul costs may be avoided with closure
- the existing environmental emission limits may only be achieved by existing coal-fired plant through increased capital expenditure or reductions in the operation of coal-fired plant.

The economic approach and assessment of the case for unit and station closure was reviewed at the time of the previous Independent Assessment (1992), namely that the net present value of the revenue and cost streams with the unit/station in service is less than the net present value of the revenue and cost streams with the unit/station closed down. The relationship involving the net present value with and without the unit/station may be re-expressed in terms of Net Avoided Cost and Net Capacity Credit. There are also two approaches to the calculation of the Net Avoided Cost (NAC), namely a system approach and a unit approach. The two approaches and the definitions of the Net Avoided Costs and Net Capacity Credits are discussed below.

#### 2.1.1 System approach

The system approach involves analysis of the change to the portfolio of revenue and costs to the owner with and without the unit notified for closure. The Net Present Value of the revenue and cost streams with the unit/station in service is based on continued operation of the unit for  $n$  years and closure in year  $n+1$ . The Net Present Value of the revenue and cost streams without the unit/station in service is based on the closure of the unit/station in year  $l$  and non-operation of the unit beyond year  $l$ . The necessary condition for a unit/station to be considered for closure may be expressed as follows:

$$NCC < NAC,$$

where:

$$NCC = \text{Net Capacity Credit}$$

$$NAC = \text{Net Avoidable Cost}$$

$$\text{and } NAC = \Delta OMF + \Delta INV + \Delta VAR - (\Delta SMP + \Delta ANC + \Delta CON) - \Delta CLO \text{ -----(A)}$$

where

$\Delta OMF$  = the difference in fixed operation, repair and maintenance costs with and without the unit

$\Delta INV$  = the difference in the investment costs with and without the unit

$\Delta VAR$  = the difference in the variable costs of operation (eg fuels) with and without the unit

$\Delta SMP$  = the difference in the system marginal price revenue with and without the unit

$\Delta ANC$  = the difference in the ancillary service revenue with and without the unit

$\Delta CON$  = the difference in the constraint payments with and without the unit

$\Delta CLO$  = (demolition costs (1) plus severance payments (1) less value of spares(1))  
less

(demolition costs (n+1) plus severance payments (n+1) less value of spares(n+1))

n = number of years of continued operation

and  $NCC$  = the difference in the potential capacity payments with and without the unit.

The system approach assumes the SMP revenue to be the same with and without the unit (ie  $\Delta SMP = 0$ ). In addition, without the unit,  $\Delta OMF = OMF$ ,  $\Delta INV = INV$ ,  $\Delta ANC = ANC$  and  $\Delta CON = CON$  where:

$OMF$  = fixed operation, repair and maintenance costs of the unit in operation

$INV$  = investment costs of the unit in operation

$ANC$  = ancillary service revenue of the unit in operation

$CON$  = constraint payments of the unit in operation

and  $NCC$  = net capacity credits of the unit in operation

Hence the 'system approach' closure criterion may be simplified to the condition:

$$NCC < OMF + INV + \Delta VAR - (ANC + CON) - \Delta CLO \quad \text{----- (B)}$$

### 2.1.2 Unit approach

The unit approach considers only the revenue and cost stream of the unit. The unit approach takes equation (A) and assumes  $\Delta OMF = OMF$ ,  $\Delta INV = INV$ ,  $\Delta VAR = VAR$ ,  $\Delta SMP = SMP$ ,  $\Delta ANC = ANC$  and  $\Delta CON = CON$  where:

OMF = fixed operation, repair and maintenance costs of the unit in operation

INV = investment costs of the unit in operation

VAR = variable costs of the unit in operation

SMP = system marginal price revenue of the unit in operation

ANC = ancillary service revenue of the unit in operation

CON = constraint payments of the unit in operation

and NCC = net capacity credits of the unit in operation

Hence the 'unit approach' closure criterion may be simplified to the condition:

$$NCC < OMF + INV + VAR - (SMP + ANC + CON) - \Delta CLO \quad \text{----- (C)}$$

### 2.1.3 Summary

The two approaches are the same if  $\Delta VAR = (VAR - SMP)$  and may generally be expected to yield similar results and conditions with respect to the decision to close units/stations.

The NAC and NCC relate to revenue and cost streams over a number of years and both can be converted into an annuitized value per kW of sent out power.

## 2.2 Methodology

National Power have assessed the closure criterion for each of their units and stations using the system approach as described above. National Power calculated the value of NAC from system modelling, with and without the unit/station. The effect that the withdrawal of a unit may have on another unit with respect to capacity payments was factored into the analysis. The evaluation also took account of the effect that withdrawal may have in re-allocating generation to other units and in adjustments to National Grid Company charges.

In comparison PowerGen have not undertaken a detailed assessment of the closure criterion assessment for each unit and station. Instead PowerGen have undertaken extensive system analysis from which Ferrybridge Unit 4 was identified as a closure candidate and the closure criterion was assessed by PowerGen for this unit alone.



The methodology used to assess the future operation of plant may be summarized as follows:

- Loss of Load Probability (LOLP): the development of a demand forecast and a view of new capacity to forecast LOLP and the general level of capacity payments
- operation: use of despatch and planning models to assess the future operation of the unit/station
- optimization: assessment of consistency with coal delivery and coal portfolio of contracts to maximise leverage on the coal purchases and ensure that emission limits are met
- cost evaluation: operating details reviewed by the station managers to review the expenditure requirements needed to meet the planned operation
- closure evaluation: the decision whether or not to close a unit is made at Head Office and is generally based on the closure criterion outlined above (see Section 2.1).

National Power and PowerGen use a period of 4-10 years for their analysis. A short duration of 4-years reflects the period between major overhauls; the longer duration of more than 4-years enables analysis to be made of the returns to some alternative investment options. More emphasis is placed on the analysis for the 4-year period, in line with the general view that coal-fired capacity will be reduced substantially in the next 10-years or so.

### 2.3 Application

The Net Avoidable Costs (NAC) calculated by National Power and PowerGen for the units notified for closure and their respective stations are shown in Table 2.1.

**TABLE 2.1**  
**NET AVOIDABLE COST (NAC) ESTIMATES**  
**FOR NATIONAL POWER AND POWERGEN**

Unit/Station	Company	NAC £/kW/year
Ferrybridge Unit 4	PowerGen	16
Ferrybridge Station	PowerGen	- *
Tilbury Units 7 & 10	National Power	16
Tilbury Station	National Power	6
Willington Unit 5	National Power	19
Willington Station	National Power	2

\* Not available

The Net Capacity Credit (NCC) is generally not expected to exceed £ 1 0/kW/year in the next few years. Both PowerGen and National Power forecast a net increase in available generating capacity in England and Wales in 1998 with the effect of downward pressure on LOLP and capacity payments. Consequently the NCC estimate by National Power is £7-10/kW/year and by PowerGen is

£5-8/kW/year PowerGen also suggest that the NCC will decrease further in the longer term with the expected addition of new plant in England and Wales.

