Critique of the three Original Expert Reports to Project TransmiT

Energy Policy Group of the University of Exeter

Ofgem has recently launched Project TransmiT - an independent and open review of transmission charging and associated connection arrangements. The aim of the review is to ensure that we have in place arrangements that 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.

Ofgem commissioned three academic teams in December 2010 (Newbery, EPRG, the University of Cambridge; Bell et al, Strathclyde and Birmingham Universities; and Baldick et al, from a number of American universities) and asked them to provide their views on the optimal approach to transmission charging for Great Britain given the new challenges networks face. The focus of this work is on the electricity transmission charging regime. Ofgem subsequently asked the Energy Policy Group (EPG) of the University of Exeter in February 2011 for a fourth short report, with a particular focus to assess whether transmission charging arrangements should be a vehicle to promote low carbon generation, as well as a short critique of the three original reports.

This critique has endeavoured to evaluate in a very high level table (Table 1) what recommendations for transmission charging the three reports make, as well as their views of alternative proposals; and has also endeavoured to set out in a rather longer form (Tables 2, 3, and 4) the extent to which each report has answered the questions set out in the Terms of Reference; what they said; and (Table 5) any issues which could reasonably have been expected to be evaluated in a little more detail.

The UK is in a very uncertain time with respect to energy policy. It is still not clear what technology pathway Great Britain will follow over the next several decades: it could range from an increasingly electric future, provided by a mix of technologies and fuels but with a large proportion of nuclear power through to a diverse, multi-scaled super-smart energy-efficient gas and electricity future with a high proportion of renewable energy (RE), storage and interconnections. What is clear is that transmission connection and charging must be 'future-proofed' against any energy system future. This means transmission connection and charging has to be able to fit with, and be complementary to, alternative market arrangements; the new regulatory incentive arrangements (e.g. RIIO); the European agenda; the potential range of business models, including energy service companies; the potential changing role of the distribution network operators; and the potential requirements of customers of any size. Moreover, all this has to happen while ensuring that the necessary innovation can take place; that the barriers within economic regulation to meeting the legally binding RE Directive are removed; and that the energy system remains secure and resilient against the economic, social and technological uncertainties facing the globe, and the UK.

Table 1 reflects the different basic mechanisms recommended by the original three Expert Reports. As can be seen, there is reasonable support from David Newbery for the adoption of 'full' Locational Marginal Pricing (LMP), where 'full' is taken to mean nodal pricing; and an almost complete dislike of a "flat" (i.e. postage stamp) transmission pricing regime. The US team also recommend moving locational pricing away from the long-term cost-recovery charges and into the short-term congestion management process, through some form of congestion pricing such as LMP.

Other than the review by Strathclyde and Birmingham Universities, the option of improving the existing TNUoS charging arrangements received relatively little attention. This option has been included in Table 1 as "Locational TNUoS - enhanced" and would represent an evolution of the existing arrangements to address known deficiencies.

The high level principles adopted and conclusions drawn by the authors of the three academic reviews are summarised in Tables 2 & 3 respectively. A critique of the three reviews based on the specific questions posed by Ofgem, is given in Table 4 and the issues that could reasonably have been expected to be evaluated in a little more detail in Table 5.

We were asked to assess the reports against a number of questions, one of which was whether the experts struck an appropriate balance in key areas of trade off between potentially conflicting objectives. We would argue that in two cases this balance has not been adequately considered.

Table 1; Evaluation of Transmission Charging Arrangements by the three Original Project TransmiT Expert Reports

		Newbery	Bell et al	Baldick et al
Range of charging options	Full LMP with flat charging		√√	√√√
	Full LMP with deep connection charging	√√√		
	Market Splitting	√	√	√
	Locational TNUoS - enhanced		√√	
	Flat TNUoS			

√ = possibly implies; √√ = implies and considers in a positive light; √√√ = argues for.

