Review for SSE of Poyry's Report to Centrica Energy "Review of Ofgem's Impact Assessment on CMP213

March 2014

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Executive summary

This report has been commissioned by Scottish & Southern Energy to provide an alternative view of the issues considered by Poyry in their report “Review of Ofgem’s Impact Assessment on CMP213”, prepared for Centrica Energy. In particular, this report considers issues raised in sections 3 & 4 of the Poyry and key conclusions include:

- In a high wind zone, CMP213 is more cost reflective for wind generation than Status Quo, contrary to Poyry’s claims (Poyry claim 1)
- CMP213 is more cost reflective and less discriminatory regarding nuclear compared with wind generators than the Status Quo, contrary to Poyry’s claims (Poyry claim 2)
- The CMP213 charging methodology can be more cost reflective than the SQSS, contrary to Poyry’s claims (Poyry claim 3)
- Station specific average load factors reasonably reflect the drivers of network constraints, contrary to Poyry’s claim (Poyry claim 4)
- The dual background approach of CMP213-WACM2 is appropriate, counter to Poyry’s claims (Poyry claim 5)
- The year-round tariff methodology does accurately link to the SQSS Economy Background, counter to Poyry’s claims (Poyry claim 6)
    - It is more appropriate for the charging methodology to use annual load factors rather than the SQSS scaling factors, contrary to Poyry’s claims
    - CMP213 Year-round tariff methodology is aligned to “under year round conditions” SQSS methodology, contrary to Poyry’s claims
    - Attempts have been made to compare the CMP213 options and the Status Quo in terms of cost reflectivity, counter to Poyry/s claims

Additionally, this report provides further evidence that CMP213-WACM is more cost reflective than the Status Quo methodology.

- Further evidence from the recently released indicative TNUoS tariffs for 2015/16 (Section 4 of this report)
- Further evidence using a simplified network model (Section 5 of this report)

In their report, Poyry conclude that at best the case for CMP213-WACM2 being more cost-reflective than the existing TNUoS charging arrangements (the Status Quo) is unproven and that the methodology might in fact produce a worse outcome. However, despite challenging the use of average annual load factors (ALF) as a proxy for an individual generator's contribution to congestion costs and the adoption of a dual Peak Security/Year-round background approach, the Poyry report fails to demonstrate that the CMP213-WACM2 charging methodology, that relies on these simplifying assumptions, is less cost-reflective that the Status Quo. In coming to their conclusions, Poyry rely heavily on work previously undertaken by the University of Bath that was largely dismissed by the CMP213 Workgroup. As was the case with the work undertaken by the University of Bath, Poyry fail to demonstrate that the use of these simplifying assumptions produce an outcome that is inferior to the existing TNUoS charging arrangements.

On the contrary, by applying the CMP213-WACM2 methodology using NGET's initial view of charges for 2015/2016 and by analysing its performance over a range of intermittent-conventional sharing scenarios using a simple model of the GB system, this report demonstrates that the methodology is likely to achieve a more cost-reflective outcome than the Status Quo.

Structure of the report

This report considers issues raised in sections 3 & 4 of the Poyry report, which relate to;

- the use by CMP213 of load factors as a proxy for the impact of individual generators on the costs of congestion,
- the use of a dual Peak Security/Year-round background and
- the alignment of these backgrounds with those used by the National Electricity Transmission System (NETS) Standards of Quality of Security of Supply (SQSS).

The report then goes on to describe modelling using a simple two-bus representation of the GB electricity system undertaken to further investigate some of the issues raised. Other CMP213 issues raised by Poyry in their report to Centrica Energy, such as the robustness of the modelling undertaken and Ofgem's interpretation of the modelling results, the treatment of island connections and the HVDC "bootstraps" and the re-distribution of transmission charges, are not addressed.

The remainder of this report is structured as follows;

- Section 1 sets out the background to this review, and the approach taken
- Section 2 considers the detail of Poyry's review of the CMP213 Impact Assessment quantitative modelling (section 3 of Poyry's report)

- Section 3 considers Poyry's assessment of the cost-reflectivity of charging options (section 4 of Poyry's report)

- Section 4 compares the cost-reflectivity of the CMP213-WACM2 and existing TNUoS methodologies by comparing the associated charges with the costs resulting from the application of the SQSS dual-background criteria.

- Section 5 undertakes a simple analysis based on a 2 bus network model of the GB power system to compare the performance of the CMP213-WACM2 and existing TNUoS charging methodologies for different combinations of intermittent and conventional generation, i.e. for various degrees of "sharing".

- Finally, section 6 provides a summary and conclusions.

1. Background to the review and approach taken

1.1 Background

Following the conclusion of Ofgem's Significant Code Review (SCR) in May 2012, NGET was directed to raise a CUSC modification proposal to address the defects identified in the existing TNUoS charging methodology, the Status Quo. NGET submitted a modification proposal (CMP213) to the CUSC Modifications Panel in June 2012, who decided that the modification should be considered by a Workgroup (the CMP213 Workgroup) who were to report back to the Panel following a Workgroup consultation.

During their deliberations, the CMP213 Workgroup considered NGET's Original proposal set out in CMP213, and identified potential options and alternatives. Ultimately, the Workgroup identified 41 potential Workgroup Alternative CUSC Modification (WACM) proposals, and voted to take forward eight proposals that were considered to most improve on baseline (the Status Quo) or the NGET Original proposal, in terms of the CUSC applicable objectives. The eight proposals taken forward included NGET's Original proposal and Diversity options 1, 2 & 3, which proposed alternative methods of dealing with the issue of sharing between non-carbon and carbon emitting generation.

During the CMP213 Workgroup process, the University of Bath were commissioned by Centrica Energy and RWE to consider the use of load factors and dual backgrounds, and their work was presented to the Workgroup in January 2013. However, the University of Bath report was published at a time when the three Diversity options were still being developed by the CMP 213 Workgroup and therefore their report only considered the NGET Original proposal. It is worth noting that the three Diversity options do address some of the concerns raised by the University of Bath in their report.

On 1 August 2013 Ofgem published its Impact Assessment of CMP213. Ofgem indicated that it was minded to approve WACM2 on the basis that the option was consistent with its statutory duties and better met its principal object of protecting the interests of customers compared with the other CMP213 alternatives or the existing TNUoS methodology. At the time, Ofgem also indicated that it was minded to implement the new charging arrangements in April 2014. However, Ofgem have subsequently indicated that, due to information received via the consultation process concerning the potentially negative impacts of a 2014 implementation date, implementation will now take place in April 2015, subject to a final decision to be taken in March 2014 on whether to replace the existing charging arrangements with CMP213-WACM2.

Following publication of the CMP213 Impact Assessment, Centrica Energy commissioned Poyry to assist in a critique of Ofgem's minded to decision to implement WACM2 and Poyry published its report in October 2013.

1.2 Approach taken

In carrying out this limited review of Poyry's report, attention is paid to the original aims of Project TransmiT and the relevant element of the Direction issued by the Authority to NGET in May 2012. The original aims of the Project are to ensure that transmission charging "*facilitates the timely transition to a low-carbon energy sector which continues to provide safe, secure high quality network services at value for money to existing and future customers*", while the relevant element of the Direction is for NGET to raise a modification that "*better reflects the differing impacts (i.e. costs and benefits) of individual generators on the TO's costs in a manner which is consistent with the principles set out in the National Electricity System Security and Quality of Supply Standard (SQSS)*". The need for proposed modifications to the transmission charging regime to comply with these aims and the Direction is a significant issue in assessing the validity of Poyry's conclusions.

In addressing the use of generator load factors and the adoption of the pseudo-CBA NETS SQSS dual background approach, the Poyry report leans heavily on the analysis originally carried out by the University of Bath. This analysis was the subject of an earlier report commissioned by Scottish & Southern Energy[1], which concluded that the University of Bath's conclusions were not justified by their analysis. The report went on show that the NGET Original proposal (on which the Bath analysis focussed and which the Authority is minded to reject in favour of CMP213-WACM2) was in fact superior to the existing charging arrangements in that the resulting transmission charges more closely reflected the costs incurred by TOs in developing the transmission system in accordance with the SQSS. A fact that the University of Bath would have needed to disprove if they were to justify their conclusions, and which they did not do.

In addition to providing a critique of a number of points raised by Poyry concerning cost-reflectivity and the use of the pseudo-CBA SQSS backgrounds, this report compares the projected 2015/16 Status Quo zonal tariffs with those resulting from the application of

[1] University of Bath report "Year-round System congestion Costs – Key Drivers and Key Driving conditions": an alternative view.

CMP213-WACM2 in relation to the costs implied by the SQSS. While care needs to be exercised in judging cost-reflectivity on the basis of how closely charges mirror SQSS costs, the analysis indicates that CMP213-WACM2 is more cost-reflective than the Status Quo on this basis in almost all circumstances. The report then goes on to compare the Status Quo with CMP213-WACM2 over a range of intermittent-conventional generation sharing scenarios and again demonstrates that CMP213-WACM2 produces a more cost-reflective outcome, both in those zones with little wind where the SQSS can overestimate the costs of accommodating additional wind capacity, and also in those zones where wind dominates.

