

NATIONAL GRID COMPANY plc¹

APPENDIX TO THE RESPONSE TO OFGEM OPEN LETTER ON EXTENDING NGC COMPANY'S TRANSMISSION OWNER PRICE CONTROL FOR 2006/07

I Overview

- 1 NGC welcome the opportunity to respond to PB Power's Technical Evaluation of our proposed capital expenditure programme. We recognise that our proposed capital programme represents a significant increase in capital expenditure, and that it is appropriate that PB Power, acting on behalf of the Regulator, should seek to challenge our assumptions to ensure that the proposals represent an efficient level of expenditure.
- 2 However, we believe that there are a significant number of areas where PB Power have either misunderstood the issues or have carried out an inappropriate assessment of our capital plan.
- 3 Given the importance of a safe and reliable transmission system to the prosperity of the UK, and its role in accommodating a diverse energy supply and facilitating the energy market, it is essential that both PB Power and Ofgem understand the full details of our capital programme. **We believe that, in order to provide the quality of transmission system that the country requires, these issues need to be urgently addressed, as the range of mini review allowance which is being mooted by Ofgem would not be sufficient to allow NGC to invest in accordance with its licence obligations and to pursue the replacement policies of a prudent transmission operator.**
- 4 As outlined in the covering response to Ofgem's open letter, we believe that there are a number of serious errors or omissions in the assessment of our capital plan. These are addressed in more detail in this appendix, and are summarised as follows:
 - (a) that the report does not recognise the detailed condition-based information on specific assets that drives the need case for our asset replacement in this period (this at the same time that Ofgem continually assert the need for replacement capex to be based on condition of assets);
 - (b) the omission of an allowance for a major category of overhead lines expenditure ('fittings-only' schemes) which is essential to the delivery of the most economic solution of managing overhead lines assets;
 - (c) the unjustified reductions made to load-related expenditure in respect of generation, exit and reactive compensation schemes;
 - (d) the inadequate appraisal of the resources available to NGC to manage and engineer the forecast levels of capex. This does not recognise the full range of resources available to NGC and the advanced plans that are in place within NGC and its suppliers to deliver the programme. This appraisal is then used as a basis to create the implausible Low scenario; and

¹ On July 27 NGC Company plc changed its name to NGC Electricity Transmission plc. All references in this document to NGC Company plc (NGC) refer to the entity now named NGC Electricity Transmission plc.

- (e) the flaws in the both the Low and High scenarios, of which Ofgem use the Low scenario to inform their view on the allowance for NGC for 2006/07.

5 This appendix is divided into three parts, as follows:

- First, we address each of the above issues in more detail and, in particular, consider the implications if NGC were to curtail its capital expenditure, over the mini review period, to the level proposed by PB Power's Low scenario. **We conclude that such a curtailment of expenditure would have serious implications for the reliability of the transmission system in the long term, and our ability to keep pace with the requirement to replace network assets;**
- Second, we provide further comments on PB Power's report, in particular on their modelling of asset replacement requirements in the longer term. **We believe that this modelling is seriously flawed, and omits to recognise the need to replace assets in the main review period that have been deferred from the mini review period.** This issue should be discussed as a matter of priority as part of the main review, but should also be addressed in the shorter term in order to provide the appropriate signals to our suppliers. This section also provides some more general comments on the Security and Quality of Supply Standards in response to a statement made by PB Power in their report.
- Finally, in a confidential section, we provide further evidence for the validity of our load-related assumptions and the capital plan required to facilitate them. This is presented in a confidential appendix as it relates to individual customers, and so is commercially confidential.

II Detail of our most significant concerns

- 6 This section addresses our most significant concerns, as outlined in our covering response to Ofgem's open letter, taking each in order as they are set out in that response.

Assessment of non-load-related expenditure

- 7 To assess our proposals for non-load-related capital expenditure in the mini review period, PB Power compare our capex projections to the outputs of PB Power's model. However, this approach, does not recognise that, **for the mini review period, our capital plan is made up of individual schemes, each backed by detailed condition assessment.** Whilst we welcome the fact that, with the exception of overhead lines, PB Power's View is that all of our proposed capital expenditure, in this period, is required, by adopting such an approach, PB Power have not properly assessed the impact on these individual schemes of their Low scenario.
- 8 Our approach to determining the need for asset replacement uses the ALERT model to determine the likely volume of assets requiring replacement **over the medium to long term**, in accordance with NGC's detailed asset lives and asset management policies. Our forecast expenditure for the period beyond 2007/08 is currently based on such model outputs, and PB Power's modelling, in general, agrees well with our own modelling for the replacement that is required.
- 9 However, in determining our capital plan (i.e. what specific schemes will be undertaken), we assess individual need cases for replacement, based on detailed condition assessment of the individual assets. For overhead lines, for example, this condition assessment includes detailed visual examination of the overhead lines, fittings and towers, and assessment of the physical strength of the individual conductors. Similarly, for each asset type, specific analysis is carried out, relevant to that asset type, to determine the replacement requirements of that asset. This allows us to prioritise the capital plan, focusing on the individual assets most in need of replacement, and to tailor each individual scheme to the condition of specific assets (for example, carrying out fittings-only replacement on overhead lines, rather than full replacement where this is the economic solution).
- 10 For the mini review period, our capital plan consists of such schemes, backed by individual condition assessment. The outputs of the probabilistic models can then be used to further validate that our scheme specific replacement programme is sufficient to meet long term replacement requirements, ensuring that condition of the asset base is acceptable and the forward work programme is manageable.
- 11 PB Power's analysis does not recognise the weight of condition based evidence that supports the individual schemes that make up the capital plan for the mini review period. For overhead lines in particular, this presents a serious issue. PB Power's View, based on their model output, fails to recognise the costs associated with the particular prioritised schemes in the mini review period, and completely omits a major element of expenditure in the fittings-only schemes. This has resulted in PB Power suggesting an unrealistically low allowance in their View which does not properly assess the validity of the schemes in our plan.
- 12 For the other elements of non-load-related expenditure, whilst PB Power's View is that our forecast is appropriate, their approach, based on modelling rather than the assessment of the validity of the individual schemes, allows them, for the Low scenario, to arbitrarily suggest that a 20% reduction in expenditure is feasible. Indeed, this flawed approach is illustrated in the statement made by PB Power "that modelling results tend to be optimistic in forecasting requirements for NLRE (an operator may take the opportunity to rationalise and so replace at lower cost)", and

