Technical Working Group Report

Significant Code Review

# Project TransmiT: Electricity Transmission Charging Significant Code Review

## Addendum to the Initial Report* of the Technical Working Group November 2011

[*Submitted to Ofgem in September 2011]

This document contains the additional discussions of the Electricity Transmission Charging SCR Technical Working Group as set out in the addendum to the group's terms of reference. It will form an input into the Ofgem December 2011 Significant Code Review Consultation.

**Provided to Ofgem on: 30 November 2011**

## Contents



## About this document

This document is the addendum to the key deliverable (the September 2011 Initial Working Group Report) of the Electricity Transmission Charging Significant Code Review (SCR) Technical Working Group. It documents a summary of the additional discussions of the group arising from the review and comment on the economic modelling work undertaken by Redpoint. The results of this modelling, the Initial Working Group Report and this Addendum, will form an input into the December 2011 Ofgem SCR consultation.

Further detail on Project Transmit, the Significant Code Review and the activities of the Working Group can be found on Ofgem's website at:

http://www.ofgem.gov.uk/Networks/Trans/PT/Pages/ProjectTransmiT.aspx

## Document Control

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# 1 Executive Summary

1.1 Subsequent to the development of the technical detail of the transmission charging options under investigation and the production, in September 2011, of an Initial Report[1], the Terms of Reference of the Technical Working Group was extended by Ofgem in order to provide the Working Group with the opportunity to comment on some of the input assumptions and initial results of the economic modelling exercise being undertaken by Redpoint Economic Consulting Limited for Ofgem.

1.2 This addendum to the Initial Report captures these comments and represents the final deliverable of the Project TransmiT Electricity Transmission Charging Significant Code Review Technical Working Group.

1.3 The purpose of the Redpoint economic modelling exercise was one of assessing the impact of the three "core" transmission charging models under consideration (i.e. Socialised, Improved Investment Cost Related Pricing (ICRP) and the Status Quo) from 2012 to 2030 in order to ascertain the likely impacts on consumer bills and power sector costs.

1.4 This was achieved through the combination of a generation investment model, a generation dispatch model, a transmission reinforcement decision model and the Transport and Tariff model used for calculating transmission (Transmission Network Use of System – TNUoS) charges. Analysis of the interactions between these elements allowed for the impacts of different TNUoS charging options to be studied.

1.5 The Working Group understands that the detail of the Redpoint modelling approach, including all input assumptions, and the ultimate outcomes for the three "core" transmission charging models, including resulting annual TNUoS charges from 2011 to 2030 by zone, will be published alongside Ofgem's Significant Code Review Consultation. This is expected to be published in December 2011.

1.6 Redpoint was also asked to carry out some sensitivity studies on variations of the three "core" transmission charging options by Ofgem. These variations included (i) a socialised approach maintaining cost-reflective local charges and (ii) Improved ICRP and Status Quo with the convertor element of HVDC bootstraps not incorporated into the locationally varying element of transmission charges. The results of this analysis were not available in time for review by the Working Group.

1.7 As interactions between transmission charging and the low carbon support mechanism modelled were complex and could make the comparison of results difficult, the Redpoint analysis was undertaken following a two stage approach:

**Stage 1:** Under the Status Quo transmission charging option, low carbon support is set at levels that deliver renewable and carbon intensity *targets.* This same low carbon support level is then used under both the Socialised and Improved ICRP transmission charging options to allow for easier comparison of the three charging option impacts.

**Stage 2:** Under both the Socialised and Improved ICRP transmission charging options, low carbon support is set to deliver the same renewable

[1] http://www.ofgem.gov.uk/Networks/Trans/PT/WF/Documents1/TransmiT%20WG%20Initial%20Report.pdf

and carbon intensity *outcomes* as the Status Quo transmission charging option.

**Stage 1**

1.8 In respect of the Stage 1 Redpoint modelling results, the Working Group comments centred on the total generation build potential and annual build rate assumptions used in the model, how reactive generation would be to changes in transmission tariffs in reality and the treatment of nuclear generation as well as the lack of availability of sufficient transmission reinforcements in the Socialised model.

1.9 On the whole the Working Group believed that the maximum generation build potential by technology and by region was overly restrictive. In response to this feedback, these inputs to the model were relaxed by Redpoint.

1.10 Some members believed that the initial Redpoint results showed that generation in the model was too reactive to transmission tariffs in making a siting decision, whilst others believed that the model was overly restrictive in this area. It was recognised that there was a difficult balance to be struck on this issue, with static gas transmission exit charges over the modelling time horizon also being raised as a potential concern in this respect. No changes to the Redpoint modelling were made as a result of this discussion.