2. Section 3 of Poyry's report, a review of CMP213 Impact Assessment quantitative modelling

2.1 Poyry claim 1; for a high wind zone, CMP213 unduly favours wind generation.

Poyry contend (Poyry 3.2.1.4) that CMP213-WACM2 overcharges low load factor conventional plant situated in zones dominated by wind, as that plant will not operate when wind output is high and will not therefore contribute to congestion.

Firstly, in making this point, Poyry neglect to mention that the existing charging arrangements take no account of the potential to share transmission capacity under any circumstances and that in allowing some sharing in zones where wind dominates, WACM2 is clearly superior to the Status Quo. CMP213-WACM2 would also result in low load factor generation paying less than generation with a higher load factor.

Furthermore, and as Poyry accept (Poyry 3.2.1.4), CMP213-WACM2 also results in peaking or any other conventional plant being subject to a negative Peak Security charge in these circumstances, rather than the positive charge applied by the Status Quo. This highlights a significant defect in the existing TNUoS charging arrangements in that they penalise and discourage the connection of conventional generation in zones dominated by wind - even though that generation may provide a significant security contribution.

As discussed in Section 4 of this report, CMP213-WACM2 applies charges to peaking plant in zones dominated by wind that are much closer to the costs implied by the application of the SQSS, and which are significantly lower than those applied by the Status Quo. Furthermore, the simple modelling described in Section 5 shows that the costs of accommodating conventional generation in a particular zone will fall as wind capacity becomes more dominant. While CMP213-WACM2 may not perfectly reflect the potential for low load factor generation to fully share transmission capacity when wind dominates[2], the charges applied

[2] It should be possible in future to design a modification that would to address this defect. This might for example be achieved by treating wind and low load factor plant differently under WACM2, or possibly by categorising dispatchable renewable generation such as hydro as "non low-carbon". Hydro is often present in "high wind" zones and recognising its dispatchability and negative correlation with wind output in this way

are closer to the costs implied by application of the SQSS. By raising the issue Poyry therefore help make the case that CMP213-WACM2 is clearly to be preferred to the Status Quo in this respect.

2.2 Poyry claim 2; CMP213 options discriminate against high load factor generators such as nuclear in favour of wind generators.

The basis of Poyry's argument (Poyry para: 3.2.1.5) is that congestion occurs during windy periods and the contribution of wind to congestion costs is similar to that of nuclear. While it is true that congestion is likely to occur when wind output is high, it can also occur during periods of low demand - even when wind output is reduced. Because of its high load factor and inflexibility, nuclear output is a more consistent cause of transmission congestion than that of wind and could therefore be expected to experience higher year round transmission charges. It is also true, as Poyry acknowledge in 3.2.1.5, that wind is less perfectly correlated than nuclear, with the correlation between the outputs of wind farms in a zone declining rapidly with separation[3]. This again suggests that nuclear should see higher charges than wind.

While accepting that the use of plant specific average load factors can result in CMP213-WACM2 charges that are lower than the costs implied by the SQSS, particularly when wind capacity is low, the outcome is clearly superior to the Status Quo where no account of load factor is taken. It should also be noted that the SQSS over-estimates the cost of connecting wind in these circumstances. Overall, CMP213-WACM2 appears to be a good compromise between simplicity and charging accuracy.

As Poyry implicitly suggest, the use of generic load factors similar to those used by the SQSS would result in wind and other intermittent renewables being overcharged. So, while having the virtue of simplicity, this would be arguably at odds with one of the original objects of Project TransmiT, which was to ensure that transmission charging "*facilitates the timely transition to a low-carbon energy sector".* The use of generic load factors would also be in conflict with the requirement in the Authority's Direction to NGET to develop a charging methodology that "*better reflects the differing impacts (i.e. costs and benefits) of individual generators on the TO's costs".* Poyry's implied suggestion that the load factors applied to wind should be somehow inflated so as to improve cost-reflectivity would introduce a new level of complexity and raises the issue of how this could be achieved in an objective and transparent fashion.

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would increase "non low-carbon" capacity and thereby allow low load factor conventional generation to benefit from a higher level of sharing

[3] There are many studies that demonstrate that the correlation between the output of wind farms declines rapidly with separation, see for example "A Primer on Wind Power for Utility Applications" published by the National Renewable Energy Laboratory at http://www.nrel.gov/docs/fy06osti/36230.pdf)

3. Section 4 of the Poyry report, cost reflectivity of charging options

In section 4 of their report, Poyry initially challenge the contention made by the CMP213 Workgroup report that the charging approach is more cost-reflective that the SQSS[4]. Poyry then go on to raise two issues relating to cost-reflectivity, firstly that average load factors do not reasonably reflect the drivers of network constraints, and secondly that the CMP213 "year round" approach is misaligned with, and does not adequately reflect, the SQSS Economic Background on which it is based. Taking these issues in turn;

3.1 Poyry claim 3; the CMP213 charging methodology cannot be more reflective than the SQSS

The aim of a cost-reflective charging methodology must be to apply charges that reflect the actual costs incurred in accommodating additional generation capacity. However, it is important to note that the pseudo-cost benefit approach (CBA) dual background methodology is no more than a deterministic short-hand for the full-blown CBA used to justify individual transmission investment decisions. It is best considered as representing the "average" outcome of a range of full CBA studies, with a 70% scaling factor for wind necessary to pull boundary flows in line with those produced by a detailed CBA approach

In fact the pseudo-CBA SQSS methodology appears to overstate the costs of accommodating wind, particularly when wind capacity is low and conventional capacity dominates. By scaling wind output by 70%, the same MWkm is always allocated to an incremental 1 MW of capacity, irrespective of how much capacity is connected. However, intuitively, the cost of accommodating wind will depend on the amount of wind capacity present, increasing when wind capacity dominates within a zone and decreasing when wind capacity is low. Neither the NGET Original proposal nor any of the CMP213 diversity options recognises the fact that the cost of connecting wind will decrease as the ratio of conventional to total generation capacity within a zone increases. However, CMP213-WACM2 does at least recognise that the cost of connecting wind increases as wind increasingly dominates - effectively applying a higher load factor as the proportion of non-shared MWkm increases. For example, where the ratio of wind to total capacity in a zone equals 0.8, the effective load factor applied by CMP213-WACM2 is 72%.

Poyry themselves suggest using a simple model that the average load factor of wind in periods when constraints are active might be in the range 47-58%. Similarly NERA, in their report to RWE[5] , suggest that a scaling factor of 56% would need to be applied for charges derived from the NGET Original proposal (equivalent to CMP213-WACM2 for situations where conventional generation dominates) to equal the costs suggested by the pseudo-CBA

[4] Final CUSC Modification Report (Volume 1), paragraphs 4.169 – 4.170

[5] See "Project TransmiT: Ofgem's Assessment of Options for Change": A Review Prepared for RWE npower, 14 February 2012. Page 17, section 3.2.3

SQSS methodology. Both Poyry and NERA therefore implicitly conclude that it is possible for a charging mechanism based on CMP213 principles to be more cost-reflective than the simple application of the deterministic SQSS dual background criteria.

3.2 Poyry claim 4; average load factors do not reasonably reflect the drivers of network constraints

In coming to the conclusion that average load factor is not a reasonable proxy for the impact of a generator on constraint costs, Poyry rely heavily on the Report "Year-round Congestion Costs – Key Drivers and Key Driving Conditions", produced by the University of Bath for Centrica and RWE[6]. Summarising, the University of Bath conclude that a generator's load factor is the outcome of a range of technology, network and market parameters, that there is not a linear relationship between load factor and congestion and that it is therefore unsafe to rely on a generic load factor as a proxy for an individual generator's contribution to the costs of resolving that congestion.

These issues were dealt with at length by the CMP213 Workgroup and were behind the reasoning to use individual generator average, rather than generic, load factors. Analysis for the Workgroup by NGET using ELSI demonstrated that, although the relationship between average load factor is not perfect, it is strong as shown by Figure 1. However, due to concerns over the relationship in situations where either wind or conventional generation dominate, the Workgroup decided to embark on the development of three Diversity options, with the Diversity option 1 methodology underpinning CMP213-WACM2.

It should be noted that decisions by the CMP213 Workgroup concerning the use of average load factors and the development of the Diversity options, which address some of the University of Bath's concerns, were taken after the publication of the Bath report to RWE and Centrica.