Table 2; Author's high level principles

	Academic Review of Transmission Charging Arrangements *Bell, Green, Kockar, Ault & McDonald*	**High level principles for guiding GB transmission charging and some of the practical problems of transition to an enduring regime** *Newbery*	**Optimal Charging Arrangements for Energy Transmission: Draft Final Report** *Baldick, Bushnell, Hobbs & Wolak.*
High level principles	Transmission charges should; • encourage efficient investment & operating decisions so that the overall cost of electricity is, as far as practical, minimised • be compatible with EU directives & regulations • be consistent with the future integration of energy markets across Europe • be consistent with the realisation of climate change targets set by Government in the UK. • not present barriers to adequate levels of security of supply • not be over-sensitive to small changes in the transmission system and its users • be as simple as possible and not simpler • should command sufficient stakeholder support to be implementable	Transmission charges should encourage; • efficient short-run use of the network (dispatch & congestion management) • efficient investment in expanding the network • efficient signals to guide investment decisions by generation and load (location, capacity, technology) • legality, fairness and political feasibility, • cost-recovery	Transmission charges should; • reflect the incremental costs imposed by usage • ensure that the recovery of historic (sunk) capital costs and other fixed costs distort usage as little as possible In addition, the authors state that • environmental objectives are most efficiently pursued through mechanisms that directly address those objectives. • equitable distribution of costs and risks can be addressed while still preserving incentives for efficient use of the network

Table 3; Author's conclusions

Academic Review of Transmission Charging Arrangements *Bell, Green, Kockar, Ault & McDonald*	**High level principles for guiding GB transmission charging and some of the practical problems of transition to an enduring regime** *Newbery*	**Optimal Charging Arrangements for Energy Transmission:** **Draft Final Report** *Baldick, Bushnell, Hobbs & Wolak.*
• The ability of some low carbon generation, such as wind, to respond to locational signals is reduced by external factors, however those signals should be maintained as some choice is still available. • Peaking plant and wind generation located in the same area should share transmission capacity, as their operation would be complimentary rather than simultaneous. • The current ICRP methodology is the "least imperfect" imperfect transmission pricing regime and options are available to address known deficiencies. • Believe that BSUoS charges should be targeted, but accept that DECC's decision to socialise the costs of the "connect & manage" transmission access regime, precludes that outcome. • Residual charges should continue to be applied on a "postage stamp" basis, but no particular preference for capacity or energy based charges. • The current ICRP methodology should be	• Locational marginal pricing (LMP) is the theoretically correct approach to transmission access pricing. However the need to accommodate European electricity market integration developments might require a "zonal" approach to congestion management, which could be an interim step toward full nodal pricing. • Due to issues such as "lumpy" investment and un-priced security, additional locational signals will be required in addition to those arising from LMP. Proposes that these should be applied via "deep" connection charges, which would arguably penalise new connections over incumbents. • Financial transmission rights (FTRs) or transmission congestion contracts (TCCs) should be introduced as a hedge against variations in nodal prices. Considers the practical issues of allocation and the need to protect incumbent rights. • Proposes that shortfalls in required revenue should be entirely applied to demand, in order to avoid GB generation being at a competitive disadvantage to generation in other Member States.	• The existing transmission pricing regime is capable only of providing a very rough relationship between transmission charges and causation. • Self dispatch results in generators being paid to resolve congestion they have caused, giving rise to perverse incentives to increase congestion. • The existing transmission pricing regime over-emphasises the need for transmission. • It is inherently difficult to hedge variations in TNUoS charges as these are essentially determined by r regulatory rather than market processes. • Transmission investment philosophy should change from "transmission follows generation" to a "generation follows transmission" approach, where investments would be planned on the basis of minimising expected generation and transmission costs. • Locational signals should be delivered through short term energy prices, rather than long term

modified to reflect the fact that investment to accommodate wind plant will be driven by year-round congestion costs rather than power flows at time of peak and therefore contain some energy element. • Consideration should be given to improving consistency in the treatment of HVDC, islands and onshore transmission is inconsistent within the current ICRP charging regime.	• Raises the possible need for "disconnection" charges to cover costs imposed on the system by decommissioning plant. • Concludes that European directives incorrectly address market failures, for example CO2 emissions and renewable support, and may distort locational signals. • The socialised "connect & manage" approach to transmission access gives rise to windfall profits to favourably located wind generation. The costs of this approach are difficult to quantify but may increase considerably going forward. • Questions whether Scottish incumbent generators should face TNUoS charges inflated by the costs of the "bootstrap" reinforcements • Losses need to be taken into account. Fully taking into account the impact of transmission losses may go some way to equalising effective load factors. • A more centralised form of generation dispatch will be required to manage a large wind capacity and that efficient dispatch is most simply delivered via nodal pricing.	transmission pricing. Incentives for efficient congestion relief should take the form of locationally differentiated energy prices. • Zonal pricing may suffice for the present, however intra-zonal congestion is likely to increase and a transition to full nodal pricing is likely to be required • All costs associated with the existing transmission system should be recovered from load, to avoid GB generation from being disadvantaged compared with generation in other Member States. • A system of FTRs should be established to enable generation to hedge against uncertainty in congestion costs • Merchant transmission investment should be permitted in order to ensure that commercially justified investments can proceed.

