

Charging Condition 2

Summary report on the review of the derivation and use of incremental cost of capacity in the GB charging methodology

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Introduction

This final report summarises the conclusions of the review that National Grid has undertaken with the Industry on Charging Condition 2 – Incremental Cost of Capacity. In April 2006 National Grid published an interim report (the April report), which provided initial conclusions on the issues discussed with the industry and asked for comments. This report does not repeat the detailed discussion provided in the April report. Therefore, readers should consider this final report as an addendum to the April report.

National Grid received four responses to the April report and this final report provides National Grid's views on the issues raised. In summary, the responses were generally supportive on the main conclusions in the April report. This summary report provides further explanation in response to comments received and confirms the changes which National Grid will shortly be making to The Statement of the Use of System Charging Methodology to improve transparency.

Background

The April report summarised the process followed by National Grid in conducting the review up to April 2006. The April report also sought to provide information that allowed interested parties to understand how the incremental cost of capacity is calculated and what it means in the context of the methodology as a whole. A principle objective of the report was to provide other users, who would not normally attend industry meetings, with an opportunity to contribute to the review prior to National Grid concluding and taking forward any changes to the methodology and / or statements.

The review covered many diverse and detailed areas of the methodology; the principles applied in the transport and tariff models, along with the detailed calculation process for the incremental cost of capacity and associated expansion factors. National Grid engaged the industry through the Transmission Charging Methodologies Forum (TCMF) and its sub-group the Charging Issues Standing Group (CISG). Much of the detailed technical discussion took place at the CISG, with the January 2006 CISG essentially being used as a Condition 2 workshop¹.

On the central issue of the cost reflectivity of the incremental cost of capacity and how it is used within the methodology, the analysis carried out in conjunction with industry discussion and response to the April report, leads National Grid to conclude the current process is cost reflective in the context of the methodology as a whole.

National Grid have reviewed the central assumption that the cost of 400kV overhead line new build can be considered as a proxy for all of the techniques for providing additional capacity. National Grid continues to believe that this a reasonable assumption in the context of the methodology and the models used to implement the methodology, the DC load flow (DCLF) transport and tariff models. The April report provides detailed analysis to support this conclusion.

¹ Slides available at: <http://www.nationalgrid.com/NR/rdonlyres/0E7946AD-3784-435B-AD68-577A62C5B43E/6252/Condition2.pdf>

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National Grid received four responses to the April report. Having considered the responses, three of which supported National Grid's main conclusions, National Grid has further consulted the industry on proposed changes to The Statement of the Use of System Charging Methodology ('the statement') which support these conclusions and now intends to proceed with them.

Improvements to the transparency of the methodology

In the April report National Grid proposed to update the statement with more information to improve the general transparency and understanding of the concept of incremental cost of capacity: what it represents; how it is calculated; the assumptions made in the calculation; and how it is used within the methodology. The responses to the April report generally supported this improvement in transparency.

In August 2006, National Grid circulated proposed changes to the statement to industry participants. In response, National Grid received some comments on the drafting and as a result have made some minor changes to improve clarity.

One particular comment was about the use of 'circuit km' rather than 'route km' in the calculation, see appendix 1 paragraph 2.26. In order not to weight unduly in favour of the £/MWkm cost of single circuits (which is significantly higher than that for double circuits) the weighting is intentionally based on circuit km i.e. 10km would be either 10km of single circuit or 5km of double circuit; this way the efficiency of double circuit construction is fully recognised.

The changes to the methodology statement are intended to improve the transparency of the current methodology; however, they do not change the actual methodology itself. Therefore, rather than a formal consultation National Grid discussed the principles in the April report and provided proposed changes to the industry, both of which provided an opportunity for all interested parties to comment. The proposed changes were also discussed at the September CISG meeting.

The final draft changes to the statement are attached as appendix A to this report. The changes will be included in the updated statement prior to April 2007, as noted above they will have no impact on the actual tariffs produced by applying the methodology.