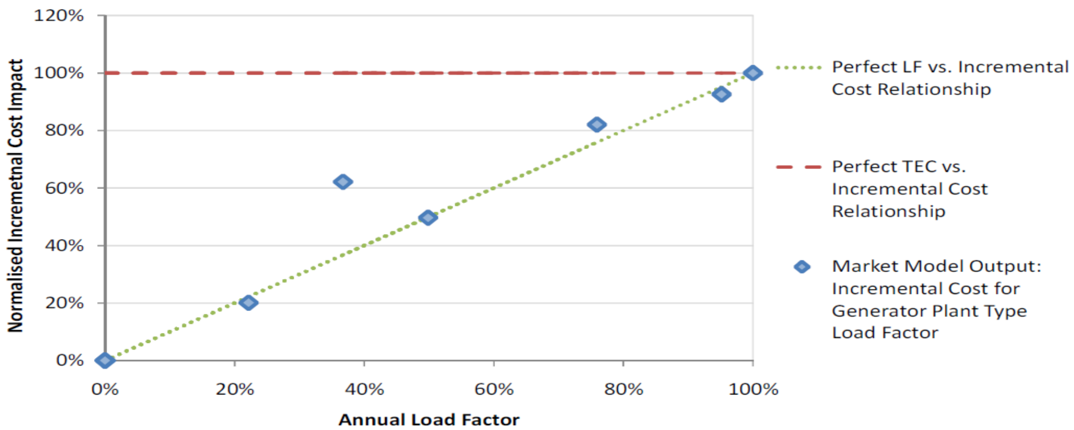


Figure 1. Relationship between annual load factor and normalised incremental cost

Source; CMP213 Project TransmiT TNUoS Developments, CUSC Workgroup Consultation Document

[6] See Annex 13 of the Final CUSC Modification Report1 Volume 2 – Annexes at http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=15495

Poyry go on to challenge the use of average load factors as a proxy for a generator's contribution to congestion costs by analysing the performance of a number of wind farms (Poyry 4.1.1.2.1). Making the assumption that congestion occurs during windy periods, they conclude that the higher the ratio between a wind farm's load factor during windy periods to its average load factor, the higher its contribution to congestion costs.

Irrespective of whether or not this is a valid conclusion and despite the simplifying assumption that congestion only occurs during windy periods, it is no doubt true that some wind farms will have a greater contribution to congestion cost than their average load factor suggests and some less. Arguably, this suggests that the use of average load factors might be an appropriate simplification, clearly producing a more cost-reflective outcome than taking no account of load factor at all. Furthermore, any attempt to resolve what appears to be a second order issue would add considerable complexity and would probably be unjustified in terms of striking an appropriate balance between simplicity/transparency and accuracy.

Summing up, the discussion around whether average load factor is sufficiently indicative of an individual generator's contribution to congestion costs was discussed at length by the CMP213 Workgroup. The University of Bath's analysis, although helpful in that it provided an additional analysis, added nothing new. NGET has identified that there ***is*** a compelling albeit imperfect relationship between load factor and a generator's contribution to congestion cost, and it is therefore unsurprising that CMP213-WACM2, which utilises that relationship, produces a more cost-reflective outcome than the Status Quo, which does not.

Furthermore, there appears to be no obvious alternative to using generator-specific average load factors. Both Poyry and NERA implicitly suggest that the use of SQSS scaling factors would result in wind being generally overcharged, while the use of these or generic load factors would prevent differentiation between individual generators in terms to their contribution to congestion costs. This would clearly fail to meet the requirements of the Authority's Direction, i.e. it would not result in a charging mechanism that "*better reflects the differing impacts (i.e. costs and benefits) of individual generators on the TO's costs".* Any attempt to improve charging cost-reflectivity by supplementing average load factor with an additional variable (which could average to zero as some wind farms would be charged more and some less), would add considerable complexity and reduce transparency. It should also be noted that, in the interests of non-discrimination, a similar approach would need to be applied to all generation technologies and not just wind, introducing further complexity for very little gain.

In any event, neither of these alternatives put forward by Poyry / NERA / Bath et al has been developed by the CMP213 process and are therefore not available for consideration by the Authority. The choice before Ofgem appears to be simple, if they concur that CMP213-WACM2 represents a more cost-reflective option than the Status Quo, they should approve it. If parties believe that further improvements in cost reflectivity are justified, they have the option to raise modifications at a later date.

3.3 Poyry claim 5; the CMP213 dual background approach is not appropriate

Here again, Poyry rely heavily on the University of Bath's report to Centrica and RWE, which demonstrates that congestion cost are not evenly spread across the year as the use of average load factors would imply, but is dependent on time, duration and location. Consequently, the University of Bath conclude that the periods during which congestion costs are greatest should be identified, and that these periods should be used as backgrounds for deriving year-round congestion costs.

While this approach might conceivably result in a more accurate outcome, it would add considerable complexity, as these periods would be sensitive to a range of variables such as generator and circuit outages. Charges would inevitably become more volatile and unpredictable. Furthermore, the approach would fail to conform to the Authority's Direction to NGET, that they should raise a modification that is "*consistent with the principles set out in the National Electricity System Security and Quality of Supply Standard (SQSS)".* While not demanding that any new charging methodology should exactly replicate the SQSS approach, the requirement to follow SQSS principles would seem to imply that a dual background should be adopted.

Poyry go on to repeat two key contentions made by the University of Bath that;

- "*Employing only two backgrounds would fail to create even the crudest representation of system performance and costs*".
- "*A consequence of adopting the current CMP 213 proposals for an improved ICRP methodology will be to increase congestion costs, which would be perverse given the objectives of project TransmiT.*

In order to justify the first contention, which was directed at the NGET Original proposal that the Authority is minded to reject in favour of CMP213-WACM2, the University of Bath would have needed to show that the proposed charging arrangements were inferior, i.e. less cost-reflective, than the Status Quo. This they failed to do in their report to Centrica and RWE.

As far as the second contention is concerned, the fact that any new charging arrangements lead to an increase in congestion costs may be an entirely cost-effective and economically justified outcome. A CBA approach to transmission planning examines the trade-off between congestion costs and the reduction in those costs through investment. If therefore, constraint costs are seen to increase, this would indicate that investment to remove or reduce those costs is unjustified, not that overall operational and investment costs had increased. Therefore an increase in congestion costs would suggest that bearing these costs is a cheaper alternative than investment in transmission network.

Furthermore, a holistic approach to the overall costs to consumers of meeting the UK's renewable targets needs to be taken. If for example, CMP213-WACM2 was not implemented and the existing TNUoS charging methodology retained, then wind (and other generation) in the North would continue to be penalised and further marginal development discouraged. This would lead to more wind being built in less resource-efficient areas or offshore, resulting in the costs of delivering the UK's renewable targets being unnecessarily increased.

3.4 Poyry claim 6; the CMP213 year-round tariff methodology does not accurately link to the SQSS Economy Background

Having questioned the appropriateness of the CMP213 year-round methodology, mostly by relying on analysis performed by the University of Bath, Poyry move on to examine the extent to which the CMP213-WACM2 methodology reflects the dual background approach adopted by the SQSS.

The Authority's direction to NGET requires that they should raise a modification that *"better reflects the differing impacts (i.e. costs and benefits) of individual generators on the TO's costs in a manner which is consistent with the principles set out in the National Electricity System Security and Quality of Supply Standard (SQSS)"*. However, Poyry contend that in using "backward looking" average (annual) load factors rather than the scaling factors used by the SQSS and adopting a year-round background that uses peak demand, CMP213-WACM2 inappropriately deviates from the SQSS methodology. Finally, Poyry point out that there has been no attempt by Ofgem or NGET to compare the CMP213 Diversity options on the basis of cost reflectivity, or demonstrate that they are superior to the Status Quo in this respect. Taking these contentions in turn;

3.4.1 The use of annual average load factors

In considering the use of average load factors rather than scaling factors or generic load factors, it is important to note that the Authority's direction requires NGET to develop a charging methodology that is consistent with the principles set out in the SQSS, rather than adopting the SQSS methodology in every detail. This distinction is appropriate as the SQSS and transmission charging have different aims. The intention of the SQSS is to identify transmission investment that is justified from a security and cost benefit point of view, and in so doing to identify costs to be incurred by the TOs. The aim of the charging methodology is, inter alia, to reflect the contribution that individual generators make to those costs.

In developing a simplified deterministic proxy for a full CBA SQSS approach, the SQSS Review Group identified the generation technology scaling factors that ensured an outcome that was no less accurate than that to be obtained from a full CBA[7]. However, while the use of generic scaling factors ensures that the pseudo-CBA SQSS methodology gives an outcome equivalent to a full CBA, their use in the charging methodology would not allow the contribution made by individual generators to TO costs to be identified, a clear requirement of the Authority's Direction. Identifying individual generator contributions to these costs requires generator-specific information, and the CMP213 Workgroup alighted on the use of average annual load factors as the most appropriate solution[8]. The Workgroup considered the use of forward looking load factors or some hybrid arrangement, but concluded that these would raise

[7] See Amendment Report GSR009; "Review of Required Boundary Transfer Capability with Significant Volumes of intermittent Generation", prepared by the SQSS Review Group at http://www.nationalgrid.com/NR/rdonlyres/BC265EEB-7415-4C58-8C56-0CF580581B8C/47751/GSR009ofgemreportv1_2_.pdf

[8] CMP213 Project TransmiT TNUoS Developments. Final CUSC Modification Report, National Grid June 2013, see http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=15494

implementation difficulties and increased the risk of the charging methodology influencing operational decisions.

