

August 2001

**Development of Multiple
Interruption and Other Standards
for Electricity Distribution**

Initial thoughts

Executive summary

The current electricity distribution price control calls for the introduction, from April 2001, of Overall and Guaranteed Standards of Performance on Multiple Interruptions. These standards, which are intended to protect the interests of the "worst served" consumers, will specify a maximum number of interruptions that a consumer ought to experience in a period of 12 months. Consumers receive compensation for failures against Guaranteed Standards and penalties can be imposed on companies for failures to operate their businesses so as to achieve Overall Standards. This document sets out Ofgem's Initial Thoughts on the development of suitable standards.

There are many issues that need to be considered in developing Multiple Interruption standards and there are conflicting pressures. The definition of an interruption could be set wide, for example by including short interruptions and not excluding any interruptions due to particular causes, but there would be a large number of non-compliant cases unless the maximum allowed number of interruptions was also set high. Such arrangements, with a high threshold and wide definitions, would fail to identify separately the very worst served consumers and discriminate between them and consumers who experienced somewhat better availability of supply. On the other hand narrow, very specific, definitions may make the standard confusing to interpret or exclude some genuinely poorly served consumers. There are also complications because, in order to establish entitlement to Guaranteed Standard payments, companies need to know which consumers are affected by each incident and with current systems this is not always possible to determine.

In order that Ofgem's Initial Thoughts might contain options that have reasonable prospects of being developed into workable arrangements by April 2002, some preliminary information has been collected from companies by Ofgem's consultants, EA Technology. An exploratory meeting was also held with energywatch. One possible approach has been identified that may satisfy most of the requirements, though Ofgem will be pleased to consider any other package of measures that would provide a satisfactory overall solution.

It appears that many of the difficulties can be overcome by having separate definitions and administrative arrangements for the two standards. The Overall Standard, which would measure service to whole groups of consumers, would share many of the features

of the Information and Incentives Project arrangements as set out in the Regulatory Instructions and Guidance¹. The standard would therefore, in effect, specify that consumers should experience the consequences of no more than, say, 5 incidents causing interruptions of 3 minute or more. (Under IIP definitions an "interruption" is a loss of supply for three minutes or longer.) By closely integrating arrangements for the Overall Standard and IIP it is thought that unnecessary duplication of data collection and possible confusion between subtly different definitions can be avoided. They will also be able to share common quality control arrangements.

For a Multiple Interruption Guaranteed Standard, which would set an entitlement for a compensation payment to individual consumers, there would be benefits in having arrangements that only take account of interruptions that cause severe difficulties for consumers. Also, it is anticipated that in some cases it will be necessary for consumers to initiate payment of compensation by making a claim. It is considered that, providing they were made aware of their rights and that the criteria were straightforward, it would be possible to develop practical arrangements. With these points in mind, a Guaranteed Standard might be that consumers should not experience more than, say, 3 interruptions of 3 of more hours duration in a period of 12 months.

In addition to introducing Multiple Interruption Standards, two other issues have to be resolved by April 2002. These are:

- Whether there is a need for an Overall Standard on telephone response. This is called for in the current distribution price control. However, since then the IIP has focussed on this subject and it may provide sufficient incentives in this area.
- What changes should be made to Overall Standard 1a (Restoration within 3 hours). In its present form it is widely regarded as unsatisfactory as it provides perverse incentives. It could be discontinued, on the grounds that other measures now focus on restoration within 3 hours, or it could be modified so that performance is calculated on a more satisfactory basis.

¹ Information and incentives project – regulatory instructions and guidance, Ofgem February 2001

These topics, together with the form that the Multiple Interruption Standards should take, are the subject of this "Initial Thoughts" consultation. Interested parties are asked to put forward their views to be received at Ofgem by 7 September 2001.