1.11 A few members of the Working Group considered that an outcome of no new nuclear build under the Socialised transmission charging option in the Stage 1 modelling was not a tenable result. Redpoint re-iterated the purpose of the Stage 1 modelling, but ultimately altered low carbon support levels in Stage 1 so that some nuclear generation would commission under all three “core” transmission charging options. As, to a certain extent, this was contrary to the purposes of the Stage 1 modelling, some in the Working Group considered it was important that this change was made clear in the Redpoint Final Report on modelling.

1.12 When presented with the initial transmission reinforcement and constraint cost results, the Working Group noted some concern that constraint costs continued to rise significantly for the Socialised charging option post 2020 whilst transmission reinforcement costs did not. Redpoint explained that this was due to the model having exhausted available transmission network reinforcements in congested areas of the network. The group remained concerned that this may be unrealistic and could lead to a sub-optimal level of overall transmission costs. No changes were made by Redpoint to the model as a result of this debate.

**Stage 2**

1.13 As Stage 2 altered low carbon support levels to ensure that renewable and low carbon targets would be met under all three “core” transmission charging options, it was this stage that allowed for a comparison of the overall impact on power sector costs and consumer bills. The Working Group was not shown the final Redpoint modelling outcomes containing these figures and hence was unable to comment on them.

1.14 As a result, other than some general comments, members of the Working Group did not discuss the Stage 2 modelling at length.

1.15 There was some debate within the Working Group over whether the Stage 1 results or the Stage 2 results were most important for the purposes of considering impacts and making policy decisions. No consensus was reached in this area.

1.16 The fact that relatively small changes in low carbon support levels could have a significant impact on the deployment of a given generation technology was noted by the Working Group. Redpoint explained that this occurred where the relative long run marginal costs for generators of a given type were very similar across the entire GB generation fleet, leading to an increased sensitivity to support levels. One Working Group member believed that this result indicated the Redpoint model was overly sensitive to the impacts of transmission charging. The majority did not share this view.

1.17 Most of the Working Group's feedback was based on the 'Imperfect Foresight' (agent simulation) approach to modelling. Due to time constraints the Working Group was not able to consider the 'Perfect Foresight' (iterating to an optimum outcome over the modelling time horizon) approach in detail. However, there was consensus that the Redpoint results arising from the 'Imperfect Foresight' approach were the most important when making policy decisions and that the 'Perfect Foresight' results should largely serve as a sense check only.

1.18 Members of the Working Group also made many detailed comments and suggestions to Redpoint on how best to present their material to stakeholders who were not technical experts in this area. These were utilised by Redpoint in their final report on the modelling work and Ofgem's external stakeholder event on the 17th of November 2011[2].

[2] http://www.ofgem.gov.uk/Networks/Trans/PT/Documents1/TransmiT%20modelling%20overview%20and%20draft%20results%20-%20presentation%20to%20stakeholder%20event%201711201.pdf

## 2 Background

**What is Project TransmiT?**

Ensure that arrangements are in place to facilitate the timely move to a low carbon energy sector whilst continuing to provide safe, secure, high quality network services at value for money to existing and future consumers.

2.1 Following a consultation in July 2011, under the banner of Project TransmiT, Ofgem launched a Significant Code Review (SCR) focused on the charging arrangements that seek to recover the costs of providing electricity transmission assets; i.e. Transmission Network Use of System (TNUoS) charging.

2.2 As part of the SCR, Ofgem established a Technical Working Group in order to develop the technical detail of two alternative approaches to TNUoS charging. These approaches, a 'Postage Stamp' (or Socialised) model and an 'Improved ICRP' model, were assessed alongside the existing, Status Quo, ICRP model in econometric modelling by Ofgem's appointed consultants, Redpoint Consulting Limited.

2.3 A record of the Working Group's deliberations and recommendations to Ofgem is available on Ofgem's website in the form of the Initial Report of the Working Group (published in September 2011). This Initial Report fulfilled the remit of the Working Group under its original terms of reference.

http://www.ofgem.gov.uk/Networks/Trans/PT/WF/Documents1/TransmiT%20WG%20Initial%20Report.pdf

2.4 In addition to the transmission charging model development, the Working Group was also given the opportunity to comment on some of the input assumptions to the economic modelling exercise being undertaken in parallel by Redpoint. In September, as a result of industry feedback, Ofgem decided to extend the remit of the Working Group[3] to provide feedback on the Redpoint modelling approach and a range of inputs and outputs of the economic modelling work. Whilst the Working Group comments were taken into account, final decisions on the modelling rested with Ofgem.

2.5 This addendum to the Initial Report records an overview of the feedback and discussions of the Technical Working Group in the aforementioned endeavour and constitutes the final deliverable of the Working Group and therefore the completion of their extended terms of reference (as outlined in Annex 1).

### Redpoint Economic Modelling

2.6 The economic modelling process has been undertaken by Redpoint in the period from July to November 2011. Over this time Redpoint has had some contact with the Working Group. Specifically, the Working Group was given an initial presentation on Redpoint's modelling approach at their meeting held on the 1st of August 2011 under the initial terms of reference. This was followed by more detailed presentations at meetings on the 10th of October 2011 and 9th of November 2011 as part of the extended Working Group terms of reference.