## 2.4 Conclusion

The necessary criterion for closure (ie  $NAC > NCC$ ), as derived by National Power and PowerGen, is met for the units notified for closure.

The work carried out by National Power and PowerGen indicates that it is preferable to close units at a station rather than the whole station. This result, at first sight, appears to run counter to the fact that the fixed overhead costs of a station would not be avoided with the closure of a single unit, but would be avoided by the closure of the station. Hence other, unit-specific, factors appear to be playing an important role in forming the level of the NAC estimate.

### 3. INDEPENDENT TECHNICAL REVIEW OF THE CLOSURE DECISIONS

#### 3.1 Introduction

In this Section we review the condition of, and investment requirements for, the units following site visits to the Ferrybridge, Tilbury and Willington stations. This review is made in the light of increased pressure to reduce particulate, NO, and SO<sub>x</sub> emissions.

#### 3.2 Emissions

The Environment Agency (successor to HMIP) has recently published proposals (January 1998) for reducing emissions of polluting substances from existing coal and oil-fired power stations. HMIP had previously set down limits in 1996, to be achieved by 2005. The Environment Agency proposes to advance the date to 2001, and may introduce further restrictions for 2005. The proposed emission limits are more severe than is required for compliance with European Union directives.

The proposed emission limits may constrain future coal-fired generation and restrict competition in the market for electricity generation. The Environment Agency may not have taken into consideration the full impact of its emission limits on the competitiveness and trading of coal-fired generation. The SO<sub>x</sub> emission limits determine the maximum coal-burn of the portfolios of coal-fired power stations owned by National Power and by PowerGen and also the maximum load factor for individual power stations. For the existing coal-fired power stations to meet the emission limits the present owners will need either to reduce operation in the future or to invest in emission control equipment to reduce the level of emissions. With reduced load factors or increased costs the continued operation of the stations/units becomes less attractive economically. The emission limits may then cause National Power and PowerGen to seek the closure of some stations/units. Hence the emission limits may adversely affect the competitiveness of coal-fired plant and reduce coal-fired plant operation in the market for electricity generation.

In addition, limits are issued by the Environment Agency for individual stations/units and this may constrain third-party entry for continued operation of a station/unit. We know that a third party has had difficulties in obtaining consent to re-open Uskmouth Power Station, and that at present (April 1998) there is no emission limit allocated for Willington Power Station from 2001. Hence the matter of emission limits may adversely affect third party entry and competition within the market for electricity generation.

#### 3.3 Willington

In general terms Willington is perhaps the station with the least technical capability on the national grid system owing to its age, design and technology.

Units 5 and 6 have operated for a similar number of hours, namely 162 000 h and 161 000 h respectively. Unit 5 is due for a major overhaul in 1998 and Unit 6 is due for a major overhaul in 1999. In addition, the IPI turbine in Unit 5 is damaged and is in need of repair. There are no major spares on site.

The existing particulate emission limit is high at  $350 \text{ mg/m}^3$  due to the presence of small precipitators and, under an arrangement with the Environment Agency, the operation of Willington is restricted. Hence investment would be required to reduce particulate emissions towards the target limit of  $50 \text{ mg/m}^3$  by 2001. Further investment would be required to reduce NO<sub>x</sub> emissions.

### 3.4 Tilbury

In general terms the units at Tilbury are considered to be in relatively good working order

Units 7-10 have operated for a similar number of hours, namely 123 000 h, 114 000 h, 124 000 h and 118 000 h respectively. Unit 7 is due for a major overhaul in 1998 and Unit 10 is due for a major overhaul in 1999. Units 8 and 9 were last overhauled in 1997 and are not due for another overhaul until 2001. There are no major spares on site.

The particulate emission limit is  $140 \text{ mg/m}^3$ . Short-term operation may continue without additional expenditure to reduce particulate emissions but in the longer term investment would be required to reduce particulate emissions. The existing technology may be close to meeting NO<sub>x</sub> emission requirements and may be sufficient if some relaxation of the emission targets at the site can be obtained.

The ash disposal site is reaching the limits of capacity. The unused capacity at the ash disposal site is expected to serve the operation of the station in mid-merit operation for only a few more years.

### 3.5 Ferrybridge

In general terms Units 1, 2 and 3 at Ferrybridge are considered to be in relatively good working order but Unit 4 has creep damage.

Units 1-4 have operated for a similar number of hours, namely 183 000 h, 173 000 h, 183 000 h and 172 000 h respectively. Hence the units have operated for a considerably longer period than those at Tilbury. The boiler system for Unit 4 is damaged and places limits on the operation of the unit. Hence Unit 4 requires a major overhaul and some restoration work. There are no major spares on site.

Low NO<sub>x</sub> burners have been installed for Units 1-3 but not for Unit 4. Hence investment would be required to reduce NO<sub>x</sub> emissions from Unit 4 to the limits required from 1998. In addition the existing particulate emission limit is  $140 \text{ mg/m}^3$  but is to reduce to  $50 \text{ mg/m}^3$  by 2001. Short-term operation may continue without additional expenditure, but investment would be required in the longer term to bring about a reduction in particulate emissions.

### 3.6 Conclusions

The condition of the stations/units may be summarised as follows:

- **Willington:** the station has perhaps the least technical capability on the system owing to its age, design and technology
- **Tilbury:** the units are considered to be in relatively good working order

- Ferrybridge: Units 1, 2 and 3 are considered to be in relatively good working order but Unit 4 has creep damage.

The requirements for major expenditure on the units are as follows:

- Willington Unit 5: repair of the IPI turbine and provision of equipment to reduce particulate and NO<sub>x</sub> emissions
- Tilbury Units 7 and 10: equipment to reduce particulate emissions, and possibly NO<sub>x</sub> emissions, in the longer term
- Ferrybridge Unit 4: restoration of the boiler system, equipment to reduce NO<sub>x</sub> emissions for 1998 and equipment to reduce particulate emissions in the longer term.

## 4. INDEPENDENT ECONOMIC REVIEW OF THE CLOSURE DECISIONS

### 4.1 Introduction

We have undertaken an independent review of the evaluation of Net Avoided Costs and Net Capacity Credits for the units notified for closure and for the power stations. On the whole our review serves as a check on the more detailed analyses undertaken by National Power and PowerGen.

### 4.2 Methodology

Our review has been undertaken for each unit/station with respect to the operation of the plant that may be achieved from bidding of the plant into the Pool at marginal cost (ie the unit approach as described in Section 2). National Power and PowerGen each have portfolios of coal-fired plant and, through strategies relating to coal burn and emissions, this provides opportunities for switching operation between plant and for adjusting bid prices. By undertaking our analysis for each unit and station without consideration of the portfolio of plant ownership we may identify when the closure criterion is satisfied without the influence of such considerations and when the decision for closure is influenced by the portfolio of plant held by the incumbent generators. The main difference in the two approaches is that instead of deriving the load factor for the unit within a system model, we assume a load factor based on the marginal cost of operation and a view of the system marginal price.