Table of contents

1. Introduction.....	5
Background.....	5
Project timetable	8
Next steps	10
Responding to this consultation	10
2. Multiple Interruptions - Issues to be addressed	12
Definition of an interruption.....	12
Interruptions to be excluded	13
Identifying consumers affected	14
Aggregating fault histories.....	16
Standards to be based on April-March, Jan.-Dec., or rolling year?	17
Level of number of interruptions at which standards to be set	17
Size of GS compensation payments and impact on companies.....	19
Payment of compensation under Guaranteed Standards	21
Rules and reporting arrangements.....	21
Data accuracy, audit and penalties	22
Possible future developments.....	22
Timetable for introduction	23
3. Multiple Interruption Standards - A possible way forward	24
General Approach	24
Multiple Interruption Overall Standard.....	24
Multiple Interruption Guaranteed Standard.....	25
4. Multiple Interruption Standards - Issues for Consideration.....	30
General	30
Multiple Interruption Overall Standard.....	30
Multiple Interruption Guaranteed Standards	31
5. The need for an Overall Standard for telephone response.....	33
Background.....	33
6. The Future of Overall Standard 1a (Restoration in 3hrs)	35
Background.....	35
Issues and possible solutions	35
Possible ways forward	36
Appendix 1	37

1. Introduction

Background

1.1 The current price control on electricity distribution businesses calls for the introduction from April 2002 of new Multiple Interruption Standards². The standards proposed, which are intended to protect the “worst served consumers” on the distribution networks, are:

- An Overall Standard covering the maximum number of supply interruptions experienced by customers, such that of the order of 99% of customers should be subject to not more than a specified number of interruptions a year. Ofgem’s initial view, subject to further work, was that this should be set at 5 interruptions per year, but that the standard might differ between companies to reflect geographical and network differences.
- A new Guaranteed Standard with provisions for customers suffering more than a specified number of interruptions per year being entitled to a compensation payment.

1.2 Guaranteed and Overall Standards were introduced under provision of the Electricity Act 1989, Sections 39 & 40. Guaranteed Standards specify standards of service that, in the regulator’s opinion, “ought to be achieved in individual cases”. Failure to meet a prescribed standard requires “payment of such compensation as may be determined by or under the regulations” made under these provisions. Overall Standards set out standards of overall performance that, in the regulators opinion, “ought to be achieved”. A duty on a public electricity supplier to “conduct his business in such a way as can reasonably be expected to lead to his achieving the standards set” was added three years later³.

1.3 Under powers contained in the Utilities Act 2000, the existing public electricity supply licences will be replaced by separate distribution and supply licences and the existing PES activities will, in future, be carried out under the new

² Review of Public Electricity Suppliers 1998 to 2000, Distribution Price Control Review – Final Proposals, Ofgem, December 1999: paras 4.11 to 4.17

³ Competition and Services (Utilities) Act 1992

licences. The Act also introduces new provisions, which apply separately to the supply and distribution activity. Although the new sections have not yet been brought into effect, reference is made to them where appropriate.

- 1.4 New Regulations are intended to be made later this year, including under provisions inserted into the Electricity Act 1989 by the Utilities Act 2000, which will impose standards, substantially similar to the existing standards, on the new Licensed Electricity Distributors and Suppliers, which are successors to the existing Public Electricity Suppliers. The Utilities Act 2000 will also introduce powers for the Authority to impose penalties, not exceeding 10% of turnover, if a licence holder fails to achieve any Guaranteed Standard or conduct its business in such a way as can reasonably be expected to lead to its achieving the Overall Standards.
- 1.5 The price control also initiated an Information and Incentives Project (IIP) to review the financial incentives on companies to deliver appropriate levels of quality of supply. There are close links between the IIP and this work on Guaranteed and Overall Standards. It was envisaged that the Information and Incentives Project (IIP) would determine the way in which these standards would be applied. The IIP proposals would also require each electricity distributor to provide to Ofgem's specification, robust and accurate data on the number of interruptions suffered by consumers, and provide a revenue incentive not to exceed a target level of interruptions.
- 1.6 The price control proposals also called for other changes to the Overall Standards. These were:
 - A new Overall Standard to be introduced covering telephone response times. This would require 90% of calls to distribution businesses to be answered with a substantive response within 15 seconds in normal circumstances and 80% of calls to be answered within 30 seconds in exceptional circumstances. Suitable telephone systems to be in place to allow operation of such a standard by April 2002.
 - In view of concerns that the existing standard OS1a (Percentage of interruptions restored within 3 hours) gives perverse incentives,

consideration to be given to other ways of seeking improvements in this performance area as part of the Information and Incentives Project.