In addition National Grid has carried out a number of tutorials on the methodology and the calculation of incremental cost of capacity. The feedback from these was very positive, and the responses to the report indicated that the industry would be keen to repeat these.

National Grid will consider facilitating similar tutorials in the future, possibly following significant changes in the representation at industry meetings. National Grid would hope to carry these out as an integral part of a CISG meeting. To this extent, National Grid intends to review the terms of reference for the CISG and discuss changes at the TCMF to facilitate an objective of providing transparency on detailed areas of the methodology for industry participants.

Summary of responses to the April report

This section reviews the main issues raised in the responses to the April report and provides National Grid's response to each and the conclusion reached. There were four responses to the April report, all of which are available on the National Grid Industry Information website².

The majority of the responses were supportive of the main conclusions in the April report i.e. in the context of the methodology as a whole, the use of 400kV overhead line cost as a proxy for new build was reasonable. There were however areas or specific issues with which respondents did not agree.

Some of the responses to the April report included a restatement of views originally put forward under the BETTA consultation process on various principles of the methodology. National Grid do not believe the purpose of charging condition 2 was to revisit issues that were extensively addressed, clearly concluded on and approved in the establishment of the GB charging methodology. However, given the open nature in which National Grid has conducted this review it has inevitably touched on some of these areas.

For completeness, the table below includes a summary of National Grid's view on some wider issues as well as the areas that National Grid considers are more related to charging condition 2.

Issue raised by respondents	National Grid response
In principle, we do not support administered transmission charges that vary excessively by location.	National Grid believes the current methodology provides a cost reflective signal. The current methodology is designed to signal the cost of locating at one point on the system relative to another, whilst still having regard for the other licence objectives of promoting competition and being non-discriminatory.
The case for a forward-looking marginal cost based methodology on a system that has large sunk costs will never be overwhelming. However we agree with NGET's view in respect of this particular charging condition i.e. focus on improving transparency rather than on the methodology itself. The present methodology strikes a balance.	The locational element of the tariff is designed to provide this forward-looking signal. The principle being that efficient economic signals are provided to all users who use the transmission system, and that these reflect the incremental cost of providing the service. Any disparity with sunk costs or historic commitments is dealt with through the residual element of the methodology, which is not locational. We note that the respondent agreed with the focus on improving transparency.

² <http://www.nationalgrid.com/uk/Electricity/Charges/gbchargingapprovalconditions/2/>

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Issue raised by respondents	National Grid response
<p>Agree level of understanding needs to be improved. Consider repeating the tutorial annually.</p>	<p>National Grid will discuss further at the TCMF. Rather than committing to an annual tutorial National Grid proposes to carry out further tutorials when there is sufficient turnover in representation at industry meetings. In the future this will most likely be facilitated through CISG.</p>
<p>Given the expected industry developments it is more important than ever to have the correct locational signals.</p>	<p>National Grid strongly agrees that the current mechanism of calculating Incremental Cost of Capacity provides a proportionate signal.</p>
<p>Transparency is a balance between NGET commercial confidentiality and full cost reflectivity.</p>	<p>Throughout the review, most representatives appreciated that National Grid did have commercial confidentiality issues with some of the data used in the calculation of Incremental Cost of Capacity. They also agreed it was more important to understand the way in which National Grid used data rather than the absolute value of the data itself i.e. the methodology and assumptions contained within the methodology.</p>
<p>Forward looking vs. Historic costs: a respondent who agreed with a principle of a cost reflective forward looking Incremental Cost of Capacity believe that it should be further assessed against the cost of large projects such as RETS.</p>	<p>National Grid notes the support for a cost reflective Incremental Cost of Capacity. On the issue of checking against specific projects, these can contain significant transmission issues that cannot be fully attributed to any individual user, such as the lumpiness involved in transmission investment or significant non-distance related costs (substation and transformers costs). These non-distance related costs are recovered through the residual element of the tariff. It is worth noting that following works, contract costs then flow through to updating 'TR3' and the weighting calculations (discussed in the April report). Therefore, the methodology is self-correcting, yet avoids the problems of being project specific e.g. instability.</p>
<p>Recognise the issues related to voltage equipment and look forward to future proposals in that area</p>	<p>National Grid does not consider this area directly related to charging condition 2. National Grid recognises the interest in this area of the methodology and is separately considering various options for dealing with signals for reactive plant.</p>