We consider the cases of continued operation with minimum investment for 4 and 10 years. Our analysis in this Section is based on the view that there is unlikely to be a long-term future for the majority of the existing coal-fired plant. Hence there is likely to be only minimum investment for the continued operation of the units proposed for closure.

With minimum investment the units may, at best, be expected to continue in two-shifting operation in low mid-merit. We assume that a bid price of £21-22/MWh would lead to a load factor of about 35 per cent; and that a bid price of £25-26/MWh would lead to a load factor of about 25 per cent. The estimated marginal costs of the units/stations could result in load factors of up to 35 per cent, but operational constraints relating to the condition of the plant (ie imminent life expiry of materials) or emission constraints (ie high particulate emissions) may limit the load factor to below 35 per cent in the short term (ie the next four years); in the longer-term (ie the next ten years) we assume that rehabilitation of the unit/station is undertaken and that this would improve the load factor up to 35 per cent until 2005 and up to 25 per cent thereafter (the reduction arising from SO<sub>2</sub> emission limits which may only be overcome through additional capital expenditure).

We acknowledge that further expenditure may enable the units/station to lead to some improvement in their competitiveness and hence justify a load factor greater than 35 per cent. This case is considered in a subsequent section (Section 7) and is accompanied by the assumption that there is a long-term future for the existing coal-fired plant.

#### 4.2.1 Net Avoidable Costs (NAC)

Our estimates of the Net Avoidable Cost are based on the following:

- OMF - The fixed operation costs are based on an average annual figure of £22.5/kW/year per unit and an additional £5/kW/year for the station; the average annual figure includes the overhaul costs; the cost of the overhaul is estimated to be about £8m per unit and is allocated to the year of scheduled overhaul.
- INV - The investment expenditure includes the major equipment required to restore the unit to operation and meet emission limits.
- VAR - The variable cost is based on £1.4/GJ (1996/7 prices)<sup>1</sup> for the unit efficiency less 7 per cent for operation at low load factors and an operating cost of £3/MWh.
- SMP - The revenue from the system marginal price is based on recent pool data (eg 1996/7) ie an average payment of £29/MWh for operation at 3.5 per cent load factor, £31/MWh at 25 per cent load factor, £33/MWh at 15 per cent load factor and £35/MWh at 5 per cent load factor.
- ANC - The revenue from the ancillary services is a forecast based on available information, including the annual value for the unit/station in recent years.
- CON - The revenue from the constraint payments is a forecast based on available information, including the annual value for the unit/station in recent years.
- CL0 - The cost of demolition less value of spares is taken to be zero. We estimate the severance costs as £10/kW(installed) for a station and £5/kW(installed) for a unit.

#### 4.2.2 Net Capacity Credit (NCC)

The net reserve capacity in 1998/9 is expected to be marginally more than that in 1997/8. In NGC's Seven Year Statement (April 1997) new plant capacity was expected to be 1.5 GW in 1997 with an additional 2.5 GW, under construction, for 1998. Peak demand growth is expected to be 0.7 GW per annum. The closures of Ferrybridge Unit 4, Tilbury Units 7 and 10 and Willington Unit 5 involve a reduction of 1.3 GW of existing capacity. Hence there is expected to be a net increase in capacity of 0.5 GW in 1998, when compared to the net increase in capacity in 1997.<sup>2</sup>

The values of the capacity element of the Pool Purchase Price for the period 1990/1-1996/7 are shown in Table 4.1. The capacity element was greater than £3.0/MWh in the three years of 1994/5 to 1996/7,

<sup>1</sup> We note this figure is higher than may be expected for 1998/9

<sup>2</sup> We note that these figures exclude the unit closures of Grain and Littlebrook announced in April 1998

but has reduced considerably in 1997. The net reserve capacity in 1998/9 is expected to be marginally more than that in 1997/8 the capacity element is not expected to exceed £1.0/MWh in the event of undertaking the proposed closures.

TABLE 4.1  
CAPACITY ELEMENT OF THE POOL PRICE

Year	SMP £/MWh	PPP £MWh	Capacity element £/MWh
90/1	17.4	17.4	0.1
91/2	19.5	20.8	1.3
92/3	22.6	22.8	0.2
93/4	24.2	24.4	0.3
94/5	20.7	23.9	3.2
95/6	19.4	23.9	4.5
96/7	20.5	23.7	3.2

The general relationship between the capacity element and the Net Capacity Credit is shown in Table 4.2 for 1998/9 prices. With an average annual capacity element of £1.0/MWh the NCC is estimated at about £9/kW/year. With an average annual capacity element of £3.0/MWh the NCC is estimated at about £26/kW/year.

TABLE 4.2  
ESTIMATED NET CAPACITY CREDIT AND THE CAPACITY ELEMENT  
IN 1998/9 PRICES

Average capacity element £/MWh	NCC £/kW/year
1.0	9
1.5	13
2.0	18
2.5	22
3.0	26
3.5	31

An NCC estimate of not more than £10/kW/year (corresponding to capacity payments not exceeding about £1.0/MWh) would appear to be reasonable for the next few years. We would not expect the



capacity element to exceed £ 1.0/MWh in the event of undertaking the proposed closures. There may be further downward pressure on the NCC with the addition of proposed new capacity in the next few years. However, the downward pressure may be countered by delays in introduction of new capacity and by continued withdrawal from service of coal-fired plant.

### 4.3 Application

Our estimate of the NAC is based on the indicative assumptions relating to the units and stations, as shown in Table 4.3. In the table we show our assumptions relating to installed capacity, load factor, investment, constraint payments, year of next major overhaul and thermal efficiency for continued operation of the units and station for 4 and 10 years.

**TABLE 4.3**  
**INDICATIVE UNIT AND STATION ASSUMPTIONS USED IN OUR ANALYSIS**

Station/unit	Years of operation	Capacity MW	Load factor %	Investment (£ million)	Constraint payments (£ million)	Year of next major overhaul	Thermal efficiency %
Ferrybridge Unit 4	4 10	350 490	25 35	8 20	0	1998	34.0
Ferrybridge Station	4 10	1820 1960	25 35	8 25	1	1998, 1999, 2000, 2001	36.5
Tilbury Units 7 and 10	4 10	680 680	15 35	0 20	0	1998, 1999	34.0
Tilbury Station	4 10	1360 1360	25 35	0 40	0.5	1998, 1999, 2001, 2001	34.0
Willington Unit 5	4 10	188 188	15 25	1 11	0	1998	30.0
Willington Station	4 10	376 376	15 25	1 21	1	1998, 1999	30.0

Our NAC estimates are compared with the estimates of the owners in Table 4.4. The results are discussed in terms of the closure criterion, namely NAC being greater or less than the NCC (where NCC is about £ 10/kW/year). Though we have undertaken separate analyses for 4 and 10-year

periods, more emphasis is placed on the analysis for a 4-year period on the assumption (see Section 4.2) that there is unlikely to be a long-term future for any existing coal-fired plant.