- 1.7 During 2000 the IIP focussed on issues associated with the definition of output measures for distribution businesses and the instructions and guidance to enable the outputs to be measured on a consistent basis over time, and across all companies. Work is currently proceeding on development of an incentive scheme. It was indicated⁴ that a separate work-stream would be put in place to consider the relationship between IIP and the new standards, and also to consider Overall Standard OS1a. A separate project to consider the issues associated with the new standards was also advocated in final proposals for the changes to Guaranteed and Overall Standards⁵ which are currently subject to statutory consultation⁶.
- 1.8 A recent IIP consultation document⁷ confirmed Ofgem's intention both to consider the need for an Overall Standard for telephone response, and to reconsider changes in Overall Standard OS1a, as part of the project on Multiple Interruption Standards. This comprehensive approach appears to be sensible and all resulting changes can then be progressed as a single revision to the Regulations and Overall Standards. In the light of progress with the IIP and the incentives it provides on telephone response quality, consideration needs to be given to whether it is necessary to introduce an Overall Standard on telephone response.
- 1.9 This consultation document sets out Ofgem's initial thoughts on how these requirements can be satisfied. The document is structured as follows:
- Chapter 1 provides background to the project, the proposed timetable, an outline of steps to be taken in progressing the project, and also arrangements for the receipt of responses to this consultation document.

⁴ Information and Incentives Project, Incentive Schemes – Initial Thoughts, January 2001: para 3.47

⁵ Guaranteed and Overall Standards of Performance – Final Proposals, Ofgem February 2001: para 6.5

⁶ Guaranteed and Overall Standards of Performance – Further Proposals, Ofgem June 2001

⁷ Information and Incentives Project, Incentive Schemes – Initial Proposals, Ofgem, July 2001: paras 1.12 - 1.16.

- Chapter 2 sets out the issues to be addressed in developing Multiple Interruption Guaranteed and Overall Standards. There are inter-dependencies between some issues and different considerations apply to Guaranteed Standards and to Overall Standards.
- Chapter 3 examines how the diverse requirements for Multiple Interruption Standards might be reconciled. One approach has been identified which, it is thought, would allow the introduction of workable arrangements to the required time-scale. However, it is not Ofgem's intention, at this stage, to preclude consideration of alternatives.
- Chapter 4 sets out issues relating to Multiple Interruption Standards on which Ofgem would like to receive the views of interested parties.
- Chapter 5 considers the need for an Overall Standard for telephone response. Although this is identified as a separate requirement in the price control, the IIP project has also addressed telephone response time and this may obviate the need for development of a separate Overall Standard. It sets out an initial Ofgem view, on which comment is sought.
- Chapter 6 considers the future of Overall Standard 1a. The main issue considered is whether there is still a need for a measure of the number of interruptions to supply that last longer than 3 hours. It also addresses difficulties arising from the structure of the current standard. Views are requested on whether such a standard should be retained, and if so how it should be modified.

Project timetable

- 1.10 There are a number of issues that need to be addressed in order to satisfy the requirements outlined above. It has been recognised from detailed work in the IIP that it may not be practical to carry out a review and make fundamental

changes in information systems in order to introduce the best possible forms of new multiple interruption standards by April 2002. It is therefore proposed that the project should concentrate on introducing workable arrangements by that date, but that this should be regarded as only an initial phase in the development of multiple interruption standards. Further improvements, which might for example be achieved as part of a wider move to more advanced metering for domestic consumers, could be considered further at the next Price Review.

1.11 Set out below is a draft timetable:

Task/process	Target
Initial Thoughts document	
Consultation response deadline	7 September 2001
Explore issues and publish Initial Proposals	End October 2001
Consultation response deadline	30 November 2001
Develop Final Proposals for publication	Mid January 2002
Legal drafting of Draft Regulations/Overall Standards for publication	Mid January 2002
Consultation responses on Regulations/Overall Standards*	Mid February 2002
DTI approval and enactment of regulations	11 March 2002

* NB The Act requires a minimum 28 day period for this consultation

1.12 In order to introduce new Overall and Guaranteed Standards, there is a statutory procedure that has to be followed before making new regulations or determining Overall Standards. This includes consultation arrangements for the proposed regulations. It is intended that the January publication will also constitute the statutory notice for the proposals.