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Issue raised by respondents	National Grid response
<p>Note the issues associated with MVA charging and AC modelling.</p>	<p>The general conclusion of all parties throughout the review was that was that the 'cost' of an AC model, not only actual cost but also in terms of the negative impact on transparency, simplicity and the ability of users to consistently reproduce results, was outweighed by any marginal increase in the accuracy that could be achieved.</p>
<p>Still have concerns with the methodology, but agree that with the objectives of achieving transparency, simplicity, stability and predictability.</p>	<p>National Grid understands the concerns, but believes the report goes as far as possible without undermining the commercial confidentiality of the transmission licensees.</p>
<p>The use of 400kV OHL is predicated on having the appropriate expansion factors. Suggest annual review of EC.</p>	<p>In the April report National Grid noted that the calculation of the Incremental Cost of Capacity and the Expansion Constants are essentially the same. The Expansion Factors also include elements of upgrade (where the actual factor is weighted to reflect the future expansion voltage rather than the current voltage). National Grid intends to review both the Incremental Cost of Capacity and the Expansion Factors at the start of each price control period. However, we do not believe that there is a justification for reviewing the Expansion Constants separately. These are both fixed to provide stability and predictability of tariffs. The review period is highlighted in the transparency improvements to the methodology statement.</p>
<p>The use of forecast data would result in the loss of objectivity and some degree of stability, and possibly introduce errors. Support for including a section in the condition 5 information paper on the accuracy of the tariff mechanism.</p>	<p>National Grid agrees and has this year included a section in the condition 5 information paper covering how accurate the published tariffs follow forecast trends identified in previous condition 5 analysis³.</p>
<p>Do not agree it is cost reflective to disregard the issue of spare capacity.</p>	<p>Refer to the discussion in the April report and conclusion in BETTA documents. National Grid continues to believe that Spare Capacity is most appropriately dealt with through the residual element of the tariff.</p>

³ Section 6 of the condition 5 information paper
<http://www.nationalgrid.com/NR/rdonlyres/E1C7183E-7C31-4C18-8A8F-309A87FB459C/10765/InformationPaperFINALv2.pdf>

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Issue raised by respondents	National Grid response
Support for a single weighted average regulatory cost of capital	National Grid agrees there would be little overall justification for applying specific costs of capital on a zonal basis.
Adjusting for other methods of enhancing capacity is attractive but complex and therefore difficult to justify.	National Grid agrees with the comments and as shown in the April report National Grid continues to believe that use of 400kV Overhead line new build represents a reasonable proxy for all the other methods of providing enhanced capacity.
Do not agree with looking at charging conditions separately and urge a more thorough review from bottom up.	The charging conditions refer to specific areas of the methodology where the Authority indicated further review may result in changes that could better meet the objectives. The main principles of the methodology were widely consulted on during the implementation of BETTA. National Grid does not believe the intention of the charging conditions was to carry out a review of the whole GB charging methodology. Given the extensive review carried out for BETTA, National Grid believe it would be inappropriate to carry out another complete review at this time.
Do not agree with the use of 'forward looking costs'. The methodology should use a weighting of new and old costs	The report discussed the merits of three main options: historic costs, current costs and future costs. As highlighted in the report National Grid believes that the use of current costs (recently incurred costs and tenders adjusted by indices to make 'current') as a forecast is the most appropriate balance between the main objectives of competition, cost reflectively and avoiding discrimination, which are, in part, demonstrated through a methodology which is simple, predictable, stable and transparent.