Summarising, therefore, it can be concluded that the different approaches to scaling generator output used by the pseudo-CBA SQSS investment cost criteria and CMP213-WACM2 are justified by the differing purposes of the two methodologies. Furthermore, the use of "historic" rather than forward looking load factors in the charging methodology can be justified on the basis of practicality and the need to avoid transmission charging considerations influencing operational dispatch.

3.4.2 CMP213 Year-round tariff methodology not aligned to "under year round conditions" SQSS methodology

In attempting to make the point that the CMP213 methodology is not sufficiently aligned to the SQSS year-round conditions, Poyry highlight the fact that both backgrounds relate to investment costs necessary to meet peak demand under intact-system conditions with no circuit outages taken (Poyry 4.3). The inference is that, in order to accurately reflect the investment costs justified by the avoidance of congestion costs occurring year-round, it is necessary to consider year-round rather than peak demand conditions.

However, this argument disregards the rationale behind the pseudo-CBA approach developed by the SQSS Workgroup and subsequently approved by the Authority. Following extensive analysis, the SQSS Workgroup alighted on a simple deterministic dual-background methodology, based on peak demand in both but using a quite different method of scaling generation, that accurately simulated the outcome of a full year-round CBA in terms of TO-incurred costs. In following those principles, as required by the Authority's Direction to NGET, it can therefore be reasonably expected that the CMP213-WACM2 methodology should also accurately reflect those costs. The CMP213-WACM2 methodology differs from the pseudo-CBA SQSS approach only in the use of generation specific annual load factors, a divergence necessary to identify the contribution of individual generators to TO costs.

In order to demonstrate that the failure of CMP213-WACM2 to more comprehensively take into account year round conditions undermined the cost-reflectivity of its charges, Poyry would need to demonstrate that the methodology failed to reflect pseudo-CBA SQSS derived costs, which would seem unlikely given that they both use the same backgrounds and approach to peak demand, or that the pseudo-CBA approach did not accurately reflect the costs of a full CBA methodology, which seems unlikely given the SQSS Workgroup's conclusions and the Authority's approval of those conclusions. Indeed, notwithstanding the fact that the pseudo-CBA SQSS methodology is designed to identify TO costs and not the contribution of individual generators to congestion costs, the analysis of CMP213-WACM2 and Status Quo charges referred to in section 4 and the modelling summarised in section 5 of this report indicate that the opposite is true – i.e. that CMP213-WACM2 charges *are* reflective of SQSS costs, certainly far more reflective of those costs than the Status Quo.

3.4.3. No attempt to compare the CMP213 options or the Status Quo in terms of cost-reflectivity

Although Poyry fail to make either case, they do reasonably make the point that, given that the fundamental rationale for CMP213-WACM2 is that it is more cost-reflective than the Status Quo, neither NGET nor Ofgem in their Impact Assessment explicitly demonstrate that this is the case. This observation is probably correct and it is indeed rather surprising given that the need for a cost-reflective outcome featured strongly in the Authority's Direction to NGET, i.e. that they should raise a modification that "*better reflects the differing impacts (i.e. costs and benefits) of individual generators on the TO's costs in a manner which is consistent with the principles set out in the National Electricity System Security and Quality of Supply Standard (SQSS)*. However, despite this apparent omission and noting Ofgem's contention made at the stakeholder event in September 2013 that their CMP213 Impact Assessment had *implicitly* compared the CMP213 alternatives in this regard, work has been undertaken both in this report and previously[9] which suggests that both NGET's Original proposal and CMP213-WACM2 are more reflective of the costs incurred by TOs in applying the SQSS criteria than is the Status Quo.

4. Comparison of WACM2 and Status Quo zonal charges in how they differ from costs implied by the SQSS

In order to compare the cost-reflectivity of the Status Quo and CMP213-WACM2 charging methodologies, the tariff elements given in NGET's "Initial view of 2015/16 TNUoS tariffs" [10] were used to compute CMP213-WACM2 charges for wind, nuclear, conventional and peaking generation for each of the 27 charging zones. These, together with the existing TNUoS methodology charges, were then compared with the costs incurred by the TOs computed by application of the pseudo-CBA SQSS methodology. In computing these costs, the scaling factors from NGET's ICRP draft sharing model shown in Table 1 were used.

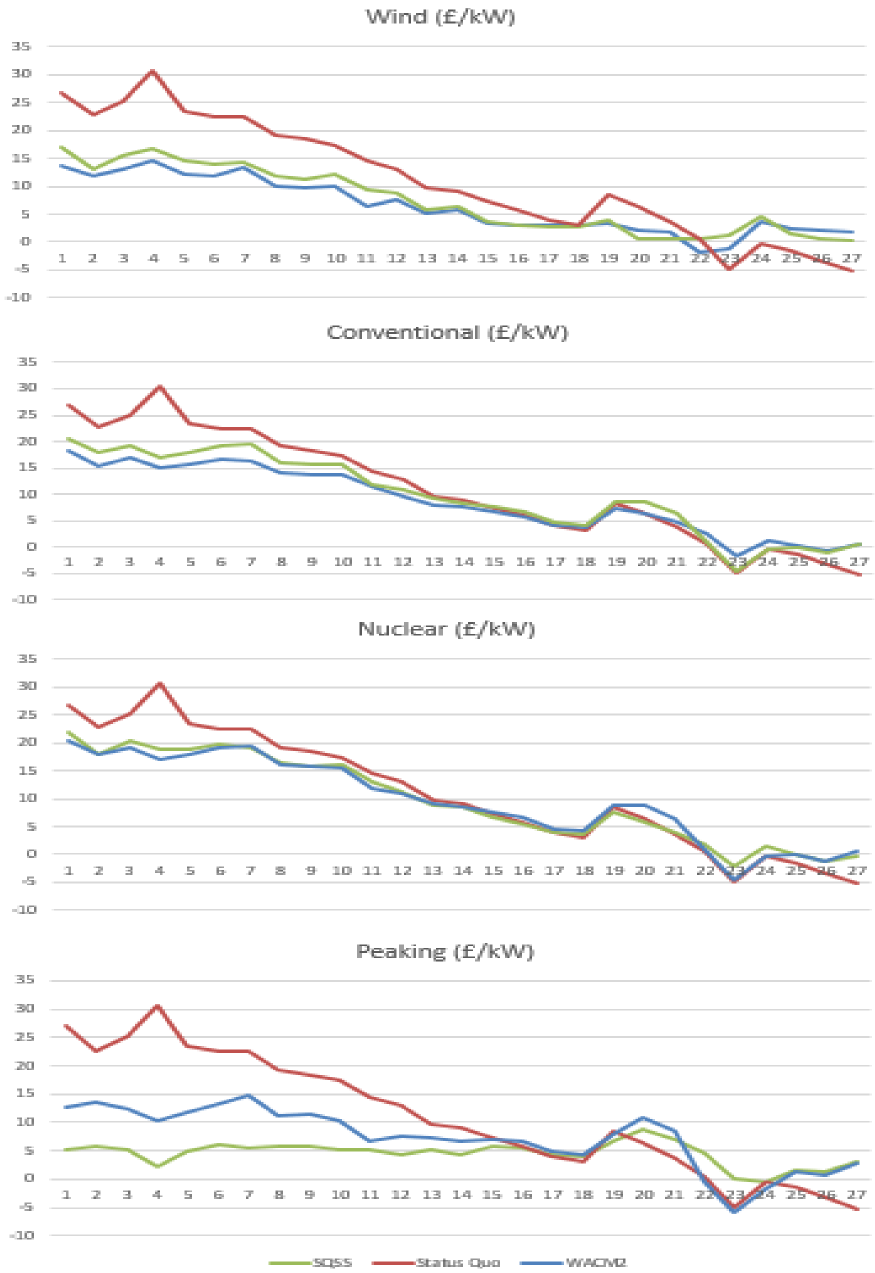
Plant Type	TEC	Generation - Peak Security	Generation - Year Round	Peak Security Generation	Generic LF Generation
Conventional	61,386	73%	66%	100%	75%
Intermittent	5,378	0%	70%	0%	25%
Peaking	5,455	73%	0%	100%	1%
Pumped Storage	2,744	73%	50%	100%	30%
Nuclear & CCS	10,841	73%	85%	100%	60%
Interconnectors	3,268	0%	100%	0%	0%

Table 1. Generating technology scaling factors

[9] See University of Bath report "Year-round System Congestion Costs – Key Drivers and Key Driving Conditions": an alternate view. Report by P E Baker to SSE, October 2013.