1.13 Ofgem is putting forward in this Initial Thoughts document only those options that it considers can be implemented by April 2002. In order to do that it has already taken the following preliminary steps:

- Employed consultants, EA Technology, to carry out a rapid initial survey of distribution companies thoughts on, and capability to meet, multiple interruption standards. This included the results of any research or studies that the companies have carried out. (The survey questionnaire is included as Appendix 1. The EA Technology report,

in which the responses have been compiled, will be published with this document on the Ofgem web-site.)

- Met with representatives of energywatch in order to discuss how customer concerns might best be reflected in new standards, what changes might be appropriate to the Overall Standard 1a, and how these changes should be incorporated in reporting arrangements.

1.14 This document is intended to identify the relevant issues. It covers both aspects on which there appears to be a general consensus and others where further work is clearly required. It sets out possible approaches that might be adopted for the new standards, and for modification of Overall Standard 1a.

Next steps

1.15 Ofgem will initiate further work on these issues. This will include:

- Exploring views and concerns expressed by companies in the EA Technology initial survey, in discussions with energywatch, and in responses to this consultation document.
- Further studies, surveys, workshops or working groups to address unresolved issues
- Brief consideration of possible longer term developments in order to ensure that the new Multiple Interruption standards are likely to be consistent with more refined arrangements in the future.

Responding to this consultation

1.16 Ofgem would like to receive responses to these proposals from all those with an interest in the development of interruption and telephone response standards. This includes distribution businesses, consumers and their representatives, employee representatives, contractors, equipment manufacturers, and any other interested parties.

Any comments should be received by 7 September 2001 and should be sent to:

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- 1.17 Where possible, it would be helpful if responses could also be sent in electronic form. Unless marked as confidential all responses will be published, by placing them in the Ofgem library. Any questions on this document, or on the Multiple Interruption Project should, in the first instance, be directed to John Benson.

2. Multiple Interruptions - Issues to be addressed

- 2.1 There are a number of issues that need to be addressed in developing effective and practical Multiple Interruption Standards. Many of these are inter-related. Some will be more relevant to the Overall Standard and others to the Guaranteed Standard. It is possible that in some respects different definitions and reporting arrangements may be appropriate for the two types of standard.

Definition of an interruption

- 2.2 The first question to be addressed is what definition of an interruption should be used for Multiple Interruption Standards. Historically, the industry, under NAFIRS (the National Fault and Interruption Reporting Scheme), has defined an interruption as loss of supply for 1 minute or more. Under IIP⁸ companies will be directly incentivised only on interruptions of 3 minutes or more and, furthermore, those events resulting from a common incident count as one interruption. The recent Ofgem consultation document on Guaranteed and Overall Standards of Performance proposes that interruptions of less than 3 minutes should be excluded in calculating Overall Standard OS1a (% restored within 3 hours)
- 2.3 These changes have been made in order to encourage companies to introduce equipment that will provide automatic restoration following loss of supply (the opportunities to employ distribution network automation to reduce interruptions are improved with a 3 minutes rather than a 1 minute time window), and also to provide temporary restoration of supply wherever possible for the longer interruptions. While such definitions may be suitable for use with the Multiple Interruption Overall Standard as it, like IIP, concerns a company's overall performance, individual consumers will not be aware of the underlying reasoning behind these definitions, or be able to know when they are entitled to receive compensation payments.
- 2.4 If short-term interruptions (i.e. less than 3 minutes) are included they may mask the experience of the truly worst served consumers who repeatedly experience long interruptions. There is a lack of data in this area and it appears likely that

⁸ Information and Incentives Project, Regulatory Instructions and Guidance, Ofgem, February 2001

including short-term interruptions would present considerable difficulties. It should also be recognised that the price control proposals indicated that standards for transient (i.e. short) interruptions would not be introduced at this review. Extending the definition of an interruption to include short interruptions was not intended at this stage.