TABLE 4.4  
COMPARISON OF OWNER'S AND OUR NAC ESTIMATES  
(£/KW/YEAR)

Station/unit	Owner's estimate	Our estimates	
		4-year	1 0-year
Ferrybridge unit 4	16	16	8
Ferrybridge station		4	2
Tilbury units 7 and 10	16	7	6
Tilbury station	6	6	9
Willington unit 5	19	15	22
Willington station	2	15	24

**Ferrybridge Unit 4:** For a 4-year period of operation our NAC estimate is similar to that estimated by the owner and exceeds the estimated value of the NCC. For a 10-year period of operation our NAC estimate is marginally less than the estimated value of the NCC. Hence we confirm the owner's view that the closure criterion is generally satisfied.

**Ferrybridge power station:** For 4 and 10-year periods of operation our NAC estimates are less than the estimated value of the NCC. Hence we confirm the owner's view that the closure criterion for the station as a whole is not generally satisfied.

**Tilbury Units 7 and 10:** For 4 and 10-year periods of operation our NAC estimates are less than those estimated by the owner and are less than the estimated value of the NCC. Moreover the inclusion of mothballing costs for temporary closure may marginally reduce our NAC estimate still further. In comparison the owner's NAC estimate exceeds the estimated value of the NCC. Hence we conclude that the closure criterion is not generally satisfied.

The differences in the values of NAC may be explained by reference to load factor: National Power assume a load factor of 5 per cent whereas we have assumed a load factor of 15 per cent. National Power seem to be taking a view on their coal portfolio that there is insufficient "room" within their portfolio for the proposed unit closures at Tilbury to operate at load factors of more than 5 per cent.

**Tilbury power station:** For 4 and 10-year periods of operation our NAC estimates are less than the estimated value of the NCC. Hence we confirm the owner's view that the closure criterion for the station is not generally satisfied.

**Willington Unit 5:** For 4 and 10-year periods of operation our NAC estimates are similar to those estimated by the owner and exceed the estimated value of the NCC. Hence we confirm the owner's view that the closure criterion is generally satisfied.

**Willington power station: For 4** and 10-year periods of operation our NAC estimates exceed those estimated by the owner and exceed the estimated value of the NCC. In comparison, the owner's NAC estimate is less than the estimated value of the NCC. Hence we conclude that the closure criterion is generally satisfied.

As an explanation of the difference in the conclusions with respect to Willington Power Station we note that our calculation of the NAC estimate includes closure costs as follows:

$$\begin{aligned} \text{ACLO} &= (\text{demolition costs (1) plus severance payments (1) less value of} \\ &\quad \text{spares( 1)}) \\ &\quad \text{less} \\ &\quad (\text{demolition costs (n+1) plus severance payments (n+1) less value of} \\ &\quad \text{spares(n+1)}). \end{aligned}$$

Continued operation of the units involves the avoidance of severance costs in year  $I$  and the inclusion of severance costs in year  $n+I$ , where  $n$  is the number of years of continued operation. In separate analyses we have used  $n = 4$  and  $n = 10$ .

National Power provided figures for the NAC estimate, as quoted in our report, which:

- were for a single year only (ie 1998/9)
- included the avoidance of severance costs in year  $I$ , but excluded the occurrence of severance costs in year  $n+I$ .

The NAC figures as provided by National Power take account of the avoidance of severance costs in year  $I$  but do not take account of the occurrence of severance costs delayed beyond year  $I$  with the continued operation of the station. Hence we derive a higher NAC estimate than the NAC figure provided by National Power and conclude that the closure criterion is satisfied for Willington Power Station.

#### 4.4 Conclusions

All of the units notified for closure are due for a major overhaul within the next two years. The timing of the overhaul militates against the continued operation of the units by dint of increasing the present value of costs. These major overhauls will also be the last before 2001 when new emission constraints are imposed. Hence the major overhauls provide an opportunity to install emission reducing equipment. Both Willington Unit 5 and Ferrybridge Unit 4 require emission reduction expenditure imminently and this tends to make these units uneconomic. Tilbury may be able to continue operation in the short term without the introduction of such equipment, although such expenditure would be needed in the longer term.

We restate the main conclusions of our analysis below:

**Ferrybridge:** The closure of the Unit 4 was proposed by PowerGen; we conclude that the closure criterion is generally satisfied for Unit 4. The closure of the power station was not proposed by PowerGen and we concur that the closure criterion is not generally satisfied for the power station as a whole.

**Tilbury:** The closure of the Units 7 and 10 was proposed by National Power; we conclude that the closure criterion is met if one assumes a low load factor of operation (ie a load factor below 10 per cent) within the owner's portfolio of plant but would not be met with a moderate increase in the load factor. The closure of the power station was not proposed by National Power and we concur that the closure criterion is not generally satisfied for the station as a whole.

**Willington:** The closure of the Unit 5 was proposed by National Power; we conclude that the closure criterion is generally satisfied for Unit 5. The closure of the power station was not proposed by National Power; but we conclude that the closure criterion is generally satisfied for the whole power station. The different conclusions arise because the NAC estimate, as provided by National Power (a) is for a single year only and (b) excludes a full account of severance costs.

## 5. INDEPENDENT STRATEGIC REVIEW OF THE CLOSURE DECISIONS

### 5.1 Introduction

In this Section we briefly review the possible strategies being adopted by National Power and PowerGen in the light of the discussion in Sections 3 and 4.

### 5.2 Ferrybridge

Unit 4 at Ferrybridge is in need of some repair and, in our opinion, generally satisfies the economic criterion for closure. Even so, the decision to prepare for the closure of Unit 4 may have been made in advance of the unit becoming uneconomic to operate. The procedures for closure of this unit may have taken effect in 1996. Low NO<sub>x</sub> burners were originally scheduled by PowerGen for installation in 1997 but this plan was subsequently revised. There has followed a period of minimum maintenance until a major outage occurred in 1997. The unit was then, in our opinion correctly, assessed as being uneconomic to return to operation.

If the decision to close the unit was made eighteen months in advance of the proposed closure date and notification was made only six months in advance, then the incumbent generator has an information advantage over its competitors in the market. Since new generating plant may be developed within the eighteen month period, the incumbent has an advantage in the development of new plant over new entrants.

If the length of closure notice is not increased, an alternative would appear to be the close monitoring of operation and maintenance costs to try to identify when expenditure on existing plant is being constrained. This approach may not lead to clear results, would require access to details relating to the operation of each station and may be considered to introduce an excessive regulatory burden into the market for electricity generation.

### 5.3 Tilbury

Units 7 and 10 at Tilbury are in reasonable condition and, in our opinion, do not generally satisfy the economic criterion for closure. National Power appears to have identified a benefit from reduction in capacity of coal-fired units within their overall portfolio of generation capacity. The units operate at low load factors (ie below 10 per cent) in the analysis undertaken by National Power and at these load factors the units satisfy the economic criterion for closure.

National Power has proposed to close Units 7 and 10 temporarily. The selection of these units for closure may have been influenced by (a) the fact that the fuel is imported and (b) the opportunity created, by closure of the two units, for the use of their precipitators to meet environmental standards and thereby avoid additional investment for the remaining two units. The station is particularly well placed for the import of coal from Rotterdam. National Power considers cheaper coal imports to be a future possibility and this appears to be why National Power proposes to close the units temporarily, and with full mothballing provision, with a view to later de-mothballing and operation of the units.