[10] See NGET Tariff Information Paper "Initial view of TNUoS tariffs for 2015/16 at; http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=31095

The outcome of this analysis is set out in Figure 2, which shows the charges for each generation technology and how these compare with the costs implied by the SQSS. It can be seen that combining the peak security, year-round and residual components produced by the CMP213-WACM2 methodology result in charges that are closer to the costs suggested by the application of the SQSS criteria than the Status Quo for almost all of the charging zones. While, as discussed in Section 3.1, the SQSS criteria represent a proxy for of the real-world identification of transmission investment requirements and do not determine the actual costs incurred by TOs, it is worthy of note that CMP213-WACM2 delivers an outcome far closer to the "short hand" methodology of determining SQSS costs than does the Status Quo in almost all circumstances.



1	North Scotland	8	The Trossachs	15	South Lancashire, Yorks	22	Cotswold
2	East Aberdeenshire	9	Stirlingshire and Fife	16	North Midlands, N Wales	23	Central London
3	Western Highlands	10	South West Scotland	17	South Lincolnshire, North Norfolk	24	Essex and Kent
4	Skye and Lochalsh	11	Lothian and Borders	18	Mid Wales and The Midlands	25	Oxfordshire, Surrey and Sussex
5	Eastern Grampian	12	Solway and Cheviot	19	Anglesey and Snowdon	26	Somerset and Wessex
6	Central Grampian	13	North East England	20	Pembrokeshire	27	West Devon and Cornwall
7	Argyll	14	North Lancashire	21	South Wales & Gloucester		

Figure 2. Comparison of WACM2 and Status Quo zonal transmission charges in terms of how they differ from costs implied by the application of the SQSS

Figure 2 also demonstrates that the existing TNUoS charging arrangements consistently overcharge generation in those Northern zones where significant amounts of wind exist. Conversely, the higher impact of the "non-shared" element in the CMP213-WACM2 methodology in these zones ensures a charging outcome that is closer to the costs implied by the SQSS. The reality is that non-shared MWkm element of CMP213-WACM2 will influence charges in the majority of zones. It should also be noted that, where the non-sharing element does not feature - i.e. in zones where there is less wind connected than conventional generation - it is likely that the SQSS will underestimate the capability of wind to share capacity and therefore exaggerate the costs of connection.

It is also worth noting that in the case of peaking plant, Figure 2 shows that CMP213-WACM2 charges are considerably more cost-reflective that those of the existing TNUoS methodology. This highlights the particular flaw in the existing arrangements discussed in Section 2.1, i.e. the inability to give correct charging signals when peaking plant provides a security role in areas dominated by wind.

5. Alternative modelling of cost reflectivity.

Previous work submitted to Ofgem[11] compared the cost reflectivity of diversity proposals compared with the Status Quo charging methodology and the SQSS, counter to Poyry's claim that such analysis had not been carried out. This section builds on the previous work as a response to Poyry analysis to demonstrate that the CMP213-WACM2 methodology is likely to achieve a more cost-reflective outcome than the Status Quo, contrary to Poyry's conclusion.

In order to further investigate the cost-reflectivity of the CMP213-WACM2 charging methodology, the simple 2-bus single circuit model shown in Figure 1 is applied to situations where the dominant power flows occur in the Peak Security background and for different degrees of sharing in situations where the dominant flows occur in the Year-round background.

[11] University of Bath report "Year-round System congestion Costs – Key Drivers and Key Driving conditions": an alternative view.

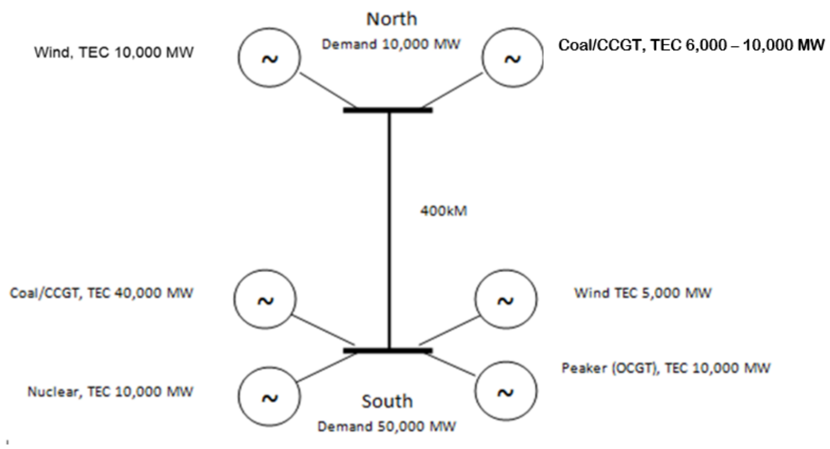


Figure 3, Simple 2 bus representation of GB system

The model assumes a demand and generation distribution that is broadly representative of the GB system, with 10GW of demand situated in the North and 50GW situated in the South. 40 GW of coal/CCGT, 10 GW of nuclear, 10 GW of OCGT and 5 GW of wind generation is connected to the Southern node, with 10 GW of wind connected in the North. The amount of conventional generation connected in the North is varied from 6 to 10 GW in order to switch the single connecting circuit from the Peak Security to Year-round backgrounds. The interconnecting circuit is 400 km in length and the cost of network expansion is assumed to be £12.5/MWkm[12].

5.1 Peak security assessment in a shared zone

Assuming that 6 GW of conventional coal or CCGT plant is connected to the Northern node and applying the SQSS Peak Security criteria, wind capacity is assumed not to contribute and all other generation is scaled to meet demand. With this dispatch, 4,545MW flows from South to North on the interconnecting circuit. Applying the SQSS economic criteria or "year round" background, the wind capacity connected to the Northern node is assumed to operate at 70% capacity, the nuclear capacity connected in the South to operate at 85% capacity, the peaking capacity is assumed not to contribute at all and the coal/CCGT generation is variably scaled. With this dispatch, 2,804 MW flows from the Northern to Southern node. As the highest flow occurs under the peak security assumptions, the circuit is assigned to that background.

Under the Peak Security background, an increase of 1MW in the coal/CCGT capacity connected to the Northern node reduces the circuit flow by 0.825 MW or 330MWkm. Applying the network expansion cost of £12.5/MWkm, the notional saving in investment costs resulting from the connection of this additional 1 MW of generation capacity is therefore 330 MWkm x £12.5/MWkm = £4,125, or £4.125kW.

A 1MW increase in the capacity of any of the generation technologies connected to the Southern node results in an increase of 0.081MW or 32.4 MWkm in the flow from South to

[12] NGET TNUoS Tariff Statement for 2013/14. See http://www.nationalgrid.com/NR/rdonlyres/E1CC114B-4815-447D-BDE9-39D2FC31D08B/58728/FinalTNUoSTariffsin13_14.pdf

North. Again applying the network expansion cost of £12.5/MWkm, the notional investment cost of accommodating the additional 1 MW of capacity is £405 or £0.4/kW.

Now applying the CMP213-WACM2 charging methodology, a 1 MW increase in coal or CCGT capacity at the Northern node, accompanied by a compensating 1 MW of demand shared pro rata across the two nodes, results in a 0.833 MW or 333 MWkm reduction in circuit flow. Applying the network expansion cost of £12.5/MWkm, the CMP213-WACM charge would be -£4.163 or -£4.163/kW, which closely aligns with the SQSS saving of £4.125/kW. An increase of 1 MW in any of the generation technologies connected to the Southern node results in an increase in circuit flow of 0.167 MW or 66.8 MWkm, resulting in a CMP213-WACM2 charge of £830 or £0.83/kW. Again this is closely aligned with the SQSS cost of £0.4/kW. Wind would incur no charge under the Peak Security assessment.

Applying the existing TNUoS charging methodology, which assumes a single peak demand background with all generation variably scaled, the circuit flow would be from North to South. A 1 MW increment of generation at the Northern node with a compensating 1 MW of demand applied pro rata between the two nodes, would result in an increase in circuit flow of 0.833 MW or 333 MWkm. The existing charging methodology would therefore apply a positive charge of £4.163/km, rather than the negative charge applied by WACM2. A 1 MW increment of generation at the Southern node would result in a reduction in transfer of 0.167MW or 66.8MWkm, with the existing TNUoS methodology applying a negative charge of £0.84/kW.

Node	Generation	Incremental SQSS Reinforcement	Existing TNUoS charges	WACM2 TNUoS charges
		£/kW	£/kW	£/kW
North	Coal/CCGT	-4.125	4.163	-4.163
North	Wind		4.163	
South	Coal/CCGT	0.4	-0.84	0.83
South	Wind		-0.84	
South	Nuclear	0.4	-0.84	0.83
South	Peaker	0.4	-0.84	0.83

Table 2. Comparison of charges arising from CMP213-WACM2 peak security assessment and the Status Quo

The charges incurred under CMP213-WACM2 and the Status Quo are summarised in Table 2, together with the costs arising from applying the pseudo-CBA SQSS methodology. It can be seen that the CMP213-WACM2 methodology produces charges that are consistent with the costs and notional savings incurred by the TO in applying SQSS criteria. The connection of conventional plant to the Northern node, necessary to support local demand in the event of transmission failure, would be encouraged through a negative charge. Conversely, the existing TNUoS charging methodology gives a perverse and potentially dangerous signal, discouraging the connection of generation to the Northern node even though that generation would contribute to the security of the local system under peak demand conditions when wind output is likely to be low. Generation connected to the Sothern node also experience charges under the existing TNUoS charging regime that have the opposite sign to the costs suggested by the SQSS.

