Electricity Distribution Losses – Initial Proposals – June 2003

A Response by British Gas Trading

Author : Tahir Majid

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EXECUTIVE SUMMARY

In aggregate terms, the current losses incentive appears to have little or no effect on DNOs' behaviour. There is evidence for this in the constant level of overall losses in recent years and the confirmation from many DNOs that losses play little or no part in their investment plans. We believe that greater emphasis should be placed on loss reduction.

A potential losses incentive methodology is: -

- Estimate the 100 per cent valuation level for losses. This is the maximum total cost increase per unit of additional output;
- DNOs estimate the cost of loss reduction scenarios;
- Verify this company specific information;
- Estimate the forward looking efficient unit cost of loss reduction (technical and non-technical losses), ideally less than the 100 per cent valuation level;
- Fully fund the existing level of losses performance, on basis of efficient costs, as part of price control revenues;
- Incentivise performance [reward/penalise] around 'existing level' of losses using an incentive equivalent to the forward-looking efficient unit cost of loss reduction;
- Set maximum and minimum levels of losses performance. Above the maximum level there will be no losses related revenue increase. DNOs to qualify for capex/opex incentive payments only if an efficient level of losses is achieved; and
- Use a common verifiable methodology for calculating losses across all DNOs.

Losses should be valued using the direct costs to customers of losses plus the cost of the environmental externality. This value should be demand weighted, a forecast estimate, revised five-yearly and use average values.

DNOs should produce acceptably accurate estimates of the level of technical losses. Measurement improvements would not only allow more appropriate and possibly separate technical versus non-technical losses incentives at the following price control but would also provide Ofgem with much better information with which to assess the efficiency or otherwise of DNO loss levels.

We would urge Ofgem to publish its long awaited review of revenue protection without further delay. Consideration should also be given to other non-technical loss improvements for example to unmetered supply inventories and settlement errors generally.

The main DNO incentive requirement for facilitating distributed generation would appear to be an effective losses incentive. Consequently, there would be considerable merit in bringing together the work in this area with Ofgem's other work on distributed generation incentives.

Centrica would welcome an opportunity to discuss this response with Ofgem.

1. INTRODUCTION AND GENERAL COMMENTS

British Gas Trading (British Gas) welcomes the opportunity to respond to Ofgem's consultation in respect of 'Electricity Distribution Losses'. British Gas has an interest in the outcome of this issue because of our presence in the electricity market.

This response considers the present position, identifies the need for reform and proposes a way forward.

British Gas agrees that this non-confidential response can be placed in the Ofgem library.

2. CURRENT INCENTIVES

2.1 Losses Incentives

Losses contain two elements: -

- Technical losses are the lost energy that is the inevitable consequence of the transfer of energy across electricity distribution networks; and
- Non-technical losses consist of settlement errors (positive or negative) plus theft of energy.

Under the current arrangements there are differential incentives applying to technical and non-technical losses.

Technical losses incentive: -

- Distribution Network Operators (DNOs) receive approximately 12.5p in Net Present Value (NPV) terms for each permanent kWh reduction in technical losses. The incentive is paid to DNOs over a ten-year period with 2.9p paid in the first year reducing to 0p after ten years.

Non-technical losses incentive: -

- As for technical losses, DNOs receive approximately 12.5p in NPV terms for each permanent kWh reduction in non-technical losses. The incentive is paid to DNOs over a ten-year period with 2.9p paid in the first year reducing to 0p after ten years; plus
- For each increased kWh distributed, i.e. each kWh of non-technical loss reduction, DNOs receive DNO-specific additional revenues for each year of loss reduction, i.e. for a typical DNO approximately 2p per annum. This is approximately 30p in NPV terms for each permanent kWh of non-technical loss reduction.

2.2. Uncertainty

2.2.1 Losses incentive

The DNO is paid the incentive over a period of ten years though in practice this value is not fixed as Ofgem can amend the value of the incentive at each price control period, i.e. every five years. Thus the level of distributor certainty on the level of the ten-year incentive payments is between five and zero years depending on when the losses reduction expenditure is incurred compared to the time of the price control review.

2.2.2 Measurement

It is not currently practicable to accurately measure losses. The accuracy of the current approach to measuring aggregate losses depends on the robustness of settlements accounting – which is to a large extent outside a DNO's control. These errors can inflate or reduce the apparent level of losses. Though settlements accuracy is improving over time, there is likely to remain a varying degree of error from year to year. This error (uncertainty) is likely to reduce the effective incentives to reduce losses from a DNO's perspective.

