Response to

Preferred Options to be considered for the Implementation of Locational Signals on the Island of Ireland

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Preamble

Losses on an electricity system are instantaneous events that depend on very many factors including weather conditions, system power factors, network components, and electricity currents on lines. In the absence of pervasive, dynamic metering of losses across the entire electricity network, any methodologies used to allocate aggregate losses can only achieve approximations and these are arrived at by making various simplifying assumptions. One such assumption made in the calculation of TLAFs is that generation losses occur in a linear fashion across the entire output of a generating plant. Or, similarly, that line losses are subject to a linear function. But "losses are nonlinear functions of line flows, and nonlinear electrical laws do not allow determining the amount of a line power flow which is the responsibility of a given generator or demand… [Where] linearization techniques are used to allocate the flow of a given line to generators and demands, the cross terms associated with quadratic functions…do not allow assigning directly losses to generators and consumers"[1].

It is the use of such simplifying assumptions and other averaging calculations that lead to the approximations noted above. With the agreement of a particular group of actors, there is nothing inherently wrong with the use of approximations. Often there is no feasible way to directly measure reality or the costs may be prohibitive for whatever incremental benefits they offer. However the use of such approximations must ensure *ex-ante* conditions that will still obtain *ex-post*. Where the circumstances ex-post differ significantly from ex-ante expectations, the conclusion may be that the approximation method in use is not fit for purpose. An alternative approximation method may be necessary.

In a stable, conventional electricity system, where power flows are generally established, approximations may not be too significant. Since change is gradual in such a case and often arrives as new plant representative of the existing generation fleet, the incremental losses incurred at the margins by the location of the new plant and the impact on the network may prove to be significant and directly observable from deviations in the established pattern of power flows, as such plant may be the major, or even sole, contributing factor to requirement for new network investment. Hence stable electricity systems may exhibit very little volatility in the pattern of transmission losses.

[1] A. J. Conejo*, Senior Member, IEEE*, J. M. Arroyo*, Member, IEEE*, N. Alguacil*, Member, IEEE*, and A. L. Guijarro *Transmission Loss Allocation: A Comparison of Different Practical Algorithms* IEEE TRANSACTIONS ON POWER SYSTEMS, VOL. 17, NO. 3, AUGUST 2002, p.571

In a rapidly changing electricity system however, with a significant and growing proportion of non-conventional generation, the assumptions made and the approximations they drive can be significantly off the mark, leading to significant volatilities in the pattern of transmission losses. On such a system, particularly where the location of new generating plant is largely informed by the availability of indigenous, renewable energy resources such as wind, using transmission losses as a locational signal leads to a signal that is devoid of meaning. When the reward anticipated from engaging in a specified behaviour (e.g. locating a wind farm at a site 'signalled' as suitable) proves non-existent once performance is complete, then questions must be asked of what exactly such a 'signal' indicates?

Signal – What?

The essential logic of a signal is that it indicates the need for specific behavioural responses. When an actor responds accordingly it is rewarded. Or at least it escapes a penalty. If the actor however ignores the signal or responds contrary to indications, it becomes liable to receiving a penalty.

The TLAF consultation refers to objectives such as "efficiency…[by] sending a strong locational signal to prospective investors to ensure that they locate future generators in well reinforced areas of the grid". Thus the implication to a prospective generator unit of responding to a transmission losses locational signal by locating at a site deemed suitable by such signal is that such action would be rewarded. Market experience shows however that the converse is the case; instead of rewards for responding to transmission losses 'locational signals', penalties have resulted. This then begs the question, what exactly is signalled by transmission losses 'locational signals'? How then can such a mechanism contribute to the efficiency of the network?

It is very possible that the volatility in transmission losses stems from faulty calculation methodology. It is also possible that such indications point to an inadequacy of the grid itself. There is a false assumption in discussing locational signals that the grid is immutable and that responses have to come from generators. It is possible that instead such signals may be indicating that the grid is grossly inadequate and needs not just reinforcements but also significant upgrades. Thus an efficiency objective might also indicate the need to make the grid more adequate. An adequacy that is driven, not by the fact of new generation connecting to the grid, but by the fact that no significant investments have been made to the grid for a number of years to enable it sufficiently meet its system-wide functions.