use this as a rationale for their low scenario². This clearly ignores the fact that NGC's plan is not based on modelling but on individual schemes, **in which such rationalisation, including the ability to secure the transmission outages and resources to deliver the required investment, has already been taken into account.** A fuller response to PB Power's Low scenario, and its implications, is presented later in this section.

Overhead lines

	NGC forecast		PB Power view	
	05/06 (£m)	06/07 (£m)	05/06 (£m)	06/07 (£m)
Overhead lines	119.3	140.8	83.8	94.6

- 13 PB Power's assessment of overhead line expenditure has completely omitted to assess the significant amount of expenditure that we propose to undertake in replacing the fittings associated with overhead lines. This omission is a function, in part at least, of PB Power's approach, which does not provide an assessment of the individual schemes, as discussed above.
- 14 NGC's overhead line conductor asset life profiles assume that the fittings are replaced in accordance with the condition of the fittings. If the overhead line fittings are allowed to deteriorate, and are not replaced in a timely manner, they will damage the conductor such that the lives of the conductors themselves are reduced. In other words, the earliest onset of significant unreliability for overhead line conductor becomes related to damage caused by time-expired fittings. If this was allowed to happen, full refurbishment of the overhead lines would be required before the full life of the conductor had been utilised. This would be clearly uneconomic.
- 15 In order to demonstrate this impact of this, we have re-modelled the overhead line replacement volumes in ALERT assuming that fittings-only schemes are not used to achieve the full potential life of conductors, i.e. with shorter lives for some overhead lines. The result of this is that the volume of conductors requiring replacement (i.e. full refurbishment) over the period to 2007/08 more than trebles to 2,379 circuit km (£671m at £281.9k per circuit km).
- 16 PB Power assert that "if an allowance was to be made for fittings-only refurbishment and considering that the latter would be applied to fully greased conductors, the proposed expenditure allowed would be reduced". In saying this, PB Power have missed the fact that fittings-only expenditure is in addition to, not substituted for, full refurbishment because the fittings have shorter lives than fully-greased ACSR. **In not considering these assets in such a manner, a complete category of non load-related expenditure has been omitted.**
- 17 We believe that it is clear that the most appropriate course of action is to replace the fittings in a timely manner, such that the full asset life of the conductors can be utilised. It is important, therefore, that PB Power should address this issue by assessing the individual schemes and their supporting information, and we would urgently seek further discussions with PB Power on this issue.
- 18 Further, as discussed above, the use only of modelling in relation to the mini review period results in PB Power failing to properly assess the full replacement schemes.

² Pages 57 and 58, PB Power report

This, along with inappropriate modelling and unit cost for tower replacement, which we discuss in more detail in the “Further Comments” section, leads to PB Power significantly underestimating the capital expenditure required in that period to deliver NGC’s prioritised, condition assessment backed schemes. Indeed, even the High scenario is below our planned expenditure, clearly failing to recognise the validity of the schemes. **We request that PB Power assess the requirements of the individual schemes urgently.**

Load-related expenditure

	NGC forecast		PB Power view	
	05/06 (£m)	06/07 (£m)	05/06 (£m)	06/07 (£m)
Infrastructure	124.8	174.6	101.0	153.4
Exit	87.1	101.4	74.0	76.0

- 19 PB Power’s arguments for the reduction in load-related expenditure are weak and do not appropriately recognise the drivers for load-related investment. We believe that the assumptions which we have made for the generation and demand background are extremely robust. This is, not least, because of the short timescales for any significant changes. The whole issue of forecasting load-related capex over a full five year price control period is fraught – and this is why we are keen to engage with Ofgem in finding suitable mechanisms for dealing with such uncertainties. However, for the mini review, we are only talking about a period of up to 19 months from now
- 20 We are disappointed that PB Power have stated that very little detail has been provided to support our load-related projections, as we have responded to all questions from PB Power on this issue and have given further information in presentations. We outline below the reasons why we believe that our forecasts remain valid, and why PB Power’s View is unrealistically low.

Exit Expenditure

- 21 On exit expenditure, PB Power first discuss at length the levels of utilisation of NGC’s transformers. This section implies that we have a degree of discretion over the level of expenditure which we do not, and that the increases in transformer utilisation over the period do not support NGC’s capital plan.
- 22 However, the driver for exit expenditure is not the utilisation of transformers, but applications for reinforcement or new transformers from DNOs and other demand customers, backed up joint assessment by ourselves and DNOs to ensure that the investment is required to meet security standards. We are obliged by Condition C8 of our transmission licence to offer terms to any party requesting connection to the transmission system. It is appropriate, therefore, that:
- (a) NGC’s requirement for expenditure on exit schemes is assessed against this obligation, and the level of connection applications, rather than against utilisation data; and
 - (b) NGC is appropriately funded for complying with this obligation.
- 23 For 2006/07, PB Power consider an allowance of £76m to be more appropriate than NGC’s submission of £101m, due to the likelihood of certain Exit schemes not coming to fruition. This allowance is approximately 75% of the expenditure required to accommodate the connection applications received by NGC.