The proportion of technical losses has to date only been estimated from the aggregate losses level (which in itself is subject to settlements error). The level of non-technical losses is thus the residual (also an estimate). That is, the proportion of total losses and the apportionment to technical versus non-technical losses is uncertain.

This level of uncertainty may not allow a clear enough link to be drawn between losses reduction expenditure and the effect of the expenditure on the overall level of losses. The current difficulties in measuring losses to any reasonable degree of accuracy means that individual changes to losses may not be visible at the aggregate level for many years.

In aggregate, DNOs appear to face a degree of uncertainty that has the effect of reducing their effective incentives to invest to reduce losses. However, as noted later in this response, reform of the losses incentive regime is likely to incentivise improvements in measurement.

2.3 Interaction with RPI-X

The losses incentive operates alongside other incentives within a DNO's price control framework, i.e. the RPI-X operating expenditure (opex) and capital expenditure (capex) incentives. For example, where a DNO is under spending its capex allowances, for every 100p of technical loss related expenditure[1] the DNO would forgo approximately 50p of capex efficiency incentive. Thus in purely financial terms, the DNO will not undertake loss reduction expenditure until it earns at least the capex incentive forgone, i.e. each 100p of capex loss reduction expenditure will need to deliver at least 4kwh (4kWh @ 12.5p $\Rightarrow$ 50p) of permanent loss reduction, over and above the recovery of incurred costs via additions to the Regulatory Asset Base (RAB).

2.4 Are technical losses rising?

Ofgem reports that losses have remained at a constant level in recent years[2]. If this is correct, then as there are significantly greater incentives towards non-technical loss reduction (approximately 40p/kWh in NPV terms for a typical DNO) versus technical loss reduction (approximately 12.5p/kWh in NPV terms), it is likely that the overall constant level of losses masks an increase in technical losses versus a decrease in non-technical losses. Consequently, the overall constant level of losses is likely to mask an overall

[1] It is assumed that loss reduction expenditure is treated like all other capex, i.e. an efficient level of losses expenditure is included within the overall capex allowances set at the beginning of the price control. Consequently, where it is efficiently incurred, the expenditure is added to the Regulatory Asset Base at the end of the price control period.
[2] Approximately 9% from 1980 to 2000. Source Ofgem, Electricity Distribution Losses – A consultation document – January 2003, Table 4.2.

increase in the environmental impact of electricity distribution. This would be a worrying trend.

In light of the above, we believe there is scope for more work to estimate the overall level of losses, the breakdown of technical versus non-technical losses and their movements over time. This should help to ensure that any changes to the losses incentive regime appropriately target the real current weaknesses.

2.5 Need for reform

In aggregate terms, the current losses incentive appears to have little or no effect on DNOs' behaviour. There is evidence for this in the constant level of overall losses in recent years and the confirmation from many DNOs that technical losses play little or no part in their investment plans. Moreover, the existing non-technical losses incentive is significantly stronger than the technical losses incentive, whereas the reverse would appear to be more appropriate.

Greater emphasis should be placed on loss reduction for two reasons: -

- To ensure that customers are getting value for money. The value customers place on technical loss reduction can be equated to at least the direct costs to them through their supplier of having to purchase an additional kWh of electricity for each kWh of electricity lost on the distribution system; and
- To ensure that the environmental effects of losses is minimised to economic levels.

There are a number of possible solutions to the problems identified. These are discussed later in this response.

3. WAY FORWARD

3.1 Valuation of losses

Because of the short-term difficulty of separately measuring technical versus non-technical losses, the valuation should be the same for both. The valuation for each kWh of permanent loss reduction on the electricity distribution system would be the: -

- Direct additional costs to customers of that unit of loss; plus
- Cost of the externality.

3.1.1 Direct costs

The direct costs are made up of the cost of the: -

- Volume of energy lost on the distribution system (about 7 per cent - of that perhaps 4-5 per cent is technical losses with the other 2-3 per cent accounted for by theft or settlement errors); plus
- Additional distribution capacity needed, if any, for the energy lost; plus
- Volume of energy lost on the transmission system (about 1.8 per cent on average but there are significant regional variations); plus
- Additional transmission capacity, if any, needed for the energy lost.

The volume of energy lost on the transmission system is likely to vary by region. In general terms, the volume of transmission energy lost to satisfy demand in the South of England is considerably higher than the transmission energy lost to satisfy demand in Scotland and the north of England. This is as a consequence of generation being generally located in Scotland and the north of England. Subject to the materiality of these regional variations, consideration should be given to including DNO-specific transmission loss valuations[3].