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Issue raised by respondents	National Grid response
<p>Propose an average charge methodology where the incremental cost of capacity is a weighted average of new and old costs.</p>	<p>As described in the report, the locational element of the charge is intended to be a forward-looking signal and represents the cost of providing an additional MW of capacity. Separate to this, the residual or flat element (that is not locational) deals with the historical commitments or sunk costs, and ultimately ensures that National Grid recovers the allowable revenue. National Grid does not believe a methodology where the locational signal is based largely on historic commitments would result in efficient investment or be cost reflective of future investment.</p>

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Issue raised by respondents	National Grid response
<p>Propose a top down approach for calculation of incremental cost of capacity, using the MW km total from the Seven Year Statement and disaggregation of the allowable revenue into those elements that are locational. The revenue could then be further checked against the ratio of distance to non-distance related assets.</p>	<p>National Grid agrees that the proposed method benefits from simplicity; however, National Grid does not believe such an approach is consistent with the methodology as a whole and is less likely to meet the relevant objectives. As described in section 8.2 of the April report, a bottom up approach is likely to be more cost reflective than a top down approach. More specifically, an approach based on the regulated allowance is clearly more weighted to historic commitments and so would be less cost reflective of potential future investments.</p> <p>In terms of the cross check, the important aspect of the locational signal is the differential between parties rather than a correlation between the absolute payment and the assets perceived as directly attributable to the connection. Given the requirement to meet a G/D split of 27:73 and the difference between historic commitments and future costs, the absolute recovery ratio will not match the ratio of distance to non-distance related assets.</p> <p>As described in the April report, the locational element of the tariff is about providing a proportional signal and not absolute revenue recovery. The size of the signal is derived from the expansion constant, the marginal km and the security factor, all of which are calculated from a 'bottom up' process to ensure they are justifiable and representative. At no time in the calculation of these elements is a restriction applied in relation to the overall revenue. Such a restriction would distort the cost reflectivity of the locational signal. Therefore, National Grid does not believe this is an appropriate test.</p>

Summary and next steps

Following consideration of the issues raised in response to the April report, National Grid does not intend to carry out further analysis over and above that already undertaken during the development of the GB charging arrangements or during this review.

Along with the industry, National Grid has carried out an extensive and detailed review for Charging Condition 2. National Grid's conclusion is that the use of new build 400kV overhead line costs, with the appropriate expansion constants, delivers a proportionate and thus cost reflective signal. This is consistent with the relevant objectives in National Grid's Transmission Licence Condition C5. Therefore, National Grid will **not** be bringing forward amendments the methodology in respect of calculating or applying the incremental cost of capacity.

As described in the April report and supported in the responses, National Grid will make the improvements the transparency of the statement in the area of incremental cost of capacity.

In publishing this report National Grid believes it has completed the full requirements of Charging Condition 2. National Grid will update the statement with the text in Appendix A before April 2007, however we will seek to achieve it along with other proposed changes, such as possible changing condition 4 changes.

The response from the industry to the tutorials was extremely positive and feedback indicated National Grid should consider annual events. National Grid will discuss this further at the TCMF and consider bringing forward changes to the terms of reference for CISG to facilitate this.

Appendix A - Proposed changes to The Statement of the Use of System Charging Methodology for Condition 2

Additional and amended text for Chapter 2 of The Statement of the Use of System Charging Methodology. To be inserted starting at 2.22 and replacing existing text 2.22 to 2.24, subsequent paragraphs to be renumbered appropriately. References in square brackets refer to existing paragraph, to be updated only in the final text.