- 24 There are at least two reasons why this ratio is not rooted in sound analysis:
- (a) This figure is inconsistent with the historic evidence of exit schemes as presented in the report, which states that historically 84% of exit schemes have been completed to the original requested timescales. On this basis alone, we see no justification, therefore, for arriving at a figure of 75%³.
 - (b) Whilst we acknowledge that there is some uncertainty over the progress of customer driven expenditure, we believe that it would be entirely unreasonable to assume even the true historic average of 84%. This is because, as stated by PB Power, of the 7 schemes that historically did not go ahead to the original timescales, 6 were due to consent difficulties. All of the current applications made by customers can be accommodated without new consents or planning permissions, and therefore will not be delayed for consents reason.

25 It is therefore our view that **the evidence supports the need for expenditure of at least £101m.**

26 Indeed, as discussed with PB Power on a number of occasions, we continue to receive applications from DNOs such that our expenditure in 2006/07 could exceed £115m. On this basis, we believe that the submission of £101m is conservative. As we have discussed this with PB Power, we would have expected PB Power's High view to have reflected at least some of this potential additional expenditure.

Infrastructure expenditure

27 For infrastructure expenditure, PB Power have suggested that our expenditure will be reduced by £9m and £21m in 2005/06 and 2006/07, respectively, by changes in the assumed generation background. Given the potentially confidential nature of these assumed changes, we discuss this further in the confidential appendix. However, as explained in that appendix, we believe that the background is extremely robust, with a high degree of certainty.

28 Further, PB Power suggest that £21m of planned spend on reactive compensation is not required. Our view is that NGC's reactive compensation requirements are based on meeting the deterministic minimum transmission capacity requirements contained in the SQSS and that we have demonstrated to PB Power why this is the most economic means of achieving compliance with SQSS. PB Power have acknowledged this in our meetings with them, but suggest in their report that this expenditure will be deferred. Were this to be the case, we would need to apply for derogations against our planning standards for the areas of non-compliance. However, derogations would not themselves prevent voltage collapse.

29 PB Power have concluded that unsanctioned schemes in 2005/06 are unlikely to come to fruition in the indicated timescales, due to the time required to accommodate transmission schemes. This is not correct. Our current sanctioning timetable will support the identified expenditure, much of which will take place in 2006/07, albeit with some front-end spend in 2005/06.

30 **On the basis of all of the above, we believe that our forecast remains appropriate and that PB Power's proposed allowance is unrealistically low.**

³ The only way of arriving at a figure as low as 75% would be to take the level of *historic* completed schemes as a percentage of the total *historic and future* schemes. This is clearly a flawed statistic, and does not represent a *historic* average rate of scheme completion to time.

Resources

- 31 Part of PB Power's justification for reducing the proposed allowance for NGC, particularly in the long term, is that sufficient resources, both within NGC and from suppliers, will not be available. However, PB Power have inadequately appraised the resources available to NGC to deliver the capital plan, and have not recognised the efforts of NGC and suppliers to increase the resources available to deliver the necessary increase in capital expenditure over the medium to long term.
- 32 For **internal resources**, PB Power present their view of a "more attainable" level, without any justification⁴. In this analysis, they do not explain why their view of our ability to deliver capex per FTE should fall from that of 2004/05 to 2005/06, or why it should fall from 2006/07 to a level for 2007/08 and 2008/09 which is lower than that actually delivered during the period 2001 to 2004. This analysis also fails to take into account the above-inflation increases in materials and construction costs over the period presented, or the differences in schemes being delivered in the different years. This analysis also completely fails to take into account the full range of resources available to NGC through its suppliers. **In summary, we believe that PB Power's analysis is not robust, and is an inappropriate way to determine our ability to deliver the capital plan.**
- 33 With regard to **suppliers**, PB Power mention our drive to increase supplier capability, but subsequently discuss it no further. This work to increase this capability is a vital part of our plans both now and in the future. We recognised that suppliers would require increased capabilities to deliver the volume of work that our modelling implies. Over a significant period, we have been communicating our future requirements to suppliers in order to allow them to recruit accordingly. For example, in 2005, three supplier forums have been held, at Director level, with all of our major suppliers. At these, we have presented our forecast expenditure going forward, illustrating the need to increase the level of supplier resources in order to deliver this increased workload. In response to the challenges ahead, both we and our suppliers have started recruitment.
- 34 PB Power's modelling broadly agrees with ours in terms of the overall volumes of assets that will require replacement in the forthcoming mini review and price control periods. Our plans to place some of this work in the main review period, rather than the mini review period, recognise the fact that the resources are not available in the mini review period to deliver the full volume as predicted by the model. However, by always choosing the lowest of their view and our view in any one year, PB Power's report does not acknowledge that this backlog of work from the mini review period will need to be delivered in the main review period. We are extremely concerned that, by concentrating on identifying wherever possible the lowest level of expenditure possible in **each** of the years to 2011/12, the report sends a signal to suppliers that lower volumes are required, when their modelling suggests volumes similar to those forecast by NGC. **There is a serious risk that sending such a signal fails to provide our suppliers with assurances that they need that the work will be forthcoming and resource adequately.**
- 35 By both delaying these signals and agreeing in principle to the volume of work which we perceive from our modelling as necessary, PB Power and Ofgem risk creating a step change in future resource requirement that our suppliers will not be able to meet within the necessary timescales. **Indeed, if this negative signal from PB Power and Ofgem was carried over into Ofgem's mini review proposals, this would be a significant constraint on our and our suppliers' ability to deliver the required**

⁴ Figure 4.10, page 55, PB Power report

levels of asset replacement, and would place at risk our plans to work with suppliers to ramp up the availability of resources.