3.1.2 Externality

The main externality is the environmental effects of electricity that is lost, i.e. the tonnes of carbon that are propelled into the atmosphere in the form of global warming gasses. A proxy for the value of this externality is that which will be applied under EU emission trading proposals. There is merit in considering adding in the value of other emissions.

Nuclear and renewables generation cause little in the way of emissions compared to other forms of generation. However, for simplicity, a simple average of the emissions of all generating plant should be used for this assessment.

3.1.3 Demand weighted

As demand increases technical losses increase at a much faster rate. Consequently losses are much higher at times of high demand than at times of low demand. As demand goes up so does the unit price of energy. Consequently, a demand weighted price should be used to value the direct cost of the energy. This is likely to lead to a higher but more realistic valuation of losses.

3.1.4 Forecast estimate

The value of each unit of losses is likely to change considerably each half hour. However, a balance needs to be struck between accuracy, using ex post values, and reduced uncertainty for investment purposes (predictability) and simplicity, using forward looking estimated values. Using forecast values is likely to be appropriate.

3.1.5 Five-yearly revisions

Again a balance needs to be struck between frequent revisions to the incentive valuation (accuracy) and the need to provide sufficient incentives to invest and where appropriate to outperform the price control assumptions. In line with the period of the existing revisions to price controls, five-yearly reviews appear appropriate.

3.1.6 Average or marginal values?

If there are to be regular revisions to the value of incentives (one year or less) then it might be appropriate to use marginal valuations. However, if there are likely to be larger gaps between revisions, say the preferred five years, then there is an increased risk that the marginal values (especially the costs of energy generation and/or marginal transmission

[3] The proposed transmission charging regime for England and Wales will use scaled marginal loss factors. This envisages a negative loss factor (increased energy) of approximately 2.4 per cent for demand in the South Western Grid Supply Point (GSP) and a positive loss factor (lost energy) of approximately 0.4 per cent for demand in the Northern GSP. The remainder of transmission losses are charged to generation.

losses) will not be valid beyond a short time horizon and/or for a small reduction/increase in losses. Moreover, there would be a significant risk that the total increase in customer costs would be greater than the true benefit to customers. In the case of five-yearly revaluations, it would be better to use average values.

3.1.7 Incentive to be paid over five or ten years?

Reducing the period over which the incentive is paid from the current ten years to the proposed five years is likely to reduce DNO uncertainty and hence is likely to increase DNO responsiveness to the incentive. However, this would lead to: -

- Only a marginal reduction in uncertainty;
- A short term negative (upward effect) on customer costs;
- Would appear to be at odds with the long term nominal asset life of forty-years;
  - Ideally, if assets have forty-year lifetimes then if tomorrow's customers are likely to benefit from today's investment in the form of reduced losses then they should contribute a proportion of the costs of that investment;

DNOs currently undertake capex expenditure for which their costs are repaid over much longer periods (up to 33 years) though they receive capex out performance incentive payments over the first five years. Centrica supports an approach for losses incentives that is equivalent to the capex incentive regime. See section 3.2 for further information on this alternative approach.

3.2 Incentive structure

3.2.1 Idealised approach

If it is important to optimise only for the achievement of the level of any output (e.g. losses) then the value of the DNO incentive (increased expensed revenues received by the DNO) should be set at 100 per cent of the value to customers of the delivery of that output. In this instance there would be no need to either predetermine targeted levels of output or worry about the costs of delivery. Instead, the incentive would be allowed to operate freely and the DNO would increase the level of output (in this case minimising losses) until the marginal cost of loss reduction exceeded the incentive rate. That is, the incentive rate would discover the efficient level of that output.

It is often appropriate to undertake customer willingness to pay research to understand this incentive valuation. However, as noted earlier, in the case of losses it would be simpler to calculate the direct cost to customers of the permanent (per annum) loss of 1kwh of electricity and add to this an estimate of the externality. However, there may be some merit in asking customers to evaluate the environmental externality. It is important that the total cost to customers of a unit increase in output is **NOT** greater than the 100 per cent valuation level otherwise customers will paying too much for the output.