5.2 Year-round Assessment in a shared zone

Here, the conventional generation connected to the Northern node in simple model shown in Figure 1 is adjusted from 6 to 10GW in order to ensure that the circuit flow under the year-round background dominates. The interconnecting circuit is allocated to that background.

This allows the cost-reflectivity of the WACM2 charging methodology, i.e. the extent to which it reflects the costs incurred in applying the pseudo-CBA SQSS criteria, to be compared with the Status Quo for various degrees of sharing between wind and conventional generation connected to the Northern zone. Charges emanating from the CMP213-WACM2 and existing TNUoS charging mechanisms together with costs implied by the application of the SQSS year-round criteria for various degrees of sharing[13] are shown in Figure 4. Three scenarios are now considered, scenario 1 where there is less wind than conventional capacity, scenario 2 where wind exceeds conventional capacity but where wind and conventional capacity are reasonably balanced and scenario 3 where wind capacity dominates. Applying that categorisation to the GB transmission system, some 11 charging zones would be described by scenario 1, while the remaining 16 charging zones would mostly be described by scenario 2. It should be noted however, that as wind capacity grows, more real-world charging zones will migrate to the “reasonably balanced” or “wind generation dominates” categories, as described by scenarios 2 and 3 respectively.

[13] The sharing factor used in Figure 1 is defined as the ratio of wind capacity to total installed capacity, i.e. a sharing factor of 50% indicates equal wind and conventional capacity, while a ratio of 0.8 indicates that there is four times as much wind capacity as conventional.

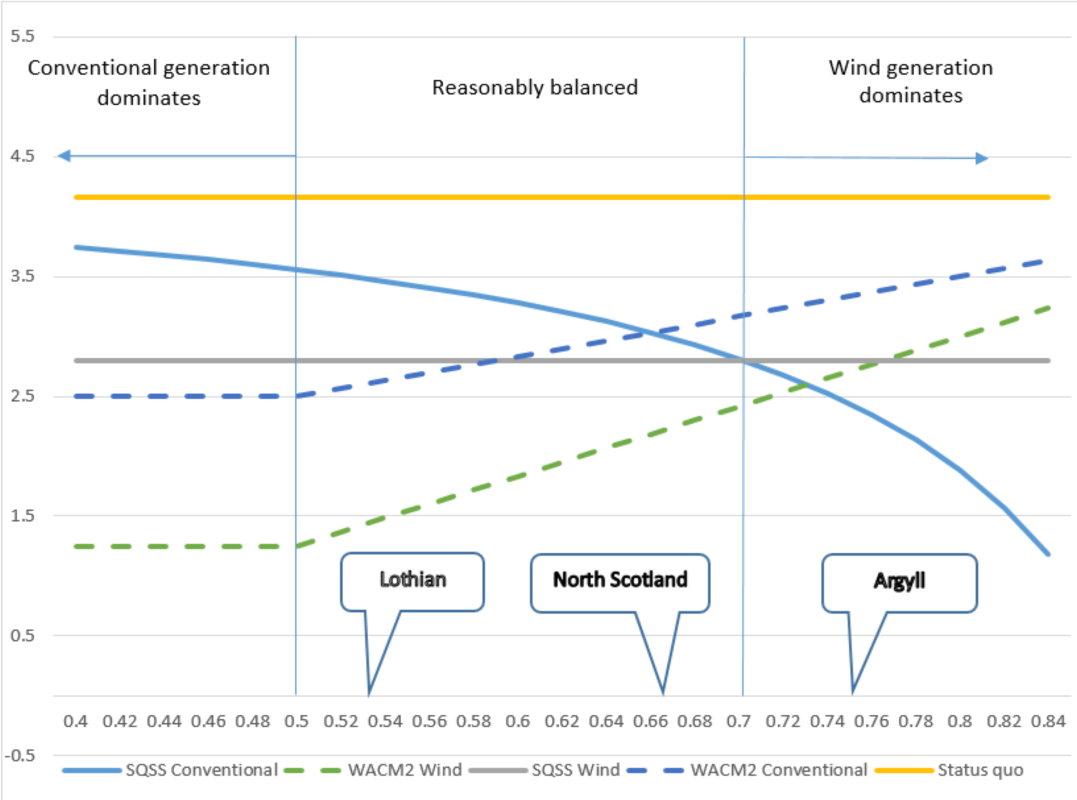


Figure 4. Variation of SQSS costs (£/kW) and WACM2 & Status Quo charges (£/kW) with sharing

5.2.1 Scenario 1 – high levels of sharing, with wind capacity less than 50% of connected capacity.

In this scenario, where conventional generation dominates, Figure 4 shows that CMP213-WACM2 charges for wind are less than the costs implied by application of the SQSS criteria. However, as discussed earlier, the pseudo-CBA SQSS methodology tends to overestimate the costs of connecting wind and some discount therefore seems appropriate. Intuitively, the cost of connecting wind should reduce when it forms a relatively small proportion of total installed capacity within a zone, as it will be more able to utilise transmission capacity that is required to accommodate conventional generation. However, CMP213-WACM2 does not recognise this effect due to the constant 70% scaling factor applied to incremental wind capacity, which is carried over from the SQSS methodology. This suggests that CMP213-WACM2 could in fact impose higher than justified charges on wind in zones where wind accounts for only a small proportion of total capacity. Figure 4 shows that CMP213-WACM2 charges applied to conventional generation are also less than the costs of connection suggested by application of the SQSS.

It can also be seen that the existing TNUoS charging regime significantly overcharges both wind and conventional generation connected to the Northern node. The overcharge applied to conventional generation increases as the proportion of wind capacity increases and the cost of connecting conventional generation falls.

Table 3 below compares the charges applied by both the existing TNUoS charging methodology and CMP213-WACM2 in situations where conventional generation dominates for both the North and South zones. It can be seen that the charges applied to all generation connected in the Southern zone are negative, due to the fact that an increase in any generation capacity will reduce the transfer into the zone.

Node	Generation	Incremental SQSS Reinforcement	Existing TNUoS charges	WACM2 TNUoS charges
		£/kW	£/kW	£/kW
North	Wind	2.8	4.17	1.25
North	Coal/CCGT	3.5 to 3.3	4.17	2.5
South	Wind	-0.75	-0.84	-0.25
South	Coal/CCGT	-0.87 to -0.82	-0.84	-0.5
South	Nuclear	-0.85	-0.84	-0.71

Table 3. Incremental cost of connecting generation compared with Status Quo and CMP213-WACM2 charges in situations conventional generation dominates

5.2.2 Scenario 2 – balanced sharing.

This scenario ranges from situations where conventional and wind capacity are balanced, to where wind capacity is around 2.5 times that of conventional capacity. Many Northern charging zones such as North Scotland and Lothian would fall into this category.

It can be seen from Figure 4 that, in this case, the CMP213-WACM2 charges for wind are less than the costs suggested by the application of SQSS criteria, with the discount decreasing as wind capacity builds and the influence of the non-shared element of the CMP213-WACM2 methodology increases. Again, some discount on the costs implied by application of the pseudo-CBA SQSS seems appropriate as the methodology overstates the costs of accommodating wind. CMP213-WACM2 charges for conventional generation are also initially less than the costs suggested by the SQSS, but increase and eventually exceed those costs as wind capacity increases.

For generation connected to the Southern node, the ratio of wind to conventional capacity is less than 0.5, so all incremental MWkm associated with increases in capacity are shared. As any increase in generation at the Southern node will reduce transfers into the node, the costs implied by the application of the pseudo-CBA SQSS methodology are negative. Both the Status Quo and CMP213-WACM2 charging methodologies apply negative charges to all generating technologies.

A summary of the charges applied by the Status Quo and CMP213-WACM2 compared to the incremental costs implied by the SQSS is given in Table 4. It can be seen that CMP213-WACM2 applies charges that are closer to SQSS costs than the Status Quo for Northern generation. For Sothern generation, both charging mechanisms deliver similar results, with CMP213-WACM2 appearing to slightly under-reward generation, particularly wind.