- 2.5 Some companies have suggested that the standards should only relate to interruptions of 3 hours or more in order to align with the required restoration for demand over 1MW in the industry network design standard ER P2/5.
- 2.6 Another approach would be to count days on which interruptions occurred, rather than the interruptions themselves. This might simplify the standard and would overcome the difficulty that counting each interruption would tend to encourage companies to manage incidents so that there was a single long interruption rather than several shorter interruptions. However, for reasons given in paragraph 2.4 above, it would still be necessary to exclude interruptions of less than 3 minutes.

Interruptions to be excluded

- 2.7 Many companies consider that interruptions arising from certain causes should be excluded from measurement of performance under the Multiple Interruption Standards. Pre-arranged interruptions, interruptions that result from transmission system failures, and those arising from exceptional weather conditions have been suggested for exclusion.
- 2.8 With pre-arranged interruptions consumers may have the opportunity to mitigate the effects and so reduce the cost and inconvenience suffered. However this is not always possible. Consumers may be just as badly affected as with an unplanned interruption, though such exemptions would be well defined and the customer would be aware of the circumstances. Careful consideration needs to be given to how significant such an exclusion might be in the operation of both guaranteed and overall standards. It should be noted that the current Ofgem IIP proposal is that pre-arranged interruptions should not be excluded from the incentive scheme.

- 2.9 Exceptions for severe weather would be harder to justify. Consumers and their representatives would be very critical of a guarantee covering multiple interruptions that did not apply at times when it was most needed. There would also be difficulties in defining the conditions for which a severe weather exemption would apply. Weather based exemptions were considered under IIP but are not part of current proposals.
- 2.10 Other possible exclusions for consideration are interruptions resulting from outages of embedded generators, faults on transmission networks, vandalism and other third party damage to distribution networks. They too have been considered under IIP. While distribution companies may feel that these are outside their control consumers are generally not concerned with the cause of an incident but with the fact that they are off supply.
- 2.11 Given the problems of defining exclusions and the fact that consumers are often not aware of the cause of interruptions, an alternative approach would be not to allow any exclusions for Multiple Interruption Standards, but to set the standards at levels that made allowance for the normal expectation of interruptions due to such causes. The benefits of such a simplification would have to be balanced against the loss of resolution (masking) of the truly worst served consumers.

Identifying consumers affected

- 2.12 In order to compute accurately the performance levels against an Overall Standard and to identify consumers entitled to payments under a Guaranteed Standard, it will be necessary to know precisely how many and which consumers have experienced interruptions.
- 2.13 This issue was considered in some detail in the IIP consultations. It was found that the systems and data of most companies were inadequate to provide, with consistency and accuracy, the information needed on the number and duration of interruptions experienced by consumers. Where necessary companies are now improving their systems to meet IIP accuracy requirements. This is generally being done by developing or refining models that associate each consumer with a particular low voltage circuit from a distribution substation. The price control is being adjusted to give them a one-off allowance of 50p per consumer for populating these models. However in some situations the

information may not be entirely accurate (e.g. two LV cables in the pavement in front of a property). Also, there is no requirement to capture information on the phase to which each consumer is connected. Consequently companies may still not know which consumers have been affected by certain incidents, only the approximate number affected.

2.14 These arrangements are adequate for the IIP incentives, which are likely to be based on the average number and duration of interruptions experienced by consumers. (Random errors should have no effect on average performance). They could be developed for use in calculating performance against a Multiple Interruption Overall Standard. They would not be adequate, though, for reliably identifying individual consumers who might be eligible for a compensation payment under a Multiple Interruption Guaranteed Standard.