Even so the closure may be seen to be a withdrawal of capacity from the market on a temporary basis to the advantage of the existing owner. The closure avoids the risk of having to operate the units at low

load factors, which would render the units uneconomic. It may also have a positive effect on capacity payments for the remaining plant. Furthermore, the closure of the units on a temporary basis appears to constrain the options for continued operation of the unit by a third party; as the duration of the temporary closure is undefined, access for operation by a third party is undefined and the ensuing period of operation may be of limited duration.

#### 5.4 **Willington**

Willington is an old power station and, in our opinion, generally satisfies the economic criterion for closure. National Power appears to be resisting closure of the full station in favour of closure of the unit that requires imminent overhaul. National Power's case for the closure of only one unit appears to be based mainly on the availability of constraint payments for the remaining unit. However we believe that these payments are unlikely to materialise. The reluctance to propose full closure of Willington Power Station may relate to a strategy to retain ownership and operation of the site, and thereby to deny the site to other users and, in particular, a competing generator.

Though not part of notification and the case for closure of the unit, National Power advised us that they intend to ship the generator stator and rotor from Unit 5 to Australia to provide spares cover for Hazelwood Power Station (in which National Power has a 72 per cent shareholding). During the technical due-diligence exercise conducted on Hazelwood Power Station in 1996, it was identified by National Power staff and acknowledged by the independent technical consultants, Stone & Webster, that significant capital investment was required to bring the six units at that station up to serviceable condition, including the use and compatibility of Willington AEI machines for Hazelwood's needs. National Power told us that a contribution to the success of the bid by National Power and Pacificorp was the identification of the use of the Willington Unit 5 AEI Generator. The Hazelwood generators are in poor condition compared to those at Willington

We note, from the above, that the decision to prepare for the closure of the unit at Willington may have taken effect following the due diligence at Hazelwood in 1996 and annual appraisal of the continued viability of the units/stations.

Finally we note that the presentation of the analysis in support of the notifications for closure did not in the case of Willington lead to the same conclusion as those derived from our independent analysis (see Section 4). It may be of benefit for future closure notifications to include a complete economic analysis for closure (including the impact of any exceptional circumstances), both for the unit(s) notified for closure and for the power station as a whole.

#### 5.5 **General**

We would generally expect the economic viability of one unit to be closely linked to the other units at the station because the units at any one station frequently have identical design characteristics. Even so we recognise that in exceptional circumstances the economic viability of one unit may differ substantially from that of another unit. Unit 4 at Ferrybridge Power Station is an example of such an exceptional circumstance. We have confirmed that Unit 4 is not economically viable while the other units at the station are economically viable to PowerGen; the different conclusions are the result of the exceptional items of repairs and investment needed to retain Unit 4 in operation.

Constraint payments may result in the economic viability of one unit differing from that of another unit at a station. However the network is frequently reinforced in anticipation of station closures and this reduces the additional revenue from constraint payments and reduces the difference in the economic viability between units at the same station. Willington Power Station is a case in point; while the available constraint payments may be loaded on one of the two units we have found the economic viability of the two units to be similar to one another (ie the closure criterion is satisfied for both units). In general, we would not expect constraint payments to lead to economic viability of one unit proposed for closure differing substantially from that of another unit at the same power station.

Since, in general, we would expect the economic viability of one unit to be closely linked to the viability of other units at a power station, we would also expect all units at one station to close before the closure of units at another station. Hence, we would only expect partial closure of two or more power stations simultaneously in the presence of exceptional circumstances at each of the power stations. This is borne out by our analysis in Section 4 which indicates that closure of the whole of Willington Power Station would be expected before the closure of any units at Tilbury Power Station.

## 5.6 Conclusions

We summarise our views relating to the strategy of National Power and PowerGen with respect to the proposed closures as follows:

- **Advance notice:** The decision to prepare for the closure of Willington Unit 5 and Ferrybridge Unit 4 may have been made up to eighteen months before the proposed closure date. It may be of benefit for a notice of intent for closure to be submitted before the existing notice period of six months, or for the operation and maintenance of plant to be more closely monitored by the Regulator.
- **Market position:** The incumbent generators may be using their existing market position to their benefit. The closure of the units at Tilbury would appear to be based on a portfolio decision to withdraw plant capacity and avoid having to run the units at low load factors where continued operation of the units becomes uneconomic. In addition to avoiding the risk of operating the units at low load factors, the temporary closure may increase capacity payments for the remaining plant. Moreover, the closure of the units on a temporary basis appears to constrain the options for continued operation of the unit by a third party; as the duration of the temporary closure is undefined, the access for operation by a third party is undefined and remaining economic life thereafter may be of limited duration. Finally, the closure of some but not all units at a station could reflect a reluctance by incumbent generators to relinquish claims to existing power station sites in order to retain their market position.
- **Notification for closure:** in general we would expect the economic viability of one unit to be closely linked to the viability of the other units at a power station. Hence, we would generally expect all units at one station to close before the closure of units at another station. We would only expect partial closure of two or more stations simultaneously in exceptional circumstances. We also note that the presentations in support of the notifications for closure did not in all cases lead to the same conclusions as those derived from our independent analysis. It may be of benefit for

future closure notifications to include a complete economic analysis for closure (including the impact of any exceptional circumstances), both for the unit(s) notified for closure and for the power station as a whole.



## 6. INDEPENDENT TECHNICAL REVIEW OF THE CASE FOR CONTINUED OPERATION

### 6.1 Introduction

While it may not be economic for National Power or PowerGen to retain a unit in service it may be economic for a third party to retain it in operation. This is particularly the case where the third party has a comparative advantage with respect to costs.

A coal supplier would normally make a margin on the coal sales. However, when faced with the loss of a customer from closure of a power station, the coal supplier may be prepared to acquire the rights to generate at the power station and make a margin through the sale of electricity. Hence vertical integration may provide the opportunity for a competitor to retain operation of a unit even though it is unprofitable for National Power or PowerGen to do so.

While it may be in the interests of a third party to continue operation of a unit proposed for closure it may not be in the interests of the incumbent generator to have the unit continue in operation once it considers the unit to be uneconomic. The continued operation of the unit proposed for closure may reduce the operation of other plant owned by the incumbent generator and thereby reduce the incumbent's market share.

In this Section we review the technical options that would enable a third party to continue operation of a unit proposed for closure.

### 6.2 Options

A third party may continue the operation of the unit, at least in theory, in the following ways:

1. the third party owns/leases and operates the unit
2. the third party owns/leases the unit but the incumbent generator operates the unit on behalf of the third party
3. the third party operates the unit but ownership is retained by the incumbent generator
4. the third party owns/leases the unit and operates the station
5. the third party owns/leases and operates the station.