But even if generators were the sole causative agents of these losses, and locational signals existed to ensure certain behaviour, what exactly is the behaviour or range of behaviours expected from generators? Should they be responding to the volatility in the signals by uprooting their plants every year and moving them to locations indicated as suitable? The old saw about what looks, quacks, and swims like a duck is instructive here. If the application of transmission losses does not create the conditions requisite for generators to credibly respond to *signals* by *locating* in certain sites, then it cannot be a locational signalling mechanism.

Matching Timeframes

A well established principle in finance is to match funding requirements with funds of appropriate tenor. Thus short term requirements are matched with short term borrowings and longer term requirements with longer tenor funds. Anything else is a recipe for disaster.

If this principle is rephrased as one of matching timeframes and applied to the volatilities seen in year-on-year transmission losses, it shows up a serious disconnect between the annual volatilities and the long lifetimes of fixed generating assets (20 -25 years). If transmission losses are meant to signal the once-off action of locating long-term, fixed generating plants at specific locations, then at the very least the initial values should persist for lengths of time matching the expected life spans of the relevant plants.

An elegant academic exercise

If no alternative behaviours can be achieved by a signal, with penalties arriving for no justifiable reasons, why keep such a signal? An argument can be made for doing so for reasons of inertia if the efforts required to derive and to maintain such a signal are minimal, and if the grief caused by such a signal is inconsequential. That however is not the case. It is evident that significant resources are being devoted to maintaining the transmission losses signalling mechanism, while consequently the externalities it imposes on the electricity industry in general through the introduction of unmanageable risks cannot be inconsequential. If the benefits of creating and sustaining an elaborate mechanism for approximating the real phenomenon of transmission losses simply to find a house for each quanta of loss are weighed against the very considerable commercial uncertainties and costs imposed right across the system, then we submit that the mechanism that exists is simply an elegant academic exercise gone amok.

Comments on TSO Preferred Options

The consultation paper on locational signals issued by the TSOs goes into considerable length on various elements for consideration with respect to transmission losses and tariffs. The comments in this section will only examine the preferred options put forward by the TSOs.

Addressing the Preferred Losses Option

In the consultation paper the TSOs advance a 3-step strategy to address the locational signals issue:

1. A Compression Factor introduced in the Short Term (Oct 2010);

2. A Splitting Option involving Uniform LAFs in the market and a mechanism for short term efficient dispatch in the physical dispatch software (2-5 years); and

3. Purchase of Losses over the long term (5+ years).

The component parts of this strategy are analysed below.

Compression Option

The essential benefit of this methodology is that it dampens the volatility present in the current TLAF methodology. It does not address the inherent failings of the current TLAF methodology, which various market participants including ourselves have repeatedly identified. However this is not the place to rehash those points.

The TSOs state that this option would require a minor change to the calculation methodology. Given this relative ease in making an adjustment, given that this option is simply a stop-gap measure, and given the already long-running issue with transmission losses, we wonder why compression was not considered as an option for the recently approved TLAFs for 2010? If it generally maintains every objective criteria as outlined by the TSO without altering the fundamental structure of the current methodology, surely its function as volatility dampener would have been of much more value for the immediate time in contrast to the TLAFs that have become approved for 2010?

With the failure to take advantage of the opportunity to use compression as a stop-gap measure, we do not see the value in introducing it in October 2010, further prolonging the TLAF unrest.

Splitting Option

We have advocated the application of uniform TLAFs as the fairest approximation method for charging for losses. As such then we welcome the choice as a component of a TSO preferred option. Linked to a mechanism for short term efficient dispatch in the physical dispatch software, we believe this option has strong merit. However two elements cause disquiet with the splitting option.