2.7 The purpose of the Redpoint economic modelling exercise was one of assessing the impact of the three "core" transmission charging options outlined in paragraph 2.2 from 2011 to 2030, in order to ascertain the likely impacts on consumer bills and power sector costs. This was done on the basis of both a 'Perfect Foresight' and an 'Imperfect Foresight' approach, as shown in Figure 1, below.

[3] http://www.ofgem.gov.uk/Networks/Trans/PT/Documents1/110909_TransmiT_charging_SCR_update.pdf

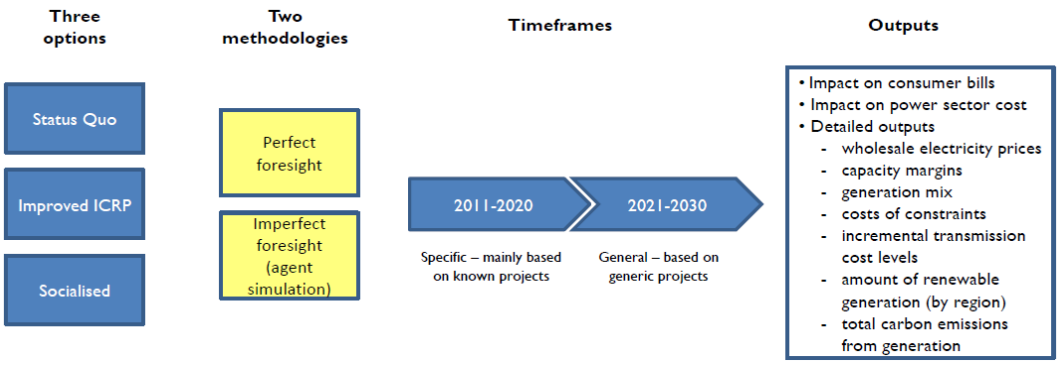


**Figure 1 - Economic Analysis**

2.8 The process used under the two methodologies is conceptualised in Figure 2, below.

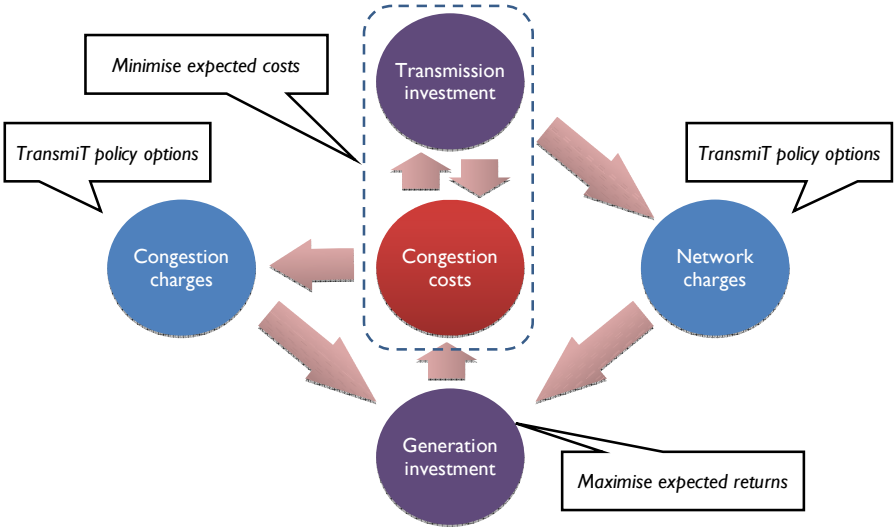


**Figure 2 - Conceptual Modelling Approach**

2.9 This process used a combination of a generation investment model, a generation dispatch model, a transmission network reinforcement decision model and the Transport and Tariff model used for calculating transmission charges (TNUoS). Analysis of the influences between these elements allowed for the impacts of different TNUoS charging options to be studied.

2.10 As interactions between transmission charging and the low carbon support mechanism modelled were complex and could make the comparison of results difficult, Redpoint agreed with Ofgem that they would take the following two stage approach:

Stage 1: Under the Status Quo charging option, low carbon support is set at levels that are deemed likely deliver the 2020 renewable *target* and achieve around 100 g/kWh carbon intensity in 2030. This same low carbon support level is used under both the Socialised and Improved ICRP transmission charging options.

Stage 2: Adjust the levels of low carbon support under both the Socialised and Improved ICRP transmission charging options to deliver the same 2020 renewable and 2030 carbon intensity *outcome* as the Status Quo transmission charging option.