PB Power Low and High scenarios

Low scenario

- 36 Ofgem, in their open letter, suggest that the allowance for NGC for the mini review period should be somewhere between PB Power's Low scenario and a lower figure, based on the average expenditure over the last price control. **We believe that, were we to only spend at a level defined by PB Power's Low scenario or lower, there would be serious implications for the transmission system.** This section seeks to highlight some of those implications and demonstrate that it would provide an entirely inappropriate allowance.

Load-related expenditure

	NGC forecast		PB Power Low scenario	
	05/06 (£m)	06/07 (£m)	05/06 (£m)	06/07 (£m)
Infrastructure	124.8	174.6	101.0	115.1
Exit	87.1	101.4	64.5	64.5

- 37 For **exit** expenditure, PB Power's Low view is based on nothing more than a view of historic levels of expenditure, albeit that PB Power themselves note that this would be unlikely. There is no good reason why an average of spend over the last few years (in which annual spend varied between £55m and £81m) should be a good predictor of requirements in the specific years 2005/06 and 2006/07. As discussed with PB Power, a much better predictor of expenditure has been, and would be, the level of applications from customers. For exit, the current level of applications is running well above the recent historic level. **It would, therefore, clearly be unacceptable to set our revenue, in this area, on the basis of the Low scenario.**
- 38 For **infrastructure** expenditure, the PB Power Low scenario assumes that several generation projects, assumed in our plans, will not proceed to the planned timescales, in spite of the fact that these projects have put up financial commitments with respect to connecting to the transmission system. Historic evidence shows that, when companies have put up these financial commitments, they are very likely to proceed with the projects on the intended timescales. The Low scenario flies in the face of this evidence. (Further detail on this point is given in the confidential appendix.) **Therefore, to base our revenue in this area on the Low scenario would be in direct contradiction to available evidence and to financially-backed customer requirements. Without the necessary revenue in the mini review period, investing to meet these requirements would therefore mean that we would earn a lower rate of return than Ofgem have themselves deemed as reasonable, that is unless a TIRG-type mechanism was used to provide the necessary revenue in the event of the relevant specified generation projects going ahead.**

Non-load-related expenditure

	NGC forecast		PB Power Low scenario	
	05/06 (£m)	06/07 (£m)	05/06 (£m)	06/07 (£m)
Transformers	13.2	19.5	10.6	15.6
Switchgear	25.9	35.8	20.7	28.6
Overhead lines	119.3	140.8	67	75.7
Underground cables	30.3	55.2	24.2	44.2
Protection and Control	28.9	32.7	23.1	26.2

- 39 For non-load-related expenditure, PB Power have proposed an across-the-board 20% reduction from their View, on the basis of:
- (a) unsanctioned schemes in the current price review period which have not been progressed;
 - (b) unit costs for transformers and switchgear which imply betterment which may not happen; and
 - (c) company policy on prioritising schemes.
- 40 With regard to unsanctioned schemes, whilst there were schemes forecast at the last price control that did not go ahead, these schemes were replaced by new schemes, resulting in a significant capex overspend during the current price control period. Given this overspend, this cannot be used as a reason to predict a reduced level of capex. With regard to unit costs for switchgear and transformers, our plans do not reflect betterment. We discuss this further in the section below. With regard to our policy and the prioritisation of schemes, as discussed above, our capital plan is based on actual schemes which have already been prioritised according to the individual needs of the assets. We do not believe, therefore, that the reasons quoted in the report justify the 20% reduction from PB Power's View.
- 41 In the rest of this section, we comment on the implications of the Low scenario for the individual categories of spend.
- 42 For **overhead lines**, NGC is committed to deliver 17 schemes in 2005/06, 13 in 2006/07. In addition, we plan to carry out detailed pre-sanction engineering on 20 future schemes and to incur pre-spend on 2007/08 schemes. By the end of September 2005, all of the OHL schemes in the capital plan for 2005/06 and 2006/07 will have been sanctioned and we will be fully committed to deliver.
- 43 It would be unwise to reduce the overhead line capex commitment in this period to a level indicated by PB Power's Low scenario, as this would directly impact on our ability to maintain public safety and would increase the risk to system security. This is because each of these schemes is urgently required and is based upon detailed condition assessment information and pre-sanction engineering (PSE), and has been prioritised by NGC due to the poor condition of the existing equipment. Some of the reasons for the need to carry out the overhead line works are listed below:
- (a) On many of the routes (e.g. Swansea North-Pembroke, Chesterfield-High Marnham, Cowbridge-Pyle), conductor failure has already occurred, forcing major unplanned outages to carry out repairs.
 - (b) Worn fittings have resulted in damaged conductors which, if left unremedied, will shorten the life of the conductors.