Table 4; Critique of academic draft reports based on the specific questions posed by Ofgem.

		Academic Review of Transmission Charging Arrangements *Bell, Green, Kockar, Ault & McDonald*	**High level principles for guiding GB transmission charging and some of the practical problems of transition to an enduring regime** *Newbery*	**Optimal Charging Arrangements for Energy Transmission: Draft Final Report** *Baldick, Bushnell, Hobbs & Wolak.*
Alignment with principles	**How are the high level principles proposed by the academics underlying their charging models in line with the overall objective of the review?**	The high level principals proposed refer to value for money, facilitating the delivery of the UK's climate change goals, compliance with European policy, maintaining security of supply etc and therefore align well with the objectives of the review.	The high levels principles adopted by the author can be summarised as the need for transmission pricing to encourage efficiency in the location, type and timing of generation connection, efficient distatch and efficient and timely transmission investment. There is little explicit consideration of the role of transmission pricing in facilitating "a timely transition to a low carbon sector", which is one of the principal questions raised by Project TransmiT.	The principles proposed by the authors are based on economic efficiency, i.e. charges should reflect incremental costs of usage and that recovery of historic costs should not distort that usage. To this extent they reflect the Project's objectives in terms of "value for money", but less so in terms of "a timely move to a low carbon energy sector" The authors believe that environmental objectives should be pursued through mechanisms that separately address those objectives, rather than transmission pricing.
	Are the proposed models consistent with their adopted principles?	The authors review postage stamp, ICRP, LRIC & nodal pricing, with variations, and assess these against of the proposed high level principles. Although each pricing methodology scores differently against each principle, they are generally consistent with the principles proposed.	The author argues strongly for a cost efficient approach to transmission pricing and proposes a move to locational marginal pricing (LMP). It is proposed that the energy price differentials arising from LMP are likely to provide insufficient locational messages and that deep connection charging is therefore also likely to be required. This cost reflective approach may not be conducive to the deployment of renewables,	The authors propose a transmission pricing regime based on short term energy pricing via LMP. A shift in transmission investment practice is also proposed, where investment is undertaken on a "generation follows transmission" basis in order to minimise expected generation and transmission costs. Sunk costs recovered on a postage stamp basis. As the author's high level principles focus

			particularly in remote regions not well served by transmission. However as the author's high level principles do not focus on the need for transmission pricing to facilitate the deployment of low carbon technology, the combination of LMP plus deep charging is consistent with those principles.	on economic efficiency alone, and do not consider issues of renewable deployment, the proposed LMP pricing model is consistent with those principles.
Balance in key areas of trade-off	**Have they struck an appropriate balance in key areas of trade-off between potentially conflicting objectives?**	The high level principles are effectively condensed into an objective which can be paraphrased as "minimising energy costs subject to meeting the 2020 renewable energy targets and achieving acceptable levels of security". While "renewable energy targets" might be broadened to " decarbonisation", the objective forms a good basis for considering trade-offs. There is also a good description of a number of trade-offs, for example the need to balance improved cost-reflectivity that might be delivered via long run incremental pricing (LRIC) and the need for consistent signals that avoid the potential for free-riding etc. The authors note the need for further analysis to understand the impact of the pricing models considered on renewable deployment.	The author argues strongly for a cost efficient approach to transmission pricing and points out the existing cross subsidy that occurs in favour of wind generation connected in remote high load-factor areas, i.e. socialised C&M. The analysis is not generally sympathetic to balancing cost effectiveness with the need to deploy low carbon generation or facilitate the delivery of the 2020 renewables targets. Potential trade-offs between cost efficiency and increased low carbon deployment are not considered.	As the authors do not believe that transmission charging should be a vehicle for pursuing decarbonisation objectives, there is no real consideration of possible trade-offs between decarbonisation and cost reflectivity. The proposition is made, however, that the allocation financial transmission rights (FTRs) might take into account the need to achieve environmental or other objectives.
Practicalities of transitioning	**Has sufficient consideration been given to the practicality of transitioning,**	The authors make some attempt to consider transitional issues, for example how nodal prices may be calculated within BETTA. Overall however, more attention could have given to transitional issues.	The author implies that the need to accommodate European market integration and "market coupling" principles across interconnectors would be a transition to full nodal pricing through an extension of those	The benefits of change are set out. The costs and practicality of transition are not dealt with in any detail, however the authors point out that the systems to support nodal pricing are established and

	including the benefits of change?	The relative benefits, and disadvantages, of alternative charging methodologies are discussed.	principles to deal manage internal congestion. In proposing the introduction of FTRs, the author considers the significant transitional issues of protecting incumbent's perceived rights.	experience of operating such markets is plentiful. Utilising "off the shelf" systems and learning from how LMP methodology had been deployed would therefore reduce transitional issues.