Third party ownership requires the purchase of the unit and rights to operate the unit from the incumbent generator. In the case of ownership the third party may either operate the unit as a separate entity (Option 1) or lease back the rights to operate the unit to the incumbent generator (Option 2). In the absence of ownership the third party may purchase the rights to operate the unit (Option 3). Options 4 and 5 would involve the transfer of operating and ownership rights for units which the incumbent considers to be economic; these options are not considered further in this review.

Options 1 and 3 require the unit to be operated separately from the rest of the power station. Separate operation of the unit from the rest of the power station is made difficult by the commonality of plant operations, systems, emissions allocation and liability. The power station arrangement does not generally lend itself to operating rights being held by two different parties from an operations and maintenance perspective for the following reasons'

- Plant: the plant is constructed in such a way that it is not feasible to isolate the routes for fuel, water, and auxiliary power supplies to the different units. In addition controls and process computing facilities are common to all units and are not easily separated
- Safety: if any of the units were operated separately there could be uncoordinated demand for these facilities which in exceptional circumstances could lead to severe plant damage and provide a threat to personnel safety. For example, with common switchboards and cable routings, one operator may wish to carry out maintenance on switchgear located in the middle of other switchgear which may be live from operation of plant by the other operator
- Coal handling: common coal handling facilities make it difficult to retain separate stockpiles in the presence of two operators. Whereas in newer power stations a bucket-wheel stacker reclaimer is used, which can stock different fuels in different areas and then reclaim them separately, at Tilbury (for example) stocking out and reclaiming is done by mobile plant (bulldozers and scrapers) which means that it is impossible to stock separate fuels in separate areas and then reclaim them without mixing of fuels taking place. This could lead not only to commercial dispute about quantities of stored fuel, but could also lead to combustion problems in the boilers which could be detrimental to unit operation and safety, depending on the differences in the fuels used by the two operators
- Emissions: emission limits relate to the whole station. Common stacks mean that the emissions from one unit cannot be separated from another unit. At Tilbury, for example, if two adjacent units are operated by a single party (eg 7 and 8 or 9 and 10) then the matter is simpler in relation to stack emissions, but with the proposed scenario of Units 7 and 10 being transferred each stack would service one unit from each operator and isolation of emissions performance would not be possible.

On the plant itself many systems would need to be operated by one party, with some means found for metering and charging the other party for the service. These systems would include cooling water, fuel oil, compressed air and fire fighting facilities. This requirement would tend to rule out Options 1 and 3. In addition, Option 3 retains ownership of the unit with the incumbent generator. This Option has a further draw-back in that it may prohibit the willingness of a third party to invest in the unit.

With Options 1 and 3 having severe draw-backs for operation of a unit separate from the rest of the power station, the remaining option is Option 2. Options 2 requires the unit to be owned or leased by the third party, separate from the rest of the station, but operated by the incumbent generator. The contractual arrangement is sometimes referred to as a tolling agreement. The agreement would need to take account of the following factors:

- duration of ownership/lease of the unit
- agreement for the purchase of coal, which would need to ensure a quality of coal suitable for the proposed mode of operation for all units at the site
- third-party guidelines for general operation and maintenance of the unit and for emergency cases (eg when one of the units at the station may be required to increase or reduce load)
- the 'Occupier' of the site is responsible to the Environment Agency for the emissions performance of the power station; under a tolling arrangement the incumbent generator may expect to allocate some of the emission limits to the third party
- access to the Pool to separately bid in prices for the unit owned or leased by the third party
- third-party access to units prior to purchase
- price for purchase of the unit by the third party
- price for the operation of the unit by the incumbent generator.

Negotiations on the above issues may be difficult and may be hindered further if :

- the incumbent generator seeks compensation within the tolling agreement for the displacement of its remaining units. If compensation is accepted it may render a third party's proposals for continued operation of the unit to be uneconomic. The negotiating stance for compensation may also prolong negotiations, during which time the condition of the units may deteriorate
- the third party objects to the incumbent generator knowing the scheduled operation of the third party's unit on the grounds that this may be an advantage with respect to the operation of the incumbent's remaining units
- the third party considers that the contract for coal in the tolling arrangement will adversely affect its coal sales to other units and stations.

### 6.3 Progress to date

Both National Power and PowerGen have been approached by third parties interested in the continued operation of some of the units notified for closure.

National Power has stated a willingness to negotiate on tolling arrangements with third parties on units and stations other than those notified for closure. To date (April 1998) National Power has been unwilling to negotiate tolling arrangements for the units notified for closure on the basis that National Power is awaiting the outcome of this 'Independent Assessor' report.

PowerGen has received an expression of interest in the unit notified for closure from a third party. Representatives of the third party have undertaken a site visit with a view to assessing their interest in a tolling arrangement for continued operation of the unit.

#### 6.4 **Conclusions**

We consider the option of joint operation of a station to be an impracticable means of continuing the operation of any of the units notified for closure. A tolling agreement may offer a more practical solution, whereby the third party purchases or leases the unit and the incumbent generator continues to operate the unit. The tolling arrangement requires agreement between the third party and incumbent generator on a number of technical, legal and commercial issues and it may be difficult to reach a consensus. Negotiations may be hindered further if (a) the incumbent generator seeks compensation within the tolling agreement for the displacement of its other plant, (b) the third party objects to the incumbent generator knowing the scheduled operation of the third party's unit on the grounds that this may be an advantage with respect to the operation of the incumbent's remaining units or (c) the third party considers that the contract for coal in the tolling arrangement will adversely affect its coal sales to other units and stations. Hence the decision to invest in a unit through a tolling agreement can only be reached through difficult negotiations between the incumbent generator and the third party.

## 7. INDEPENDENT ECONOMIC REVIEW OF THE CASE FOR CONTINUED OPERATION

### 7.1 Introduction

In this Section we assess the value to a third party of the continued operation of a unit notified for closure. For each of the units we consider the case for continued operation with a revised coal price, investment expenditure and bid price and thereby revised load factor of operation relative to the assumptions used in our analysis in Section 4. We also comment on commercial aspects of the tolling arrangement proposed in the previous Section (Section 6).

### 7.2 Methodology

To gauge the possible value of the units under continued operation by a third party, we use the 'unit' approach set out in Section 2.

The annuitised net benefit for continued operation of the unit and station is calculated as the NCC less the NAC. For this evaluation we assume a value of NCC in a range of &O-10/kW/year for the lo-year period. The NAC is calculated for each unit and station for two alternative cost scenarios, which are considered to be reasonable for the purpose of providing an estimate of the value of the plant to a third party within the context of this study. Both scenarios are made on the assumption that there is likely to be a long-term future for existing coal-fired plant in the market for generation (ie a relaxation of the environmental pressures and slow-down of new gas-fired generation):

- **Scenario 1:** this scenario is based on minimum investment and operation at a load factor up to 35 per cent. The scenario is the same as the lo-year case used in Section 4 except that the coal price is reduced by 20 per cent to £1.12/GJ
- **Scenario 2:** this scenario is based on an assumption of increased investment and hence enhancement such that the unit can be operated at the load factor of 45 per cent. The scenario is the same as the lo-year case used in Section 4 except that the coal price is reduced by 20 per cent to £1.12/GJ, the investment expenditure is increased by £10 million per unit, the load factor is increased to 45 per cent, the reduction in the thermal efficiency for operation in mid-merit is reduced from 7 to 5 per cent and the average system marginal price of operation is £27/MWh.