- (c) Dampers and spacers have fallen from towers, presenting a risk to the safety of both NGC staff and the general public.
 - (d) The condition of some towers is such that they cannot be climbed safely without remedial works.
- 44 All of the schemes proposed by NGC are backed by such compelling condition information that we do not believe that any of these schemes should be deferred. Indeed, we are contractually committed to spend virtually all of the £119m forecast for 2005/06, and may indeed spend more. For 2006/07, we have already sanctioned more than PB Power's View. NGC fully expect to sanction at least as much as the £141m forecast in its business plan for 2006/07.
- 45 In addition to the implications of delay for individual schemes, any delay of these schemes would impact on the delivery of schemes in the future. The work is carefully programmed alongside other work and requires lengthy outages with long restoration times. This type of outage window is difficult to achieve and, as a consequence, if delayed, some outages may not be available for several years, thereby lengthening the period before replacement and increasing the risks to safety and system security. For example, on the South Coast, it is only possible to take one circuit out for replacement at a time. The programme to replace the overhead lines on the South Coast will take a number of years. Whilst a short delay to one of the early schemes would only result in a slight increase in risk of unreliability, if schemes planned for the back end of the programme are delayed further, the risk of unreliability is greatly increased in future years. It is vital, therefore, that the programme to deliver replacement of the overhead lines is not delayed if the future reliability of the system is not to be jeopardised.
- 46 For **switchgear**, we are in agreement with PB Power that planned switchgear replacement in this period (i.e. 2005/06 to 2006/07) is significantly below levels required to maintain the integrity of the asset base, because of resource constraints, requiring significant catch-up over the period 2008 to 2011. A 20% reduction from those plans would only exacerbate this situation. NGC is investing significantly in OBR60 refurbishment during 2005/06 to 2006/07, to offset the shortfall in replacement work and remove £92m of expenditure from the next review period. The 20% reduction would put at risk this type of **refurbishment** investment, and force further increases in switchgear **replacement** requirements during the next Price Review Period.
- 47 The older air-blast circuit breakers, which make up the majority of our **replacement** plans in the mini review period, have the highest replacement priority on safety and reliability grounds. These are supplemented by replacement of some oil-circuit breakers in very poor condition, for example at Littlebrook where the need case is compounded by the substation infrastructure, presenting safety risks to site access and restricting maintenance. As the switchgear replacement schemes generally span three or more years, much of the expenditure in 2006/07 is continuation of work commenced in earlier years, leaving limited opportunity for deferral. The need cases for replacement schemes commencing in 2006/07 are supported by forensic evidence from decommissioned assets and asset failures. Given these compelling need cases, it would be extremely unwise to delay these schemes, particularly as we have had to establish risk management zones around a number of types of air-blast circuit breakers, following destructive failures at other sites. Having deferred the replacement of these assets during the current price control period, it will not be possible to defer them further, as to do so would seriously impact on the safety and reliability of the system.
- 48 Further, part of PB Power's justification for the 20% reduction is their perception that our weighting of costs between GIS and AIS imply some element of betterment. As discussed with PB Power, our plans to replace using GIS switchgear are driven by the

needs of individual sites. For example, our policy is to replace with GIS switchgear where there are high pollution levels, where space in the substation is at a premium, or where there are visual amenity issues. In addition, the need to install GIS equipment is also driven by the preference of the DNO. Where the DNO uses GIS, where space is at a premium, we are also required to use GIS in order to interface with the DNO equipment. Therefore, the assumption that all replacement will take place using AIS is impractical.

- 49 For **cables**, our plans are based on historic and projected cable system performance, measured in terms of availability (operational performance) and oil-loss (environmental performance), weighted according to the criticality and environmental sensitivity of the circuit. We will need to manage the operational and environmental risks of operating oil-filled cable circuits for the next 50 years. In addition, this is a technology rapidly reaching obsolescence and there are significant risks associated with the skills and materials available for repairs, exacerbating operational risks. Given these risks, combined with the rising trend in failures and the strategic location of much of our cable network, it would not be prudent to defer expenditure in this asset class.
- 50 Replacements of three cable circuits are due in 2007 and 2008, namely Kirkby – Lister Drive 1 (275kV), the BICC section of the Bustleholm–Nechells 1 & 2 (275kV) and Bramley-Dicdot 1A & 2A (400kV). All suffer tape-corrosion, a problem with no remedial options. These circuits are all expected to be replaced, using direct buried XLPE cable, introducing new manufacturers to the UK market - and work is already underway to ensure that this new technology is applied to our system with due caution and is, therefore, appropriately phased.
- 51 Deferral of any of this expenditure would result in additional system and environmental risk and would impact on the future replacement programme beyond this. All these circuits are pre-1973 BICC cable, which is well known for tape corrosion, resultant oil leaks and unplanned outages. Given system and environmental drivers for the works, we do not believe it wise to defer 20% of expenditure in this period.
- 52 **Protection and control** investment is driven by the need to prevent mal-operation, which can lead to plant failure and major transmission incidents, and the incorrect operation of Delayed Auto Re-close when the transmission system is most vulnerable. Control investment is driven by the need for reliable control of remote equipment. This is vital for post-fault system restoration and for 'black-start' conditions. Correctly operating protection and control equipment is essential to the resilience of the network, and plays a key part in preventing system collapses of the type seen in North America in 2003.
- 53 Protection and control replacement volumes are dependent on system access and availability of skilled resources. Therefore, if schemes were deferred in this period, there would be limited opportunities to 'catch up' with the replacement programme. PB Power's volumes for replacement exceed those planned by NGC (although some of this difference is explained in the "Further Comments" section of this appendix). Given all of this (i.e. both the limited opportunities to catch up and the consequences of failure), we cannot understand how PB Power can suggest that a 20% reduction in expenditure could be achieved, consistent with us meeting our licence obligations.
- 54 For **transformers**, the majority have not yet reached end of life. For the mini review period, **all transformer replacement schemes relate to transformers with design weaknesses and individual defects, and have the highest replacement priority.** All of these schemes are based on compelling **individual** need cases. For some transformers, it has been necessary to establish special risk management measures to ensure safety of staff and contractors on site. Forensic evidence from the stripdown of transformers deferred to the current year has provided compelling

evidence that this risk management strategy is essential. Given this, it is unreasonable to assume that these schemes could be delayed.