However, in practice there are a number of problems with the idealised approach set out above: -

- The valuation of the incentive might not be clear beyond a narrow range of output performance;
- Where the cost of output increase is materially lower than the 100 per cent output valuation it is likely to be appropriate to optimise for output level and cost reduction

otherwise companies would earn disproportionately high rates of return for increases in output;

- Expenditure is often not separable leading to perverse incentives for DNOs to reclassify expenditure to take advantage of any higher rates of return that might be on offer through the incentive mechanism or to receive payment through more than one mechanism (e.g. the expensed incentive rate plus capitalisation of the same expenditure). If this behaviour was carried out it could in turn lead to customers paying more for a unit of output than the 100 per cent output valuation;
- The level of DNO certainty (control) might be low;
- Customers might expect a minimum level of output performance;
- An unlimited output performance might be inappropriate because of the uncertainty about valuations over a long range of output performance; and
- Calculations of output levels are often subject to the differing interpretations of DNOs.

3.2.2 Way forward

A practical solution to these problems is therefore to: -

- Estimate the 100 per cent valuation level for losses; this should be done separately for technical and non-technical losses. This is the maximum total cost increase per unit of additional output;
- DNOs estimate the cost of loss reduction scenarios, again separately for technical and non-technical losses. Ideally this should be part of the forward looking price control review Business Planning Questionnaires due later this year;
- Verify this company specific information (if possible through benchmarking of all companies' projections);
- Estimate the forward looking efficient unit cost of loss reduction (technical and non-technical losses), ideally less than the 100 per cent valuation level;
- Fully fund the existing level of losses performance, on basis of efficient costs, as part of price control revenues. Because of annual variability in loss levels care will be needed to determine the 'current' level of performance;
- Incentivise performance [reward/penalise] around 'existing level' of losses using an incentive equivalent to the forward-looking efficient unit cost of loss reduction. This incentive should work by increasing/decreasing the capex allowances by the amount of the incentive for each unit increase/decrease in level of losses. That is: -
  - The capex allowances automatically adjust to take account of the amount of output delivery;
  - The separability/reclassification of the costs is avoided thereby avoiding overpayment;
  - The normal capex efficiency incentives, and the equivalent proportion of unanticipated savings retained by DNOs of approximately 11 per cent for a permanent unanticipated efficiency, will operate and flow back to the DNO over a rolling five-year period;

  - At the end of the price control period efficiently incurred expenditure will be added to the RAB; and
  - DNOs will receive the costs incurred (in form of return and depreciation) over the normal period (up to 33-years) for capex – this will ensure that all of the customers that benefit from permanent loss reduction expenditure (today's and tomorrow's customers) will pay for that investment;
- Set maximum and minimum levels of losses performance via a licence condition. Above the maximum level there will be no losses related revenue increase. Below the minimum level, Ofgem should investigate the performance and where appropriate this should lead to enforcement [financial penalty?]. A compliment to setting minimum levels of performance would be that DNOs would qualify for the capex/opex incentive payments only if an efficient level of losses is achieved (see section 3.3.2 below); and
- Use a common verifiable methodology for calculating losses across all DNOs (Ofgem could specify how losses are calculated and audit this info as it does for the current IIP scheme).

A limited risk with this approach might arise where the control that a DNO has over the level of losses is low and the costs associated with operating the system do not automatically rise and fall with the level of losses. However, this risk should be low because the introduction of this revised incentive arrangement should coincide with increased quantities of distributed generation connections. Individual distributed generation could cause distribution losses to rise or fall, though overall, distributed generation would be expected to cause distribution losses to fall.

As most expenditure is multipurpose (i.e. expenditure is not clearly separable), as noted earlier, other forms of losses incentive scheme could lead to perverse incentives for DNOs to reclassify expenditure to take advantage of any higher rates of return that might be on offer through the incentive mechanism or to receive payment through more than one mechanism.

3.3 Miscellaneous

3.3.1 Technical versus non-technical losses

Technical and non-technical losses are likely to vary differently with demand. Though the inclusion of the value of the externality is straightforward with respect to technical losses, the rationale for including the externality for non-technical losses (especially settlement errors) is not clear. Furthermore, the costs of reducing the level of each type of loss are also likely to differ.

Currently, technical and non-technical losses are incentivised through a common losses incentive though non-technical losses have an additional and material units distributed revenue driver incentive. This differential losses incentivisation is by accident rather than design. Moreover, it is likely that the technical losses incentive should be greater than that for non-technical losses, the reverse of the current situation.

In the short term it does not appear easy to properly separately incentivise the two or to reduce the disparity between the incentives for the two types of losses. This problem arises out of the difficulty of measuring overall losses and then separately identifying the proportion of technical versus non-technical losses.