The net present value is evaluated from the annuitised net benefit (ie NCC less NAC) for ten years of continued operation of the unit and station and a discount rate of 10 per cent.

### 7.3 Application

The values of the NAC, NCC and annuitised net benefits (ie NCC less NAC) for Scenarios 1 and 2 are shown in Table 7.1 for the units and station. The evaluation of the annuitised net benefit is similar for the two scenarios.

We conclude from the scenarios in our analysis, and the results shown in Table 7.1, that:

- the annuitised net benefit for the units notified for closure and for the stations as a whole at Ferrybridge and Tilbury is positive; hence, on our assumptions, we consider Unit 4 at Ferrybridge and Units 7 and 10 at Tilbury to be potentially attractive to a third party
- the annuitised net benefit for the unit notified for closure and for the station as a whole at Willington is negative; hence, on our assumptions, we consider Unit 5 at Willington not to be attractive to a third party.

**TABLE 7.1**  
**COMPARISON OF OUR NAC, NCC AND ANNUITISED NET BENEFIT**  
**ESTIMATES FOR THIRD PARTY OWNERSHIP**  
**(£ /KW/YEAR)**

Station/unit	NCC estimate	NAC estimate		Annuitised net benefit estimates	
		Scenario 1	Scenario 2	Scenario 1	Scenario 2
Ferrybridge unit 4	0-10	-5	-5	5to 15	5to 15
Ferrybridge station	0-10	-8	-10	8to 18	10 to 20
Tilbury units 7 and 10	0-10	-5	-6	5to 15	6to 16
Tilbury station	0-10	-2	-3	2to 12	3to 13
Willington unit 5	0-10	12	14	-12 to -2	-14 to -4
Willington station	0-10	14	15	-14 to -4	-15 to -5

We estimate the net present value for Unit 4 at Ferrybridge to be £15-45 million and the net present value for Units 7 & 10 at Tilbury to be £25-65 million. We consider the continued operation of Willington Unit 5 and station to have no positive net present value to a third party. However, if it were to be made available, the Willington site may be of interest to the incumbent generator or third party for the development of a new station or some other development.

#### 7.4 Comment

Our evaluation of the viability of continued operation of the units notified for closure is based on consideration of two scenarios. A third party may consider some other scenario to be more appropriate for the evaluation of the units, depending on their view of

- the duration and level of operation
- the revenue stream and, in particular, the pool price
- the operating costs and, in particular, the cost of coal

- the level of initial investment.

The view taken on the future market may be influenced by the following factors:

- the extent to which gas-fired plant will continue to enter the market and reduce the load factor of the coal-fired units and/or reduce the pool price
- the extent to which environmental targets, with respect to SO<sub>2</sub>, NO<sub>x</sub>, and particulate emissions, will require additional investment expenditure for coal-fired units.

Continued operation of the units notified for closure by a third party may introduce additional competition for mid-merit generation plant, which would generally be of benefit to the consumer. The third party may be willing to continue operation of the units if the third party has access to lower costs (or accepts lower returns) than the corresponding costs (or returns) of the incumbent generators, considers there to be reasonable returns for the continued operation of the unit and, moreover, is willing to enter into a tolling contract. The presence of the third party in the market may then put some downward pressure on pool prices.

Though third party entry may increase competition, the details of the tolling contract (as discussed in Section 6) may limit the competitiveness of tolling and, ultimately, diminish any effect on pool prices. In particular the incumbent generator may seek compensation for loss of profit owing to continued operation of the units notified for closure. The level of compensation may act either as an obstacle for competitive bidding by the third party having entered the market, or as a barrier to third party entry into the market.

## 7.5 Conclusion

We have undertaken an analysis which we consider to be reasonable for the purposes of providing an estimate of the value of the plant to third party within the context of this study. For the analysis we have assumed that there is a long-term future for existing coal-fired plant in the market for generation (ie a relaxation of the environmental pressures and slow-down of the installation of new gas-fired generation).

We consider continued operation of Ferrybridge Unit 4 and Tilbury Units 7 and 10 for 10 years each to yield a positive net present value on the cash flow for a third party. We estimate the net present value for Unit 4 at Ferrybridge to be £15-45 million and the net present value for Units 7 and 10 at Tilbury to be £25-65 million. We consider the continued operation of Willington Unit 5 and of the station as a whole to have no positive net present value to a third party. However, if it were to be made available, the Willington site may be of interest to the incumbent generator or third party for the development of a new station or some other development.

The evaluation of the worth of the units by a third party may differ from our estimates depending on the third party's views and assumptions relating to the continued operation of the plant. The decision of a third party to proceed with a tolling arrangement will be influenced by a number of factors. These factors will include views of the future development of the market including (a) the extent to which gas-fired plant will continue to enter the market and reduce the operational load factor of coal-fired units and/or reduce the pool price and (b) the extent to which environmental targets, with respect to SO<sub>2</sub>, NO<sub>x</sub>, and particulate emissions, will require additional investment expenditure for the coal-fired units.

Though we consider there to be an economic case for a tolling arrangement for some of the units notified for closure and that the entry of a third party may increase competition in the market for generation, the details of the tolling contract may erode some of these opportunities and benefits. Hence we would expect a third party to consider a tolling agreement for part-operation of a coal-fired station to be a 'second best' alternative when compared to an option to re-develop a whole coal-fired station.



## 8. COMMENTS BY THE GENERATORS

### 8.1 Introduction

Our report has been prepared in consultation with both National Power and PowerGen. Their comments have been gratefully received and a number of these comments have been taken into account in this report. Other comments are discussed below.

### 8.2 Closure notifications

Our independent assessment of the decisions to close the units notified for closure excluded specific appraisal of portfolio issues (see Section 4). Both National Power and PowerGen expressed the view that in the absence of consideration of the portfolio issues, the analysis was not capable of identifying the direct and indirect financial implication of the closure decisions. This view was expressed in response to the qualified, rather than emphatic, nature of our conclusions with respect to some of the proposed closures.

We expressed the view that our approach to the study sought to understand how the closure decisions were reached and independently assess whether or not those decisions were reasonable. This review involved a check as to whether the closure decision was reasonable rather than a duplication of the whole analysis undertaken by National Power or PowerGen. To reduce the scale of the analysis to reasonable proportions and to avoid the need for access to the details of National Power and PowerGen's models and year-on-year cash projections we excluded portfolio analysis from our assessment. Hence we simplified our analysis when compared to that undertaken by National Power and PowerGen and necessary for their day-to-day management of their plant portfolio.

In conclusion: our approach had the benefit not only of gaining an understanding of the closure decisions made by National Power and PowerGen but also of the potential benefits of continued operation of the units to a third party. The approach has led to a better understanding of the scope for continued operation of the power plants as represented by the qualified nature of some of our conclusions.