- 55 Deferral of the replacement of these assets would seriously impact on the reliability of supplies provided to customers through these transformers. As with switchgear, PB Power argue that our unit costs imply betterment, specifically quoting our costs for 275/132kV transformers, which make up 60% of our planned replacement in the mini review period. PB Power compare the costs from our mini review submission with the costs shown in TR3. However, as we have discussed with PB Power, we do not use TR3 in the costing of schemes, as these costs do not take engineering costs and site complexities into account. A more appropriate comparison should be to PB Power's own costs for transformers. We cannot understand why PB Power feel that there is an element of betterment as, for the assets being replaced in our plan, PB Power's unit costs agree closely with our own. Given the compelling need cases and the close agreement of unit costs, the Low scenario of a 20% reduction in the mini review period is unrealistic.

High scenario

- 56 Whilst clearly our main concern is with the Low scenario, which Ofgem use to inform their view on the allowance for 2006/07, we are also concerned about the approach taken to derive the High scenario. We do not believe that the High scenario represents PB Power's genuine view on the potential capex requirement. By capping the high scenario at NGC's forecast level, this presents an uneven view of PB Power's assessment of NGC's capital plan, suggesting that it lies at the top end of PB Power's view. In reality, there are a number of individual areas where PB Power's assessment would lead to a higher level of capex than NGC propose. These are not reflected in the High scenario.
- 57 For load-related expenditure, PB Power acknowledge that we have received more applications from DNOs than are reflected in our submission, such that expenditure could be higher than our forecast. However, the High scenario is then arbitrarily set at the level of NGC's forecast, rather than reflecting the true potential high scenario.
- 58 For non-load-related expenditure, PB Power's modelling shows higher volumes of replacement of transformers, switchgear, protection and control and other substation assets than we propose to carry out in the mini review period. In some cases, PB Power forecast a significantly higher requirement for expenditure. As explained above, this difference is because our submission is based on actual schemes, taking into account resource and outage constraints. Despite this higher level forecast by PB Power, the High scenario is capped at the NGC forecast level, apart from overhead lines which are capped at PB Power's View.
- 59 **The impact of this arbitrary approach to developing a High scenario is to skew the location NGC's forecast, relative to a reasonable High scenario, suggesting our forecast is more towards the high end of PB Power's forecast than is really the case. Our capital plan is a balanced view of our likely capital expenditure, taking into account both our ability to deliver expenditure, and the likely slippage in load related investment.** A more consistent High scenario would provide a more balanced comparison between NGC's forecast and PB Power's range of views.

III Further comments on PB Power report

60 This section contains further comments on PB Power's report that have not been addressed earlier in this appendix. The section comprises:

- (a) an update on our sanctioning of schemes for 2005/06 and 2006/07;
- (b) further analysis of issues for individual asset types that relate to the mini review period;
- (c) further analysis of the period beyond 2006/7; and
- (d) comments on PB Power's expressed view of the role of security standards in determining required investment by NGC.

Sanction Status

61 PB Power's report makes a number of references to the sanction status of the schemes in our capital plan. However, the figures quoted relate to the sanctioned status as of May 2005. Since then, we have continued to sanction expenditure for 2005/06 and 2006/07, such that the sanction status, as of August 2005, shows a significantly different picture to that presented by PB Power.

62 All material capital expenditure is sanctioned by the Transmission Project Sanctioning Committee, an executive level body chaired by the Transmission Chief Executive. The committee sanctions works on the strength of the need case, and rigorously challenges the scheme brought to it for sanction, and is the most critical stage of NGC's governance of capital expenditure. For nearly all projects, scheme sanctioning is a key indicator that the scheme will go ahead as development work has been carried out and as finances and resources have been committed to the delivery of the project. Most schemes are sanctioned around 12 to 24 months ahead of major works beginning on site, so that major contracts can be agreed and placed and detailed site planning can be carried out.

63 From the capital plan perspective this means that a high proportion of current year (2005/06) capex will be sanctioned. By August 2005, any remaining unsanctioned expenditure in the current financial year will tend to reflect costs that will be incurred through materials purchase and detailed planning for schemes being delivered in 2006/07 or later, rather than through site construction activities.

64 NGC is on track to deliver an increased level of capital investment during 2005/06 and 2006/07, compared to recent years. This is reinforced in the table below.

	2005/06	2006/07
NGC Business plan forecast (excl. contributions)	£476m	£628m
Total Forecast Capex at 12 th August	£491m	£701m
Sanctioned level at 12 th August	£480m	£465m
Sanctioned as % of BPQ forecast	>100%	74%
Committed Level	£263m	£65m

65 The table above demonstrates that National Grid's executive committee is committed to deliver more than our forecast expenditure for 2005/06, and is well progressed in committing to the forecast level of expenditure for 2006/07. **Indeed, the sanctioned level for both years is already significantly higher than the levels proposed by**

Ofgem, reinforcing our view that the allowance proposed by Ofgem, informed by the PB Power Low scenario, is unrealistically low.