Node	Generation	Incremental SQSS Reinforcement	Existing TNUoS charges	WACM2 TNUoS charges
		£/kW	£/kW	£/kW
North	Wind	2.8	4.17	1.25 to 2.4
North	Coal/CCGT	3.3 to 2.68	4.17	2.5 to 3.4
South	Wind	-0.7	-0.84	-0.25
South	Coal/CCGT	-0.82 to -0.63	-0.84	-0.5
South	Nuclear	-0.85	-0.84	-0.71

Table 4. Incremental cost of connecting generation compared with Status Quo and CMP213-WACM2 charges in situations where conventional and wind generation are reasonably balanced

4.2.3 Scenario 3 – low levels of sharing where wind capacity dominates

This scenario describes zones containing significant amounts of wind capacity but little conventional generation, i.e. wind to conventional capacity ratios of above 2.5. Some Northern zones such as Argyll would fall into this category, and the number can be expected to increase as wind capacity grows.

Again, it can be seen from Figure 4 that the CMP213-WACM2 charges for both wind and conventional generation increase with increasing wind capacity, as the non-shared element of the methodology becomes increasingly influential. Charges for conventional generation exceed SQSS costs, which decline as wind becomes increasingly dominant. Charges for wind also rise above SQSS costs as wind capacity increases. Both wind and conventional charges converge and would equal the Status Quo charge in situations where only wind generation is present.

The fact that conventional generation should increasingly be able to utilise network capacity necessary to accommodate wind as the dominance of wind increases is not recognised by either the Status Quo or the CMP213-WACM2 methodology. However, while the Status Quo only considers peak security conditions and can take no account of sharing, the potential exists for future modifications to the basic CMP213-WACM2 methodology to take this issue into account.

For this scenario, the charges applied by CMP213-WACM2 are more cost reflective of the SQSS than the Status Quo and are summarised in Table 5. For Northern generation, the existing TNUoS charging arrangements are seen to be inferior to CMP213-WACM2, in that they consistently overcharge wind and particularly conventional generation. Both the Status Quo and CMP213-WACM2 charging mechanisms apply negative charges to Southern generation, which reflects the contribution made by incremental generation to reducing transfers into the zone. The charges applied by both mechanisms are broadly in line with SQSS costs, albeit CMP213-WACM2 tends to under-reward wind generation.

Node	Generation	Incremental SQSS Reinforcement	Existing TNUoS charges	WACM2 TNUoS charges
		£/kW	£/kW	£/kW
North	Wind	2.8	4.17	2.4 to 2.9
North	Coal/CCGT	2.68 to 1.6	4.17	3.4 to 3.7
South	Wind	-0.7	-0.84	-0.25
South	Coal/CCGT	-0.63 to – 0.4	-0.84	-0.5
South	Nuclear	-0.85	-0.84	-0.71

Table 5. Incremental cost of connection generation and associated Status Quo and CMP213-WACM2 charges in situations where wind generation dominates

6. Summary

This report provides an alternative view of issues raised by Poyry in relation to Ofgem's CMP213 Impact Assessment and minded to decision to implement the CMP213-WACM2 charging methodology. In particular, the report focuses on issues raised by Poyry in relation to;

- the use of average load factors as a proxy for the impact of individual generators on the costs of congestion,
- the use of a dual Peak Security/Year-round background, and
- the alignment of these backgrounds with those used by the National Electricity Transmission System (NETS) Standards of Quality of Security of Supply (SQSS).

The report then goes on to compare the indicative 2015/16 zonal transmission generation charges derived from CMP213-WACM2 with the Status Quo and with the costs arising from application of the pseudo-CBA SQSS methodology. Finally, the two charging models are compared across a range of sharing situations using a simple two-bus representation of the GB system.

- **In a high wind zone, CMP213 is more cost reflective for wind generation than Status Quo, contrary to Poyry's claims (Poyry claim 1)** - By applying the CMP213-WACM2 methodology using NGET's initial view of charges for 2015/2016, this report demonstrates that the CMP213-WACM2 methodology is likely to achieve a more cost-reflective outcome than the Status Quo, contrary to Poyry's claims.

- **CMP213 is more cost reflective and less discriminatory regarding nuclear compared with wind generators than the Status Quo, contrary to Poyry's claims (Poyry claim 2) –**
    - From their own arguments, Poyry implicitly acknowledge that relatively high load factor nuclear should see higher charges than relatively low load factor wind, and in this regard, the use of plant specific average load factors is clearly

superior to the Status Quo where no account of load factor is taken. Therefore, CMP213 is more cost reflective and less discriminatory regarding high load factor generators such as nuclear compared with wind generators than the Status Quo, contrary to Poyry's claims.

- While CMP213-WACM2 may not perfectly reflect the potential for low load factor generation to fully share transmission capacity when wind dominates[14], the charges applied are closer to the costs implied by application of the SQSS. However, by raising this issue in an attempt to criticise CMP213-WACM2, Poyry therefore help make the case that CMP213-WACM2 is clearly to be preferred to the Status Quo in this respect.

- The CMP213 charging methodology can be more reflective than the SQSS, contrary to Poyry's claims (Poyry claim 3) -
  - Station specific average load factors more reasonably reflect the drivers of network constraints for individual stations than the SQSS generic scaling factors, or the Status Quo methodology, contrary to Poyry's claims.
  - The CMP213 "year round" approach is well aligned with, and cost reflective of the SQSS Economic Background and certainly better than the Status Quo methodology in this regard.

- Station specific average load factors reasonably reflect the drivers of network constraints, contrary to Poyry's claim (Poyry claim 4) –
  - NGET has identified that there ***is*** a compelling albeit imperfect relationship between load factor and a generator's contribution to congestion cost, and it is therefore unsurprising that CMP213-WACM2, which utilises that relationship, produces a more cost-reflective outcome than the Status Quo, which does not.
  - Both Poyry and NERA implicitly suggest that the use of SQSS scaling factors would result in wind being generally overcharged, which suggests that WACM2 is more cost reflective than using the SQSS scaling factors, which is in turn more cost reflective than the Status Quo.
  - Station specific average load factors under WACM2 are more cost reflective because the use of these or generic load factors would prevent differentiation between individual generators in terms to their contribution to congestion costs.

[14] It should be possible in future to design a modification that would to address this defect. This might for example be achieved by treating wind and low load factor plant differently under WACM2, or possibly by categorising dispatchable renewable generation such as hydro as "non low-carbon". Hydro is often present in "high wind" zones and recognising its dispatchability and negative correlation with wind output in this way would increase "non low-carbon" capacity and thereby allow low load factor conventional generation to benefit from a higher level of sharing

- Analysis for the Workgroup by NGET using ELSI demonstrated that, although the relationship between average load factor is not perfect, it is strong and CMP213-WACM2 was specifically designed to further improve on the Original proposal to remedy concerns over the relationship in situations where wind generation dominates. However, much of University of Bath's comments were only relevant for the Original proposal, since their report pre-dated WACM2 and the recent changes introduced by WACM2 result in much of Bath's comments becoming obsolete and no longer relevant, which Poyry fails to take into account.

- **The dual background approach of CMP213-WACM2 is appropriate, counter to Poyry's claims (Poyry claim 5) -**
  - The requirement to follow SQSS principles would seem to imply that a dual background should be adopted.
  - Bath proposed an alternative multi-background approach to take account of time, duration and location of constraints, however, they did not provide any evidence that this would be any more cost reflective than WACM2. Additionally, Baths proposal would add considerable complexity, with more volatile and unpredictable charges and fail to conform to the Authority's Direction to NGET.

- **The year-round tariff methodology does accurately link to the SQSS Economy Background, counter to Poyry's claims (Poyry claim 6)**
  - **It is more appropriate for the charging methodology to use annual load factors rather than the SQSS scaling factors, contrary to Poyry's claims -** The different approaches to scaling generator output used by the pseudo-CBA SQSS investment cost criteria and CMP213-WACM2 are justified by the differing purposes of the two methodologies: The SQSS aims to identify costs to be incurred by the TOs, while the charging methodology aims to reflect the contribution that individual generators make to those costs. While it is appropriate therefore that the SQSS uses generic scaling factors, it is necessary for the charging mechanism to use generator-specific information, such as annual load factors.

  - **CMP213 Year-round tariff methodology is aligned to "under year round conditions" SQSS methodology, contrary to Poyry's claims -** Following extensive analysis, the SQSS Workgroup alighted on a simple deterministic dual-background methodology, based on peak demand in both but using a quite different method of scaling generation, that accurately simulated the outcome of a full year-round CBA in terms of TO-incurred costs. In following those principles, as required by the Authority's Direction to NGET, it can therefore be reasonably expected that the CMP213-WACM2 methodology should also accurately reflect those costs. The CMP213-WACM2 methodology differs from the pseudo-CBA SQSS approach only in the use of generation specific annual load factors, a divergence necessary to identify the contribution of individual generators to TO costs. The analysis of CMP213-WACM2 and Status Quo charges referred to in section 4 and the modelling summarised in section 5 of this report indicate that CMP213-WACM2 charges *are* reflective of SQSS costs, certainly far more reflective of those costs than the Status Quo.