2.11 The Working Group had two extra meetings to sense check the preliminary results from Redpoint's modelling. The first meeting considered initial Stage

1 results for the three "core" transmission charging options. At this time the model did not incorporate endogenous[4] transmission reinforcement decisions, which would offset network constraint costs. The second meeting considered Stage 1 and Stage 2 results, including endogenous reinforcement decisions.

2.12 The Working Group did not see the final outputs, of either the Stage 1 or Stage 2 models, which brought together various cost elements to illustrate the impact on consumer bills or on power sector costs. These results would be particularly important for the Stage 2 modelling scenarios as they were set up to deliver similar sustainability outcomes in terms of generation investment in order to allow for an assessment of the transmission charging option with the lowest overall cost.

2.13 The Working Group were only shown and hence only sense checked the modelling results for the three "core" transmission charging methodologies. They were not shown the results of the Redpoint modelling of the two variations of these methodologies; i.e. (i) a socialised approach maintaining cost-reflective local charges and (ii) Improved ICRP and Status Quo with the convertor element of HVDC bootstraps not incorporated into the locationally varying element of transmission charges.

[4] Endogenous – derived from within the model

# 3 Comments on Stage 1 Modelling

3.1 Redpoint presented their preliminary Stage 1 results in meeting 7 of the Working Group on the 10th of October 2011 in order to receive input on their initial modelling outputs, and to confirm the accuracy and validity of their input assumptions.

3.2 Whilst the intention was to seek feedback from the Working Group on several aspects of their modelling work, Redpoint were particularly keen to hear views on their assumptions for the following issues:

i) levels of government low-carbon support;

ii) generation capacity build potential and maximum annual build rates; and

iii) treatment of nuclear plant under a socialised charging approach.

**What is the intent of Stage 1 modelling?**

Ofgem requested that Redpoint carry out their economic modelling of the three TNUoS charging options in two stages. Stage 1 does not alter the low carbon support available to generators under the Status Quo approach to charging. The purpose of this Stage is to allow for observation of the impact of the different charging models separate from the effects of a change in support level.

## Low Carbon Support

3.3 In the Stage 1 modelling, equivalent levels of low carbon support were applied across the three "core" transmission charging options in order to isolate the impacts of the different charging approaches.

3.4 Redpoint noted that because the primary objective of the low carbon support mechanism is to stimulate investment in low carbon technologies, ensuring the input assumptions about the levels of this support over the modelling timeframes (2011-2030) were reasonable would serve to generate more realistic outputs.

3.5 The Working Group acknowledged the difficulty of this problem, noting that it would largely need to be based upon a degree of speculation as to what UK Government policy is likely to be over the next two decades towards providing support for low carbon energy. The relative levels of support across all low carbon technologies after 2020 were seen as particularly challenging.

3.6 The provisional Redpoint modelling results presented to the Working Group were based on the 'Imperfect Foresight' approach, which assumes that generation investors have a five-year view of forward wholesale price, transmission charges, low carbon support levels and plant closures. Redpoint noted that they did not expect the results for 'Perfect Foresight' (i.e. full information on transmission charges and generator locations) to be radically different from the 'Imperfect Foresight' model. The Working Group noted that the main benefit of the 'Perfect Foresight' modelling was corroboration of the 'Imperfect Foresight' results.

## Generator Build Constraints

3.7 There were a number of questions from the Working Group about the constraints placed, by Redpoint, in the modelling on annual and cumulative generation build by technology type. The Working Group expressed a view that build constraints should reflect non-economic considerations such as planning, access to cooling water, supply chain and finance constraints, whereas economic factors should be captured endogenously in the modelling. Redpoint indicated that there is a delicate balance between modelling real world restrictions and allowing enough flexibility for the economics to have an effect.

3.8 Redpoint stated that their assumptions on build potential and annual build rates are based on the current (2011) "TEC Register"[5] obtained from

[5] The TEC Register provides a publicly available record of the existing allocation of Transmission Entry Capacity.

National Grid's website. These inputs were used to generate outputs projecting the potential and maximum annual build rates for each type of generation technology.

3.9 There was some debate over whether the TEC Register, used as a basis for generation build potential from 2011 to 2020, was suitable for informing this element of the Redpoint model. Some members argued that the TEC Register was not suitable as it inherently incorporates economic considerations based on existing conditions and that there is therefore a need to be careful about constraining locational decisions based upon it. On the other hand, others argued that using the TEC Register is only incorrect if there is time to deliver new or alternative projects before 2020. Furthermore, some members considered that the TEC Register included a significant number of generation projects, not all of which will be delivered and therefore it should allow sufficient choice between different projects.

3.10 There was some agreement amongst the Working Group that the preliminary modelling inputs for annual build rates, shown in Figure 3 below, appeared overly constrained and should be relaxed to better account for locational build decisions by generators.