In the consultation paper the TSOs state that "[a]lternative means, which are not incorporated in the market, should be *devised to charge locationally for the losses* e.g. through an additional component in the TUoS charge"[2]. This represents nothing short of a preposterous suggestion. If that is the view of the TSOs then what is the point of the whole exercise to review the losses mechanism? To engage in an elaborate musical chairs game? Are there not enough 'clever tricks' already in the whole locational signals mechanism? If that view persists then we would propose that this option be straightaway discounted.

In addition, the fact that this option again represents a step along the way to the 'enduring' TSO option gives reason to ask the question, "Why implement it?". Why not simply adopt the 'enduring' option and phase it in well defined stages?

Purchase of Losses

It is rather ironic that even though it is the most important option, judged on the basis of the TSOs favouring it as the enduring solution, purchase of losses receives the least coverage in the consultation paper, with little detail provided to allow it be properly evaluated. This almost gives an impression of this option as an afterthought and not well developed in the least. If this happens to be the case then the industry has simply been given a non-existent target to aim for. Five years hence the subsisting TLAF methodology may simply become the de facto mechanism.

[2] Italics intended

Ignoring this and giving this option the benefit of doubt, if this is the eventual TSO preferred mechanism for dealing with transmission losses, why not simply adopt it straightaway instead of the 3-step strategy advanced?

The consultation notes that this option will "require the addition of physical assets to the network and a possible major system dispatch software modification"[3]. However if we understand the concept of purchase of losses as proposed by the TSOs, we suggest that if this option were to be adopted straightaway as the mechanism for dealing with transmission losses, it could be introduced in a 2-phased process. In the first phase the TSOs would purchase the losses as currently determined by their existing methodology. In the second phase, when the requisite physical assets have been added to the network, the TSOs would then purchase losses based on actual metered values.

We suggested such a 2-phase process at the workshop held to discuss the locational signals paper. In response to that suggestion the TSOs alluded to governance issues with the purchase of losses based on modelled values. But surely this argument only results in a case of double standards? Why should it be acceptable for generators to pay for losses allocated to them based on a modelling exercise conducted by the TSOs, while at the suggestion for the TSOs to purchase those same losses derived by them governance issues suddenly arise? But governance issues do not make that amended option unworkable; they simply means that some concerns need to be addressed. And surely such concerns can be addressed. Besides, such concerns may not be much different from concerns about the existing methodology.

Recommendation

With the 2010 TLAFs already approved and published, a maximum 12-month window opens up again to squarely address transmission losses on an all-island basis. Given the TSOs preference for purchase of losses, we again advance our earlier stated suggested that the Purchase of Losses option should immediately be adopted for 2011 and subsequent years on the basis of transmission losses estimates currently derived by the TSOs. Any governance issues can be identified through the first half of 2010 and solutions developed and implemented in the second half of 2010. Subsequent to that, work can then commence on addressing the physical aspects of the Purchase of Losses option.

[3] TSO consultation paper

Addressing the Preferred Tariffs Option

The consultation paper proposes a Dynamic Model with a Postage Stamp element for transmission charging, with a 60(max):40(min) allocation to the locational, new assets build and the socialised components respectively.

The immediate difficulty with this option is that it appears contrary to the shallow connections charging policy. Unless a move away from the shallow connections policy is proposed we do not see how it can be reconciled with this option.

A subtle but more worrying concern relates to the material effect on new generators expected almost exclusively to fund all new future assets. The statistics presented in Appendix K present the TSOs preferred option as relatively 'tame' in comparison to the other options. But this is only so because the study evaluates a case where the locational element only recovers 35% of the required revenue.

A more meaningful comparison would have provided a case where the locational element lies between 80-90%, but is muted by the 60% cap suggested by the TSOs. This would have given a more useful indication of the level of tariffs for a significant number of years once Grid25 goes into full swing. In addition it would have demonstrated the true value, or otherwise, of the 60% cap. It may even suggest that locational signals would still be present within the option were the cap to be lowered, say to 40%.

The TSOs rightly identify the need to mute volatility. However the undermining element to this 'pure' economic solution is that the materiality posed to new generators may be sufficient to preclude them entry into the market. Given the potential for such outcomes, it may be necessary to consider the material effect of this option, or any other option, on new entrant generators under the most extreme scenarios.

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