Comments on mini review period

Overhead lines

- 66 As discussed in the “Main Comments” section, of the assessment of overhead lines completely omits the fittings-only work. This issue has been addressed earlier in this appendix. **In addition, we believe that PB Power’s assessment of the full replacement and tower replacement work is flawed, and should be addressed urgently.**
- 67 As discussed earlier, PB Power’s view of overhead lines expenditure for the mini review period relies heavily on their modelled volumes, despite the fact that NGC’s submission is based on actual schemes, the requirement for which is supported by detailed condition information. PB Power have based their allowance for full replacement of overhead lines on the outputs of their model, resulting in an allowance based on the replacement of 811 circuit-km of line. However, our business plan is based on actual schemes, which by their very nature, are “lumpy” in terms of the amount of circuit replaced. PB Power should, therefore, base their proposed allowance on their view of the validity of the individual schemes, not on the output of the model.
- 68 For towers, PB Power have modelled the asset replacement of towers according to the 1999 version of EPS 12 (Issue 1). We acknowledge that this is the only way that PB Power could have modelled towers, but would point out that this does not take account of NGC’s revised view of the condition of towers, and the work done by NGC to extend tower lives. Because of this, **PB Power’s model vastly overestimates the volume of towers to be replaced.** That said, **PB Power’s unit cost for replacement is unrealistically low at £19.5k per circuit km of towers,** or £39k per route km (i.e. ~3 towers). This is barely enough money to paint three L6 towers and, if spent on steelwork replacement, would equate to, at most, around 1 tonne of steel per tower, or less than 5% of the tower. As PB power’s modelling represents towers at the end of their life and requiring full replacement, this unit cost is completely inadequate to allow for replacement of a tower. **We believe that a more realistic cost would be £500k per route km for three new towers, assuming that these works coincided with a re-conductoring scheme.** This would rise to £750k per route km if the conductors had to be written-off before the end of their technical and financial lives.
- 69 The combination of PB Power’s incorrect modelling of towers, and use of modelling of conductor replacement rather than an assessment of the individual schemes, means that PB Power have underestimated the expenditure required on lines and tower replacement by around £30m in 2006/07, in addition to the omission of the fittings-only schemes. **Given these discrepancies in PB Power’s modelling, we would request that PB Power urgently review their analysis, and base this analysis on a review of the validity of the individual schemes in the plan.**

Transformers

- 70 PB Power broadly agree with NGC’s replacement volumes for transformers over the period to 2007/08, and correctly identify the reason for the shortfall between their modelling and Table 2.4 of our business plan submission as transformers to be replaced under schemes 00Z103 Transformer deployment replenishment and 015497 Condition driven SGT replacement. These schemes do not have specific transformers assigned as the first is to cater for the replenishment of strategic spares deployed in response to failure and the second is to accommodate accelerated

replacement of a number of transformers which are expected to deteriorate over the period.

Switchgear

- 71 PB Power's modelling for the period to 2007/08 suggests that NGC should be replacing more switchgear than we actually plan to do. In actual fact, our modelling broadly agrees with PB Power's modelling. However, we are deferring the replacement of a number of items of switchgear in this period. We acknowledged that this would be the case in our BPQ submission. In total, the difference between PB Power's modelling and the amount of switchgear planned to be replaced in NGC's schemes is 131 items of switchgear.
- 72 We have deferred the replacement of this switchgear for a number of reasons, not least because the need to accommodate additional load-related expenditure in the present period has diverted resources from replacement work. PB Power have acknowledged that our present investment plan will result in a backlog of switchgear replacement. We would not accept the argument that deferred investment in 132kV switchgear is because the equipment is "still performing an acceptable level of service". Indeed, we have experienced destructive failures of switchgear during the current period. For this reason, the equipment for which replacement has been deferred out of the 2005-2008 period will still require replacement in the period beyond 2008.
- 73 In addition, we have extended our refurbishment capability and programme during the current price control period to include selected OBR60 and OHBR140 circuit breakers, allowing deferral of the replacement of these assets. This refurbishment work on 105 OBR60 and 20 OHBR circuit breakers allows deferral of £92m of expenditure in the next Price Control Period and £42m in the following period. We believe that we have fully exploited refurbishment options for air-blast switchgear as most family groups where refurbishment is appropriate have been targeted and the remnant life of other bay components are beginning to limit opportunities.

Protection and Control

- 74 Table 4.3 of PB Power's report indicates that we propose to carry out replacement work on Protection, Control, Metering & Telecommunication equipment in 831 bays during the period to 2007/08, whereas PB Power's model suggest that this equipment needs replacing in 1741 bays. However, in addition to the volume indicated in our forecast, up to 192 bays of Protection and Control replacement will be accounted for under our submitted switchgear units (i.e. 2x96). This explains part of the discrepancy noted in PB Power report on Page 46 that "the unit quantities in the NGC submission do not reflect the actual unit quantities that will be replaced".
- 75 As discussed previously with PB Power⁵, we intend to determine the exact shortfall and our proposals for the full Price review period, taking into account the volumes we intend to catch up (if our proposed switchgear volumes for 2008/09 to 2011/12 are allowed), and those that will additionally be covered under other load-related schemes. We would anticipate this to address the majority of the potential shortfall highlighted by PB Power in Table 4.3. Any concerns that we are investing below our replacement policy will be addressed in our submission for the period, where we may need to increase our current forecast.