The Expansion Constant

- 2.22 The expansion constant, expressed in £/MWkm, represents the annuitised value of the transmission infrastructure capital investment required to transport 1 MW over 1 km. Its magnitude is derived from the projected cost of 400kV overhead line, including an estimate of the cost of capital, to provide for future system expansion.
- 2.23 In the methodology the expansion constant is used to convert the marginal km figure derived from the transport model into a £/MW signal. The tariff model performs this calculation, in accordance with [2.34], and also then calculates the residual element of the overall tariff (to ensure correct revenue recovery in accordance with the price control), in accordance with [2.39].
- 2.24 The transmission infrastructure capital costs used in the calculation of the expansion constant are provided via an externally audited process. They also include information provided from all Transmission Owners. They are based on historic costs and tender valuations adjusted by a number of indices (e.g. global price of steel, labour, inflation, etc.). The objective of these adjustments is to make the costs reflect current prices, making the tariffs as forward looking as possible. This cost data represents National Grid's best view; however it is considered as commercially sensitive and is therefore treated as confidential. The calculation of the expansion constant also relies on a significant amount of transmission asset information, much of which is provided in the Seven Year Statement.
- 2.25 For each circuit type and voltage an individual calculation is carried out to establish a £/MWkm figure, normalised against the 400KV overhead line (OHL) figure, these provide the basis of the circuit expansion factors discussed in [2.25]. In order to simplify the calculation a unity power factor is assumed, converting £/MVAkm to £/MWkm. This reflects that the fact tariffs and charges are based on real power.
- 2.26 The table below shows the first stage in calculating the expansion constant. A range of overhead line types is used and the types are weighted by recent usage on the transmission system. This is a simplified calculation for 400kV OHL using example data:

400kV OHL expansion constant calculation					
MW	Type	£(000)/km	Circuit km*	£/MWkm	Weight
A	B	C	D	E = C/A	F=E*D
6500	La	700	500	107.69	53846
6500	Lb	780	0	120.00	0
3500	La/b	600	200	171.43	34286
3600	Lc	400	300	111.11	33333
4000	Lc/a	450	1100	112.50	123750
5000	Ld	500	300	100.00	30000
5400	Ld/a	550	100	101.85	10185
sum			2500 (G)		285400 (H)
Weighted Average (J= H/G):					114.160 (J)

*These are circuit km of types that have been provided in the previous 10 years. If no information is available for a particular category the best forecast will be used.

- 2.27 The weighted average £/MWkm (J in the example above) is then converted in to an annual figure by multiplying it by an annuity factor. The formula used to calculate of the annuity factor is shown below:

$$Annuity\ factor = \frac{1}{\left[\frac{1 - (1 + WACC)^{-AssetLife}}{WACC} \right]}$$

- 2.28 The Weighted Average Cost of Capital (WACC) and asset life are established at the start of a price control and remain constant throughout a price control period. The WACC used in the calculation of the annuity factor is the National Grid regulated rate of return, this assumes that it will be reasonably representative of all licensees. The asset life used in the calculation is 50 years; the appropriateness of this is reviewed when the annuity factor is recalculated at the start of a price control period. These assumptions provide a current annuity factor of 0.066.
- 2.29 The final step in calculating the expansion constant is to add a share of the annual transmission overheads (maintenance, rates etc). This is done by multiplying the average weighted cost (J) by an 'overhead factor'. The 'overhead factor' represents the total business overhead in any year divided by the total Gross Asset Value (GAV) of the transmission system. This is recalculated at the start of each price control period. The overhead factor used in the calculation of the expansion constant for 2006/07 is 1.8%. The overhead and annuitised costs are then added to give the expansion constant.

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- 2.30 Using the previous example the final steps in establishing the expansion constant are demonstrated below:

400kV OHL expansion constant calculation	
	Ave £/MWkm
OHL	114.160
Annuitised	7.535
Overhead	2.055
Final	9.589

- 2.31 This process is carried out for each voltage, along with other adjustments to take account of upgrade options, see [2.27]and [2.28], and normalised against the 400KV overhead line cost (the expansion constant) the resulting ratios provide the basis of the expansion factors.
- 2.32 This process of calculating the incremental cost of capacity for a 400kV OHL, along with calculating the expansion factors is carried out for the first year of the price control and is increased by inflation, RPI, (May–October average increase, as defined in National Grid's Transmission Licence) each subsequent year of the price control period.

End of proposed changes for Condition 2