**Build potential and maximum annual build rates**

| MW | Cumulative maximum potential build | | Annual maximum build |
|---|---|---|---|
| | 2020 | 2030 | |
| New nuclear | 1,670 | 21,650 | 4,000 |
| Coal + CCS | 6,690 | 6,690 | 4,000 |
| CCGT + CCS | 0 | 6,786 | 4,000 |
| Onshore wind | 12,188 | 13,609 | 2,000 |
| Offshore wind | 16,560 | 36,900 | 5,000 |
| Biomass | 4,130 | 6,551 | 2,000 |
| Tidal and wave | 411 | 1,325 | 2,000 |

**Figure 3 – Initial Generator Build Potential and Annual Build Rate Modelling Assumptions**

3.11 During this discussion Redpoint also confirmed that the generation build assumptions included embedded generation (based on National Grid's *Gone Green* Scenario).

3.12 The Working Group discussed at length which particular generation technologies appeared to be overly constrained and there was a general consensus that constraints should be loosened for:

- Growth in coal with CCS between 2020 and 2030 (but at the same locations as proposed)
- Onshore wind to 2030
- Tidal and wave to 2030

3.13 There was some additional debate about appropriate constraints on biomass. For offshore wind, it was noted that it is important that constraints do not place stringent limits on locational build decision.

3.14 As a result of this feedback, Redpoint agreed to revisit the assumptions with the aid of additional Working Group input that was provided via email outside of the meeting. This input was collated and used to derive new maximum build potential assumptions, as summarised in Figure 4 below.

| (MW) | | South England | North England | Wales | South Scotland | North Scotland | Embedded | Total | Growth from existing[1] |
|---|---|---|---|---|---|---|---|---|---|
| New nuclear | 2020 | 1,670 | 0 | 0 | 0 | 0 | | 1,670 | 1,670 |
| | 2030 | 13,200 | 4,850 | 3,600 | 0 | 0 | | 21,650 | 21,650 |
| | TEC register | | | | | | | | 21,650 |
| Coal + CCS | 2020 | 0 | 800 | 0 | 1,950 | 0 | | 2,750 | 2,750 |
| | 2030 | 0 | 4,740 | 0 | 1,950 | 0 | | 6,690 | 6,690 |
| | TEC register | | | | | | | | 2,450 |
| CCGT + CCS | 2020 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 |
| | 2030 | 4,786 | 2,000 | 0 | 0 | 0 | | 6,786 | 6,786 |
| | TEC register | | | | | | | | 0 |
| Onshore wind | 2020 | 98 | 1,152 | 118 | 6,532 | 7,531 | 1,570 | 17,000 | 11,496 |
| | 2030 | 348 | 1,787 | 420 | 8,230 | 9,245 | 1,570 | 21,600 | 15,047 |
| | TEC register | | | | | | | | 6,052 |
| Dedicated biomass | 2020 | 0 | 879 | 350 | 97 | 0 | 2,804 | 4,130 | 1,229 |
| | 2030 | 165 | 879 | 649 | 347 | 0 | 4,511 | 6,551 | 1,943 |
| | TEC register | | | | | | | | 1,546 |
| Tidal and wave | 2020 | 155 | 0 | 85 | 0 | 1,359 | 401 | 2,000 | 1,589 |
| | 2030 | 5,000 | 0 | 400 | 0 | 5,210 | 1,315 | 11,925 | 10,600 |
| | TEC register | | | | | | | | 3,232 |
| (MW) | | Offshore south | Offshore Irish Sea | Offshore North Sea | Offshore Scotland | | | Total | Growth from existing[1] |
| Offshore wind | 2020 | 7,735 | 4,691 | 6,817 | 3,835 | | | 23,078 | 21,413 |
| | 2030 | 12,879 | 5,891 | 19,595 | 9,610 | | | 47,975 | 46,310 |
| | TEC register | | | | | | | | 25,564 |

**Notes:** [1] Excludes growth in embedded capacity, for comparison with TEC register figures.

**Figure 4 - Revised Generator Build Potential Modelling Assumptions**

3.15 Feedback was also provided by the Working Group on the assumptions about the location of new build CCGT and onshore wind. However, as there was no clear consensus across the Working Group, Redpoint maintained their initial locational split for these technologies, based on the TEC Register in the short term and a wider geographical spread in the longer term.

3.16 One member of the Working Group maintained that less flexibility in the locational decisions of CCGT generators in the model would have been more representative and therefore a more appropriate basis for carrying out the analysis. There was no consensus view on this point.