Table 5; Are there any additional issues that the teams should have taken into account in considering the optimality of a charging model?

	Academic Review of Transmission Charging Arrangements *Bell, Green, Kockar, Ault & McDonald*	**High level principles for guiding GB transmission charging and some of the practical problems of transition to an enduring regime** *Newbery*	**Optimal Charging Arrangements for Energy Transmission: Draft Final Report** *Baldick, Bushnell, Hobbs & Wolak.*
Impaction of transmission pricing on decarbonision	The authors acknowledge that the timescales and scope of the report prevented the detailed analysis necessary to quantify the impacts of various charging models on, say, the deployment of renewable or low carbon resources. However, given that one objective of Project TransmiT is to ensure that transmission pricing arrangements will facilitate a timely move to a low carbon sector, this issue could have been given greater prominence in the report.	Given that a principal objective of Project TransmiT is to ensure transmission pricing arrangements will facilitate a timely move to a low carbon sector, this issue could have been given greater priority in the report in terms of considering and comparing alternative transmission pricing regimes. For example, some qualitative analysis of the impact of various charging mechanisms on the total cost to consumers of meeting renewable targets could have been attempted.	Given that one object of Project TransmiT is to ensure transmission pricing arrangements will facilitate a timely move to a low carbon sector, this issue could have been given greater priority in the report in terms of considering and comparing alternative transmission pricing regimes. For example, some qualitative analysis of the impact of various charging mechanisms on the total cost to consumers of meeting renewable targets could have been attempted.
Planning Issues	Covered	Although not within the scope of TransmiT, it is clear that planning issues are driving up the cost of delivering the UK's renewables targets by limiting the contribution of onshore wind and driving up the costs of associated transmission. One issue might therefore be whether the additional costs imposed on transmission, i.e. the need to go offshore (bootstraps), should be "socialised" on a public good or amenity preservation basis.	Although not within the scope of TransmiT, it is clear that planning issues are driving up the cost of delivering the UK's renewables targets by limiting the contribution of onshore wind and driving up the costs of associated transmission. One issue might therefore be whether the additional costs imposed on transmission, i.e. the need to go offshore (bootstraps), should be "socialised" on a public good or amenity preservation basis.

Interaction with EMR consultation	Although the authors make some connections with the EMR consultation, more consideration could have been given to how alternative transmission pricing models sit with possible DECC's EMR outcomes.	Although the author makes some connections with the EMR consultation, more consideration could have been given to how alternative transmission pricing models sit with possible DECC's EMR outcomes	More consideration could have been given to how alternative transmission pricing models sit with possible DECC's EMR outcomes.
Europe	Although the authors refer to the requirements of European legislation, there is no real discussion of the possible implications on GB transmission pricing of European electricity market integration, i.e. market coupling and the potential for locational signals delivered via transmission pricing to disadvantage GB generation.	Covered	Discussion of European market integration is essentially limited to the issue of applying transmission charges to load in order to harmonise with European practice. Some discussion of the introduction of market coupling/splitting as a precursor to nodal pricing would have been useful
Addressing known deficiencies of the existing transmission pricing regime.	Covered	Although the author concludes that the current transmission pricing regime is inferior to the LMP approach, some consideration of how the current regime could be improved (i.e. addressing issues related to offshore, HVDC, recognising asset "sharing" etc) would have been useful.	Although the authors conclude that the current transmission pricing regime is inferior to the LMP approach and identify specific difficulties with the regime, some discussion of how those difficulties could be addressed would have been useful.
User commitment	No real discussion of the issue.	No real discussion of the issue.	No real discussion of user commitment but the issue of "anticipatory" investment, which could reduce the burden of user commitment, is discussed
Charging embedded generation for use of the transmission system	A contentious issue which could usefully have been addressed by the authors.	A contentious issue which could usefully have been addressed by the authors.	A contentious issue which could usefully have been addressed by the authors.