- **Attempts have been made to compare the CMP213 options and the Status Quo in terms of cost reflectivity, counter to Poyry/s claims -** Work has been undertaken both in this report and previously[15] which suggests that both NGET's Original proposal and CMP213-WACM2 are more reflective of the costs incurred by TOs in applying the SQSS criteria than is the Status Quo. Further, Ofgem's made the contention at the stakeholder event in September 2013 that their CMP Impact Assessment had *implicitly* compared the CMP213 alternatives in this regard.

Additionally, this report provides further evidence that CMP213-WACM is more cost reflective than the Status Quo methodology.

- **Further evidence from the recently released indicative TNUoS tariffs for 2015/16** –
  - The comparison of zonal charges given in Section 4 demonstrates the superiority of CMP213-WACM2 over the Status Quo in most situations. Therefore, by applying the CMP213-WACM2 methodology using NGET's initial view of charges for 2015/2016, this report demonstrates that the CMP213-WACM2 methodology is likely to achieve a more cost-reflective outcome than the Status Quo, contrary to Poyry's claims.

  - In the case of peaking plant, Figure 2 shows that CMP213-WACM2 charges are considerably more cost-reflective that those of the Status Quo TNUoS methodology which simply levies charges on the basis of TEC. This highlights the particular flaw in the existing arrangements discussed in Section 2.1, i.e. the inability to give correct charging signals when peaking plant provides a security role in areas dominated by wind.

- **Further evidence using a simplified network model (Section 5 of this report)** –

[15] See University of Bath report "Year-round System Congestion Costs – Key Drivers and Key Driving Conditions": an alternate view. Report by P E Baker to SSE, October 2013.

- By analysing the performance of the CMP213-WACM2 methodology over a range of intermittent-conventional sharing scenarios using a simple model of the GB system, this report demonstrates that the CMP213-WACM2 methodology is likely to achieve a more cost-reflective outcome than the Status Quo, contrary to Poyry's conclusion.

- Under the Peak Security background, the existing charging arrangements are unable to deliver the appropriate locational signals where peaking plant provides a security role in zones dominated by wind is demonstrated. CMP213-WACM2 is able to give the correct signals, due to its dual background approach. This issue is also highlighted by the comparison of zonal charges, with Figure 2 demonstrating the excessive charges levied by the existing TNUoS arrangements on low-load factor plant in Northern zones dominated by wind.

- The analysis also shows the superior performance of the CMP213-WACM2 methodology in those zones where wind capacity exceeds that of conventional plant, with the impact of the "non-shared" tariff element bringing charges closer to the costs implied by the SQSS.

7. Conclusions

7.1 Issues raised by Poyry

7.1.1 The use of average load factors as a proxy

Poyry conclude that the use of average load factors is not representative of the contribution made by individual generators to constraint costs and discriminates in favour of wind and against high load factor generators such as nuclear. In coming to this conclusion, Poyry rely heavily on analysis previously carried out by the University of Bath that demonstrates that the relationship between constraints costs and load factor is not linear. However, NGET have demonstrated that a relationship does exist and, while not perfect, its use allows CMP213-WACM2 to deliver a more cost-reflective outcome than the Status Quo, which takes no account of a plant's load factor. CMP213-WACM2 can therefore claim to strike an appropriate balance between simplicity/transparency and accuracy. It should also be noted that the University of Bath's analysis pre-dates CMP213-WACM2, which was developed to reflect the reduced ability to share transmission capacity in situations where wind generation dominates.

In concluding that CMP213-WACM2, through the use of average load factors discriminates in favour of wind, Poyry use the examples of both peaking and nuclear generation. However, as far as peaking plant is concerned, the use of average load factors is clearly beneficial compared with the Status Quo, which simply levies charges on the basis of TEC. Furthermore, in raising the point, Poyry draw attention to the fact that, unlike the Status Quo, the dual background approach adopted by CMP213-WACM2 results in low load factor plant in wind-dominated areas receiving the correct locational signal, i.e. a negative Peak Security charge. In discussing the situation of high-load factor plant, Poyry note that congestion will often occur in windy periods and that wind should consequently be exposed to the same level of charges. However, wind output is far less well correlated than the output of technologies such as nuclear and will therefore contribute less to congestion.

The analysis of zonal charges set out in Section 4 of this report also demonstrates that CMP213-WACM2, through the use of average load factors, results in transmission charges that are more closely aligned with the costs given by the pseudo-CBA SQSS for the majority of transmission charging zones. While there are concerns about comparing charging methodologies on the basis of how closely they align with SQSS-derived costs, the outcome of the analysis strongly suggests that CMP213-WACM2 represents a more cost-reflective outcome that the current Status Quo charging arrangements in almost all situations.

7.1.2 The use of a Peak Security/Year-round background

In challenging the appropriateness of using a dual background approach, Poyry again rely heavily on analysis previously undertaken by the University of Bath. While potentially improving accuracy, attempting to account for the temporal and other drivers of congestion costs by adopting a multi-background approach would introduce considerable complexity while at the same time reducing transparency. Furthermore, such an approach would be at odds with the Authority's Direction to NGET, which requires that any proposed modification should be consistent with the principles underpinning the SQSS.

To make the case that the use of a dual-background approach fatally undermines the credibility of CMP213-WACM2, Poyry and the University of Bath would need to demonstrate that the outcome was worse or no better than the Status Quo. This they fail to do and the analysis set out in Section 4 of this report clearly indicates that the opposite is true and that CMO213-WACM2 is more cost reflective than the Status Quo methodology.

7.1.3 Alignment of the CMP213-WACM2 Year-round methodology with that of the SQSS

In challenging the CMP213-WACM2 Year-round methodology, Poyry highlight the fact that it is peak-based and uses average load factors rather than the SQSS scaling factors. However, this is to misunderstand the rationale behind the pseudo-CBA SQSS methodology and its role as a transmission investment rather than transmission charging tool. The pseudo-CBA SQSS methodology is designed to accurately mimic the outcome of a full year-round CBA analysis in identifying the need for reinforcement, but using peak demands and appropriate generic scaling factors. The intention is to identify investment needs and costs, while the aim of the charging methodology is to identify each individual generator's contribution to those costs. While it is appropriate therefore that the SQSS uses generic scaling factors, it is necessary for the charging mechanism to use generator-specific information, such as annual load factors.

It should also be noted that both Poyry and NERA implicitly suggest that using the pseudo-CBA SQSS 70% scaling factor for wind to determine transmission charges would result in wind being overcharged.

7.2 Comparison of zonal charges

The comparison of generation zonal transmission charges given in Section 4 demonstrates the superiority of CMP213-WACM2 over the Status Quo in most situations. Compared with costs implied by the SQSS, it is clear that the existing TNUoS charging arrangements consistently overcharge generation in those Northern zones where significant amounts of wind exist, while the CMP213-WACM2 "non-shared" element ensures a charging outcome that is closer to the costs implied by the SQSS. Furthermore, in those zones where there is less wind connected than conventional generation and there is no non-sharing element, it is probable that the SQSS underestimates the capability of wind to share capacity and therefore exaggerates the costs of connection.

7.3 Alternative modelling of cost reflectivity.

A simple 2 bus North - South model is used to investigate the performance of CMP213-WACM2 and the existing TNUoS charging methodology in situations where the Peak Security background applies and also for various degrees of sharing under the Year-round background. While there may be a limit to what useful information can be derived from such a simple model, some interesting facts do emerge. Firstly, under the Peak Security background, the inability of the existing charging arrangements to deliver the appropriate locational signals where peaking plant provides a security role in zones dominated by wind is demonstrated. CMP213-WACM2 is able to give the correct signals due to its dual background approach. This issue is also highlighted by the comparison of zonal charges, with Figure 2 demonstrating the excessive charges levied by the existing TNUoS arrangements on low-load factor plant in Northern transmission charging zones dominated by wind.

This analysis also shows the superior performance of the CMP213-WACM2 methodology in those zones where wind capacity exceeds that of conventional plant, with the impact of the "non-shared" tariff element bringing charges closer to the costs implied by the SQSS. Again, while it would be wrong to assume that the SQSS methodology represents a "gold standard" in terms of cost-reflectivity, the analysis does show that CMP213-WACM2 generally produces generation charges that are closer to SQSS costs than does the existing charging methodology.

7.4 The Authority's Decision

Poyry's conclusion in their review of Ofgem's CMP213 Impact Assessment is that the case for CMP213-WACM2 is at best unproven and that its introduction might result in a less cost-reflective charging regime than the Status Quo. However, hopefully this report has demonstrated that many of Poyry's concerns are misplaced and that CMP213-WACM2 does in fact represent a significant advance in terms of cost-reflectivity on the existing Status Quo arrangements. While it is accepted that further improvements may be possible in order to achieve an even more cost-reflective outcome, those choices are not before the Authority at the present time. Ofgem therefore has to decide whether CMP213-WACM2 represents an improvement on the Status Quo and, if so, confirm its minded to decision. Failure to implement CMP213-WACM2 would ensure the continuation of existing Status Quo arrangements that have been shown, by the Project Transmit analysis and the CMP213 analysis, not to be cost-reflective and which penalise generation in many situations.