3.17 The maximum generator build rate assumptions, shown in Figure 5 below, were reviewed and broadly retained for the modelling by Redpoint as those presented to the Working Group reflecting less feedback in this area. However, maximum annual build constraints for onshore and offshore wind have been scaled up to facilitate the delivery of increases in maximum build potential for these technologies.

| | Previous maximum annual build (MW) | Updated maximum annual build (MW) |
|---|---|---|
| New nuclear | 4,000 | 4,000 |
| Coal + CCS | 4,000 | 4,000 |
| CCGT + CCS | 4,000 | 4,000 |
| Onshore wind | 2,000 | 4,000 |
| Offshore wind | 5,000 | 7,500 |
| Dedicated biomass | 2,000 | 2,000 |
| Tidal and wave | 2,000 | 2,000 |

**Figure 5 - Maximum Generator Build Rate Assumptions**

3.18 The Working Group queried why large decreases in offshore wind tariffs in the Socialised scenario have a very small impact on aggregate offshore wind build towards the end of the modelling period. Redpoint noted that this is linked to the maximum potential build in a given location available to the generation investment model. In addition, under the Improved ICRP scenario

build decisions for offshore wind are driven by locational TNUoS. In contrast, under the Socialised scenario build decisions are driven by water depth.

3.19 The significance of gas transmission exit charges on CCGT plant locational decisions was noted and the Working Group therefore asked for more information on the Redpoint assumptions about gas exit charges. Redpoint stated that potential change to gas transmission costs over time (i.e. locational signals) had not been modelled. Redpoint agreed to provide further information on the modelling approach taken.

3.20 One member of the Working Group believed that the modelling approach was overly reliant on electricity transmission entry and gas transmission exit charges in driving the locational decisions of CCGT generators and this had resulted in significant differences in the location of new CCGTs between modelled scenarios than would have otherwise arisen. Some other members of the Working Group did not agree with this assessment.

**Treatment of Nuclear Under a Socialised Charging Approach**

3.21 The Working Group discussed the modelling outputs which indicated there would be no new nuclear build in the Stage 1 results for the Socialised transmission charging option. Redpoint explained that the results simply reflected the modelling approach taken, involving fixed low carbon support levels across all three "core" transmission charging options. Redpoint explained that, as low carbon support mechanisms are tightly matched to the long run marginal cost (LRMC) of a generator under the Status Quo charging option, a small increase in a generators LRMC (i.e. that would be observed across the majority of areas designated by the UK Government for nuclear sites when moving from the Status Quo to the Socialised transmission charging option) leads to the result that nuclear is not economic and does not get built under the Socialised option.

3.22 There was general consensus that part of the problem in determining realistic nuclear plant build and retirement was contingent upon government policy towards this generation technology. It was considered that, while the Working Group was reticent to make assumptions about government policy, it was logical to expect that the need for diversity in the generation mix would make it unlikely there would be no nuclear plant under the Socialised option.

3.23 In addition, some Working Group members noted it is likely that the outcome of the Project Transmit SCR will be known before the nuclear low carbon support level is set by the UK Government, therefore the support level would be expected to take account of any change in transmission charging. On this basis some members of the Working Group felt that Stage 2 was the inherently more 'reaslitic' outcome whereas the Stage 1 results would demonstrate the impact of a change to the charging regime with all other things being equal.

3.24 Redpoint acknowledged the feedback from the group and agreed to consider modifying its approach and presenting a less extreme result for nuclear build under Socialised charging for Stage 1. However, Redpoint did warn against confusing the intent of Stage 1 and Stage 2 modelling; noting that the scenarios for build by technology produced in Stage 2 were likely to be more representative of what may eventually transpire due to the variable low carbon support levels in this Stage.

3.25 Despite a clear distinction being made between the two Stages of modelling and the intention of these, some members of the Working Group felt that any modelling which showed a significant change in the level of nuclear build arising from differences in Transmission charging were "unrealistic" as this may be perceived as implying that UK nuclear policy will be driven by Transmission charging.

3.26 In light of Working Group feedback (some via correspondence) revisions were made to the Redpoint modelling approach to slightly increase low carbon support levels by a small proportion for nuclear to move to a less extreme result for new build under a Socialised transmission charging approach in Stage 1. Redpoint added that for the purposes of transparency, the reasons for this change would be noted in their Final Report.

3.27 Some in the Working Group believed that because there had been some changes to elements of the input assumptions applied by Redpoint in the Stage 1 modelling work as a result of Working Group feedback, it is important that the reasons for these changes, and explicit detail of what the changes involved are, is recorded and made publicly available by Redpoint / Ofgem. These members believed that this would serve to bring transparency to the linkages between input assumptions and modelling outputs, such as how low carbon support levels have been calibrated in Stage 1 to hit the 2020 renewable targets and 2030 decarbonisation targets.

**Constraint Costs and Transmission Reinforcements**

3.28 The Working Group commented extensively on the transmission constraint costs results of the Redpoint modelling, particularly for the Socialised transmission charging option. It was noted that according to the modelling the constraint costs increased significantly in the post 2020 period in the Socialised Stage 1 model and that despite these high constraint costs, no additional transmission network reinforcement investment occurs after 2020.

3.29 Some Working Group members expressed the view that this was unlikely, noting that, economically, if transmission constraint costs became excessive then transmission network reinforcements would naturally increase to find a more optimally efficient level of network capacity.