An improved losses regime should in itself incentivise DNOs towards improved measurement especially with respect to technical losses (DNOs that carry out revenue protection activities will already know the amount of "found" units as a consequence of their own actions). DNOs will need this improved measurement to allow them to target their investment appropriately. However, DNOs may have perverse incentives to estimate losses in a way that allows them to benefit from the incentive in an inappropriate way. DNOs already calculate losses on an inconsistent basis. DNOs should produce acceptably accurate estimates of the level of technical losses to allow reasonable estimates of non-technical losses to be derived. As noted above, there should be a common methodology for calculating losses across all DNOs.

The measurement improvements would not only allow more appropriate and possibly separate technical versus non-technical losses incentives at the following price control but would also provide Ofgem with much better information with which to assess the efficiency or otherwise of DNO loss levels.

3.3.2 Assessment of efficient level of losses at end of next price control

DNOs should provide annual reports to Ofgem on the actions that they have taken including the costs and results of those actions on the level of technical versus non-technical losses. These reports should be used by Ofgem to assess the efficiency or otherwise of the level of DNO losses. Consideration should be given to carrying out additional work, along the lines of the recent work on quality of supply disaggregation, to get an understanding of the efficient level of losses for each DNO taking account (where appropriate) of differences in operating environment or other system characteristics.

If entitlement to the additional rewards of the recently introduced rolling five-year rewards to opex and capex efficiency were linked to achieving an efficient level of losses, where this efficiency was assessed by reference to some form of inter-DNO benchmarking of the actual level of losses (simply loss improvements), then any perverse incentive to under spend on loss-related expenditure so as to benefit from the current capex efficiency incentives would be significantly reduced. This methodology to reduce perverse incentives to under investment has been successfully introduced to incentivise IIP quality of supply improvements.

Moreover, even if the existing DNO incentive remained unchanged, linking DNO efficient loss performance with entitlement to the additional capex and opex efficiency incentives would immediately remove the existing losses investment dis-incentive by significantly reducing the effective losses expenditure hurdle rate, though other problems would remain.

3.3.3 Competition in connections

It is important that the effects of competition in connections do not undermine DNO losses incentives. Non-DNO connections providers are currently perversely incentivised to produce lowest cost, i.e. high loss, connections.

3.3.4 Revenue protection etc

The existing revenue protection services offered by some though not all DNOs are an important contributor to capping the level of theft of electricity. We would urge Ofgem to publish its long awaited review of this area without further delay. Consideration should

also be given to other non-technical loss improvements for example to unmetered supply inventories and settlement errors generally.

3.3.5 Treatment of Distributed Generation losses

Centrica agrees with Ofgem's proposal to remove the current somewhat arbitrary adjustment for the effect of distributed generation on losses in favour of the actual (increase or decrease) in losses as a consequence of that generation.

3.3.6 Distributed Generation Incentives

As noted in British Gas' response, dated 22/8/03, to Ofgem's "Electricity Distribution Price Control Review – Initial Consultation – July 2003" the main DNO incentive requirement for facilitating distributed generation would appear to be an effective losses incentive (an additional distributed generation connection incentive is also required). Consequently, there would be considerable merit in bringing together the work in this area with Ofgem's other work on distributed generation incentives.

3.3.7 Allowing expenditure in the regulatory asset base

Some DNOs appear to be concerned that the current incentive is not effective; as it does not give enough certainty to DNOs that they will be able to recover losses reduction expenditure. Consequently Ofgem's clarification that it does not intend to disallow from the Regulatory Asset Base any loss reduction expenditure that is efficiently incurred has to be welcomed. However, this clarification is simply a confirmation of what might be expected in any event in light of DNOs' current obligations with respect to "develop and maintain an efficient, economical and co-ordinated system of electricity distribution" and the government's likely Social and Environmental Guidance to the Authority following the recent publication of the government's energy policy.

3.3.8 Using the opex/capex efficiency proportion

Ofgem intends to use the current percentage of unanticipated opex and capex efficiencies retained by DNOs as a guide to the level of the DNO losses incentive. Ofgem proposes a marginal DNO losses incentive plus pass through of capex costs. It is unclear how the marginal losses incentive proposed by Ofgem relates to unanticipated efficiencies. Further explanation of Ofgem's rationale in this area would be appreciated. However, the alternative incentive mechanism proposed by British Gas includes the existing capex efficiency incentive. Consequently, this automatically uses the current capex efficiency incentive retention proportion.

Tahir Majid/Regulatory Affairs/British Gas/ 05.09.2003