⁵ Meeting on 27th June 2005

Comments on period beyond 2006/07

- 76 This section presents our comments on PB Power's modelling of non-load-related expenditure in the period beyond 2006/07. For the majority of his period, our forecast is also based on modelling, rather than on specific schemes. However, we believe that PB Power have made some fundamental errors in their modelling that has resulted in unrealistically low projections of the likely capex requirement. **We believe these issues should be addressed as a matter of urgency as part of the main review.**

Switchgear

- 77 We are extremely concerned that PB Power's modelling of switchgear is flawed, and omits to consider the volume of replacement deferred from the mini review period that will need to be delivered in the main review period. With regard to PB Power's view on switchgear replacement expenditure in the period beyond 2008, we believe that some fundamental errors have been made. In order to demonstrate this, we have attempted to repeat the modelling that we believe PB Power have undertaken, and compared it with our view of the requirements.
- 78 In studying PB Power's report, we have realised that it has made an error in forecasting the volumes of switchgear replacement required in the period to 2011/12. This was essentially due to a data error in processing the BPQ request in short timescales. In this section we take the opportunity to correct this error, and to present a revised forecast of the total required expenditure. Notwithstanding this error, we demonstrate that the errors made by PB Power mean that it is still significantly underestimating the expenditure required. NGC's revised forecast for switchgear replacement in the period 2008/09 to 2011/12 is £484m.
- 79 As PB Power's report contains no information on how they have modelled any of the non-load-related elements beyond 2007/08, we have had to make a number of assumptions in order to identify the areas where we believe PB Power have made errors. As PB Power's modelling agrees with the outputs of our ALERT model in the mini review period, we have assumed that this is also the case for the period beyond 2007/08. PB Power state that "the modelling process used in this review has been refined so that the replacement of deferred assets can be spread over a defined number of years in the immediate future"⁶.
- 80 However, we can only reproduce the costs presented by PB Power in table 4.12 by assuming that this deferred volume is **not** included in the volumes for the period beyond 2007/08, and by assuming that PB Power have used their own AIS only unit costs. Both of these assumptions are flawed. Further, we note that PB Power's unit costs are referred to as being prepared in August 2002, and for 132kV switchgear are identical to those used for DPCR4. It would appear, therefore, that these costs have not been updated to 2004 prices. In addition, it does not appear that PB Power's unit costs include protection, as our costs do, and do not recognise the proportion of GIS switchgear being constructed. Were all of these issues to be addressed, PB Power's projection would be very similar to NGC's revised forecast.
- 81 **Regardless of whether our assumptions are correct, we would seek to discuss this issue with PB Power in order to resolve the discrepancies.**

⁶ Appendix C, page C3, PB Power report

Overhead lines

- 82 PB Power have provided no information on how they have modelled overhead lines in the period beyond 2007/08, but have proposed an allowance in that period of £432m, some £76m below NGC's forecast. In the absence of any further information, we can only assume that PB Power have made similar errors in the analysis of our required expenditure as were made for the mini review period, particularly with regard to their omission of fittings-only schemes. **We would request that PB Power review their analysis for these costs to properly include this expenditure.**

Cables

- 83 For cables, PB Power have proposed an allowance of £255m for the period 2008/09 to 2011/12, some £108m below NGC's forecast. Again, in the absence of any explanation in the PB Power report as to how they have arrived at this figure, NGC can only make some assumptions. It would appear that, despite their claim that the model outputs have been adjusted for non-model related expenditure, PB Power have not properly accounted for expenditure, within the period, on schemes which are not delivered until after 2012, as these volumes are not reflected in the model for that period.
- 84 For example, the Tottenham to St Johns Wood circuits are not due to be replaced until 2012. However, significant expenditure is due to be incurred up to this date, as a tunnel is the most likely route of the new cables. Our recent experience of tunnelling has identified that a long lead-time is necessary in order to secure public approval and securing scarce tunnelling resources. Around £130m will be spent on this scheme in the period to 2011/12 alone. Expenditure will also start in the main review period for replacement of the New Cross to Wimbledon circuits in 2014, again likely to be in a purpose built tunnel. If the spend in the period to 2011/12 on these schemes has not been appropriately included in PB Power's model, this may well account for the difference between PB Power's and NGC's views. **Again, we would request that this issue is explored further, and more explanation provided on how PB Power have arrived at their costs.**

Other asset categories

- 85 As for switchgear and overhead lines, we are concerned that PB Power have omitted to include the backlog of replacement work for other asset categories in the period beyond 2007/08. Where PB Power's model predicts more volume in the mini review period than we plan to carry out (i.e. transformers, protection and control, substation other), NGC request that PB Power urgently review their modelling. Where such backlogs have been omitted, PB Power should adjust their proposed allowance for the period beyond 2007/08 accordingly.

Security and Quality of Supply Standards

- 86 In their report, PB Power state that "certain jurisdictions are moving towards (or have already adopted) a "grid benefits test", implying that a similar cost benefit type approach should be adopted by NGC, rather than the deterministic SQSS. We would like to take the opportunity to point out that the SQSS was arrived at following extensive consultation with both Ofgem and the industry. Whilst it sets out a deterministic standard, this standard has effectively, through consultation, been defined to be the appropriate minimum level, its cost being more than offset by the benefits of security and reliability delivered to domestic, industrial and commercial users.
- 87 Whilst PB Power's statement suggests that these standards should be reviewed again, NGC is obliged to plan to the current standard, and it is therefore appropriate

for NGC to be funded at such a level that allows it to fulfil its licence obligations. It is clearly not appropriate that PB Power should assess NGC's planned expenditure against some assumed cost benefit type model, without changing NGC's obligations to plan against these standards through consultation with the industry.

IV CONFIDENTIAL Comments on PB Power report

[Section removed to protect customer's commercially confidential information]