3.30 It was explained by Redpoint that the reason for this was the exhaustion of all available transmission network reinforcements on the constrained boundaries. The list of available transmission network reinforcements is based on known projects as identified in the Price Control Review submissions (under the RIIO framework) by Transmission Owners, any additional reinforcements that have been mooted and a set of generic reinforcements that become available to the model once all named projects on a particular boundary have been exhausted.

3.31 One member of the Working Group also noted that under Stage 1 it was logical to expect excessive transmission constraint costs because of the 'unrealistically' high levels of renewables in the generation mix.

3.32 As a whole, the group were unconvinced that the level of transmission constraint costs shown were credible. Instead it believed that, at the level shown, there could be transmission investments available that would produce a cheaper overall outcome.

3.33 The Working Group also commented on the relatively small size of annual transmission constraint costs (averaging ~£50m) in the Status Quo charging option after 2020. There was some concern that this may be indicative of over reinforcement of the transmission network, beyond that which is optimal.

3.34 The following points were noted about the transmission decision rules:

- Investment rules for transmission were based on a comparison of the levelised cost of an individual reinforcement with the expected savings in constraint costs. If the savings outweigh the costs, the reinforcement is committed in the model.

- Transmission investments are discrete large projects (i.e. 'lumpy' in nature). The investment may be larger than the optimal size, but still present a benefit relative to not doing the reinforcement at all.

3.35 The Working Group believed that constraint volumes should be presented alongside constraint costs.

# 4 Comments on Stage 2 Modelling

4.1 Redpoint outlined that the Stage 2 modelling differed from Stage 1 in that it featured adjusted levels of UK Government low carbon support under the Socialised and Improved ICRP charging options in order to deliver the same 2020 renewables and 2030 carbon intensity outcome as the Status Quo option.

4.2 At a high level, the methodology for scaling of the low carbon support levels in the Improved ICRP and Socialised transmission charging options were explained to the Working Group by Redpoint.

**General Comments**

4.3 Some members noted that applying a non-specific (i.e. uniform) scalar by generation technology is not reflective of the existence of large revenues available to offshore technology. Others commented that having no low carbon support adjustment under the Socialised transmission charging option is counterintuitive as offshore wind has the biggest potential gain from a uniform TNUoS tariff.

4.4 Some in the Working Group believed that, under the socialised charging option, the level of low carbon support for offshore wind generators seemed somewhat excessive given the costs associated with offshore generation; such as the reduction of transmission charges when compared with either Status Quo or Improved ICRP. In the interests of transparency, the Working Group believed that the approach to setting low carbon support levels should be clearly set out by Redpoint so that people can interpret the results.

4.5 Although the high level explanation of the scaling methodology used in calculating low carbon support levels was informative, some in the group believed that a more detailed explanation would be beneficial. This was not shared with the Working Group at this time, largely due to time constraints. However, Redpoint indicated that this would be made clear in their Final Report, to be published alongside Ofgem's consultation in December 2011.

4.6 The Working Group believed that the Redpoint modelling should avoid second guessing UK Government policy in setting low carbon support levels and there that there was a need to be clear about what was trying to be achieved by adjusting the low carbon support. While transmission charging and levels of low carbon support are inherently linked, the modelling should primarily concentrate on the impacts of transmission charging

4.7 The provisional Redpoint modelling results appeared to show that small adjustments to low carbon support levels had a sizeable effect on the deployment of some specific generation technologies. One member of the Working Group highlighted that they believed this fact suggested that the modelling overplayed the impact of transmission charging on generation siting. No evidence was provided to support this view.

4.8 Many Working Group members expressed a desire to see the outcomes of Redpoint's overall cost benefit analysis (CBA) work looking at overall power sector costs and consumer bills, on the basis that they understood this to be the main purpose for undertaking the Stage 2 modelling. Working Group members also noted that stakeholders, such as generators and suppliers, will need to see TNUoS tariffs, by year and by zone for each year over the modelling time horizon, for each of the three "core" transmission charging approaches in order to understand what the impact will be on them of any proposed change. Ofgem confirmed that the CBA will be presented as part of the consultative process that Ofgem intends to launch in December 2011.

**What is Stage 2 Modelling?**

Ofgem requested that Redpoint carry out their economic modelling of the three TNUoS charging options in two stages. Stage 2 recalculates the low carbon support assumptions available to generators with the aim of ensuring that 2020 renewable targets are met under each of the charging approaches. For modelling to 2030 it adjusts the level of support to give the desired carbon intensity under all transmission charging options. The purpose of this Stage is to allow for a comparison of the overall costs of meeting the targets, including the effects of a change in support level.

4.9 One member of the Working Group noted that, as Stage 2 results involved an adjustment to low carbon support levels, it was important that stakeholders did not base judgements about the suitability of each option on overall costs. Rather, in the context of the Ofgem Project TransmiT SCR review, it was more sensible to base judgements on the signals generated by each of the three "core" transmission charging options.