### 8.3 Third party operation

Our independent assessment of the decisions to close the units notified for closure included a review of the viability of the units for continued operation by a third party (see Section 7). Our analysis included a number of assumptions. National Power have expressed the view that:

*"We find it difficult to recognise the above conditions as representative of the UK market in view of the environmental undertakings given at UK government and EU levels. For these conditions to be met there would have to be a significant relaxing of the environmental pressures combined with a dramatic slow down of new gas-fired generation "*

We generally concur with these sentiments. On the other hand, while we have no evidence to suggest that the assumptions we have used in our third-party analysis are held by any third party, at the time of writing (April 1998) we would not consider the assumptions to be outside the bounds of possibility.

#### 8.4 **Conclusions**

For this report we have reviewed the reasonableness of the proposed closures and have drawn our conclusions with some qualification. It may be preferable for the Independent Assessor to be able to reach a view on the reasonableness of the closure decisions without qualification. A review of the closure decisions could be undertaken as a full auditing review of the processes and procedures in the decision process within National Power or PowerGen, but such a review would not necessarily place the proposed closures in the broader context of the competitive market. This report has sought to assess the proposed closures in this broader context.

## 9. CONCLUSIONS

In this report we have considered the following:

- the economic reasonableness of the criterion underpinning the closure decisions by PowerGen and National Power
- whether the closure criterion conforms to the statements specified by National Power and PowerGen under Paragraph 2 (v) and 2 (vi) of Condition 9A
- whether the estimates of future costs, avoidable costs, revenues and lost revenues associated with each closure proposal are reasonable
- the technical viability of third party operation of individual station units
- the market valuation of the unit closures to a third party
- the potential impact on electricity prices and possible profitability enhancement of National Power and PowerGen's other plant;
- any additional information relevant to the closures.

Our analysis has been undertaken with some degree of uncertainty regarding the future of coal-fired plant. Proposed emission limits may constrain future coal-fired generation and restrict competition in the market for electricity generation. For existing coal-fired power plant to meet the proposed future emission limits the present owners will need either to reduce operation in the future or increase investment to reduce the level of emissions. With reduced load factors or increased costs, continued operation of the stations/units becomes less attractive economically. The emission limits may then cause the owners to seek the closure of some stations/units.

Our main conclusions are summarised as follows:

- We consider the necessary economic criterion underpinning the closure decision forwarded by PowerGen and National Power to be reasonable. We have undertaken an independent analysis to validate the conclusions made by the owners of the units notified for closure. The presentation of the analysis in support of the notifications for closure did not in all cases lead to the same conclusions as those derived from our independent analysis. It may be of benefit for future closure notifications to include a complete economic analysis for closure both for the unit(s) notified for closure and the power station as a whole.
- We consider the closure criterion conforms to the statements specified by National Power and PowerGen under Paragraph 2 (v) and 2 (vi) of Condition 9A. However, we consider the decision to prepare for the closure of a unit at each of Willington and Ferrybridge Power Stations to have been made well in advance of the notification period of six months. We consider an extension to the notification period to be worthy of consideration.

- We consider the estimates of future costs, avoidable costs, revenues and lost revenues associated with each closure proposal to be reasonable for the cases of Willington Unit 5 and Ferrybridge Unit 4. In addition for Willington Power Station we consider the owner's analysis to have understated the costs of continued operation and conclude that the closure criterion is satisfied not only for Unit 5 but also for the whole power station. For Tilbury Units 7 and 10 the closure criterion is satisfied only when the units are assumed to operate at low load factors (i.e. below 10 per cent). These conclusions are drawn from our analysis (see Section 4) which is based on a view that there is unlikely to be a long-term future for the majority of the existing coal-fired plant - a view which we consider to be reasonable in the prevailing circumstances.
- We consider it to be impracticable for an incumbent generator and third party jointly to operate units at a power station. We consider it to be more practical for a third party to own or lease a unit and for operation to be retained by the incumbent generator through a tolling agreement. We also consider that the negotiations required to form a tolling agreement may be quite involved and prolonged.
- We consider continued operation of Ferrybridge Unit 4 and Tilbury Units 7 and 10 to have positive net present values of the cash flow for a third party, as derived from our analysis (see Section 7) which is based on a view that there is a long-term future for existing coal-fired plant - a view which may be held by a third party. We consider the continued operation of Willington Unit 5 and station to have no positive net present value to a third party; however, if it were to be made available, the Willington site may be of interest to the incumbent generator or third party for the development of a new station.
- We consider that there is an economic case for a tolling arrangement for some units notified for closure, and the entry of a third party may increase competition in the market for generation; but the details of the tolling contract may erode some of these opportunities and benefits. Hence we would expect a third party to consider a tolling agreement for part operation of a coal-fired station as a second best alternative when compared to an option to re-develop a whole coal-fired station.
- We consider that, in general, the economic viability of one unit is closely linked to the other units at the station. Hence, we would generally expect all units at one station to close before the closure of units at another station. We would only expect partial closure of two or more stations simultaneously in the presence of exceptional circumstances at each of the stations. It may be of benefit for future closure notifications to include the impact of any exceptional circumstances within the economic analysis, both for the unit(s) notified for closure and for the power station as a whole.

**A. ABSTRACTS FROM STATEMENTS PURSUANT TO LICENCE  
CONDITION 9A**

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CONDITION 9A**

**National Power**

“Generating Unit Closures

*The Company’s policy is to close a Generating Unit permanently at the point at which it believes that the present value of its expected net contribution to Company profits is insufficient to justify the company resource needed to keep it operational.*

*Net contribution is defined as:*

- *capacity income*
- *additional company production costs resulting from closure of the Unit*
- *relevant costs of closure*
- *relevant costs of keeping the Unit open.*

*The Company’s policy is to close a Generating Unit temporarily if it believes that the present value of the expected net contribution to Company profit arising from temporary closure is greater than the present value of the expected net contribution arising from keeping the Unit open and sufficient to justify the company resource needed to manage it.*

*Net contribution from temporary closure minus net contribution from keeping the unit open is defined as:*

*capacity income*

*plus additional company **production** costs resulting from non-availability of the Unit*

*plus costs of temporary closure*

*minus costs of eventual reinstatement.*

Reduction in Capacity

*The Company will declare to the National Grid Company the maximum economically justifiable capacity for each generating set which can be sustained on a continuous basis without unacceptable risk to plant or personnel. ” (National Power 1992)*

**PowerGen****“Closure**

*In determining its policy regarding the closure, whether permanent or temporary, of any Generating Units, the Company periodically reviews the prospects for revenues and costs of each of its Generating Units, and, where this indicates that plant is or is expected to become uneconomic, it carries out a detailed study of the commercial case for closure; taking account of the direct and indirect financial implications for the Company.*

**Reduction in Capacity**

*In determining its policy to make reductions in the capacity of any Generating Unit, the Company has regard to the proven output capability and physical condition of the plant and assesses commercial effects of such changes, particularly the scope for cost savings in relation to the revenues of that Generating Unit, ” (PowerGen 1993)*