4.10 The Working Group did not review the results of the Redpoint 'Perfect Foresight' modelling in great detail due to time constraints. However, the Working Group were of the opinion that the Imperfect Foresight results should be the primary model results, which could be corroborated by those arising from Perfect Foresight modelling.

4.11 Redpoint explained that they had experienced some challenges with modelling the 'Perfect Foresight' approach, noting that it produces convergent results on two of the three "core" transmission charging options (Improved ICRP and Socialised). However, under the Status Quo option, the iterations do not converge to a single result. This means that the Status Quo model flips between two results due to a feedback loop between wind generation build in Scotland, HVDC transmission network investment and the associated TNUoS tariffs. As a result, the two extremes of Status Quo results landed above and below the 'Imperfect Foresight' outputs in terms of overall impact.

4.12 One Working Group member suggested that caution should be exercised when evaluating the 'Perfect Foresight' modelling approach due to its inherent 'lack of realism'. As such, this limited the degree to which generalisations and inferences could be made from the results it generated.

## 5 Comments on Presentation of Results

5.1 The Working Group indicated that a comprehensive list of modelling input assumptions, and how they were derived, would be an invaluable part of Redpoint's Final Report. Redpoint confirmed that this would be included as appendices.

5.2 The need to include further detail on the Scottish Island tariffs arising out of the models for each of the three "core" transmission charging options was also highlighted as important.

5.3 One Working Group member indicated that, whilst a useful way to gauge the results of the economic analysis and respond to Ofgem's SCR consultation, care should be taken when considering the TNUoS tariffs arising out of the Redpoint modelling process. In particular, these tariffs would not represent actual TNUoS tariffs and therefore should not be used for investment decision purposes.

5.4 One member noted that it would be helpful if Redpoint's Final Report included more detail (i.e. numbers and assumptions) in the graphs showing cumulative retirements by generation type. Redpoint noted the possibility of including these in their Final Report. Redpoint added that they would explore the possibility of releasing a spreadsheet document containing more detailed figures on a range of modelling outputs where the material was not deemed to be commercially sensitive.

5.5 Some Working Group members suggested that it would be helpful to see a disaggregation of some of the zones associated with the geographical presentation of the modelling results, e.g. North and South Wales. It was also suggested that installed capacity and generation investment (net entry and exit) should be disaggregated further to allow better observation of load factor implications (high and low) under Improved ICRP, possibly by transmission charging zone.

5.6 One Working Group member suggested that it would be helpful to see a disaggregation of installed capacity on the Scottish islands, including the order with which they commissioned although it was noted that this might be commercially sensitive (see paragraph 5.4 above).

5.7 In addition to the above, the Working Group made a number of suggestions to Redpoint both for the wider stakeholder event on 17th November 2011 and for the Redpoint Final Report, as well as making a number of requests for additional information to be made available. These suggestions are outlined in Redpoint's summary note of the relevant meeting in which they were raised, which is available at the following location:

http://www.ofgem.gov.uk/Networks/Trans/PT/WF/Documents1/Redpoint%20summary%20of%20Working%20Group%20meeting%2009112011%20v0%201.pdf

## Annex 1 – Addendum to Working Group Terms of Reference

### Addendum to the Terms of Reference for the Technical Working Group

This addendum should be read in conjunction with the original terms of reference for the industry technical working group[6] agreed on 1st August 2011. It describes the scope, level of commitment and deliverables of additional work discussed and agreed at the sixth meeting of the working group on 9th September 2011.

### 1. Scope of additional work

The technical working group is to:

- Review and comment on initial modelling results for the three potential charging options in order to help "sense check" the model.
- Review and comment on the final modelling results, including policy option and commodity price sensitivities, to highlight likely impacts of different TNUoS charging approaches on all relevant stakeholders and the achievement of relevant energy policy goals. Advise on how best to present the results to stakeholders.

### 2. Commitment

During October and November 20111 approximately two to three days will be required from each member of the working group to attend two further working group meetings. Members will also be required to provide comments in both written and verbal form at meetings, requiring an element of preparatory work.

### 3. Deliverables

The key deliverable is a publishable report by 16 November 2011 comprising the initial report of the working group plus additional section(s) describing the outcomes of this additional work. National Grid Electricity Transmission (NGET) will be responsible for coordinating the drafting of this report, with contributions expected from working group members.

### 4. Proposed Meetings

Currently two meetings are planned, both at Ofgem's Millbank offices in London:

Meeting 7: 10th October, 12.30 – 17.00 – to review initial model runs

Meeting 8: 9th November, time to be decided – to review final model outputs

[6] http://www.ofgem.gov.uk/Networks/Trans/PT/WF/Documents1/Working%20Group%20Terms%20of%20Reference.pdf