2.15 These shortcomings might be addressed in several ways:

- Improve the accuracy of the models. Discussions with equipment manufacturer suggest that, in order to confirm reliably the source and phase of LV supplies, it will be necessary to have access to the local substation and to individual consumers' premises. The cost of enhancing the quality of data in the models in that way would clearly be considerable. An indication of the phase to which premises are connected can be obtained by using detection equipment when they are illuminated at night, but there would probably be difficulties with complex configurations of properties (e.g. flats) and it is not clear what level of accuracy might be achieved. This approach would not overcome difficulties where records are not clear and a property could be supplied from one of several LV mains. There would be significant costs associated with establishing and maintaining a high level of accuracy in modelling network connectivity to individual consumer level.
- The model could be used "as a first pass" to provide information that could subsequently be refined. That could be by manual scrutiny and investigation by distribution company staff, or by paying consumers on the basis of information that was not totally accurate. In such

cases payments could subsequently be made to consumers who made credible claims that they had also been affected and suffered interruptions entitling them to penalty payments. Conversely, there would be a cost and loss of credibility in the arrangements resulting from payments where a company had not actually failed to satisfy the standard.

- Consumers would have to initiate claims for penalty payments. Companies would provide a claim form on which consumers would have to specify when their supply had been interrupted. This could then be checked by companies against their records. Even if companies adopted a liberal approach in cases which were not clear, there would still be scope for disputes to arise.
- Use modern metering and communication equipment that is able to record details of supply interruptions at each consumer's premises, and assemble and collate the information. Technically, this would be the best way of identifying consumers affected. However, other benefits would probably have to be delivered for an economic case to be made for such an investment. Although potentially a very attractive longer-term solution it does not offer a realistic short-term option.

Aggregating fault histories

2.16 In order to have effective administration of Multiple Interruption Guaranteed and Overall standards companies will need to have information systems that can aggregate the fault experiences of individual consumers. Manual systems are unlikely to be adequate for this purpose and companies will need to have IT systems with the necessary capabilities in place by April 2002. The broad requirement for this has been clear since the current price control was accepted early in 2000.

Standards to be based on April-March, Jan.-Dec., or rolling year?

- 2.17 The proposed standards call for a level of interruptions *per year* that is not to be exceeded. It will be necessary to specify the year on which the standards are to be based. Alternatives are:
- April-March: This has been used for performance reporting for more than 30 years. It is used in annual Quality of Supply Reports, Licence Condition performance reporting, etc.
 - Jan-Dec: More easily understood by consumers, but not generally used by distribution businesses. A disadvantage is that one such year may include the worst periods of weather from two winters.
 - Rolling Year: Only suitable for the Guaranteed Standard. Better from a consumer's perspective as there is no danger that a period with many interruptions will fall into two "years" and so fail to produce penalty payments. This might be more complex to administer.

Level of number of interruptions at which standards to be set

- 2.18 The multiple interruption standard proposals in the price control relate to "quality of supply for worst served consumers". In setting the standards it will be necessary to consider whether they should simply set a maximum number of interruptions that any consumer should experience, or whether they should in some way reflect the circumstances of a consumer's location and the capabilities of the local distribution company network.
- 2.19 A uniform minimum national standard of x interruptions per year would provide a single level below which any electricity supply would be regarded as being very unsatisfactory. Such an approach would focus on what was acceptable to consumers in general. It would have the advantage of simplicity but could not take account of differing expectations arising from location (e.g. city centre compared with remote rural) and different experience arising from those locations. It would be set at such a level that it tended to highlight poor security of supply experienced by small numbers of consumers living in remote locations.

- 2.20 A more “tailored” approach could reflect the level of security of supply normally associated with the type of networks in a particular locality. It would focus more closely on what a distribution company might reasonably be expected to provide. It could be more onerous (than a uniform standard) in urban areas and less demanding in rural areas. It would be harder to administer. There would inevitably be criticism when comparisons were made between the standards applying to adjacent communities that were close to the boundaries of different areas. The Electricity Act 1989 states that there can be different provisions for different suppliers for both Guaranteed (Section 39(2) and 39A(2)) and Overall Standards (Section 40(2) and 40A(2)).
- 2.21 It can be argued that the IIP measures apply strong incentives to improve security of supply in urban areas where network investment produces the best return in terms of average interruptions and customer minutes lost. Consequently it appears that there is an increasing need to protect consumers in the worst served localities, typically remote rural communities, rather than provide additional encouragement to companies to improve security in other areas.
- 2.22 Some companies consider that allowance should be made, not just for differences that are inherent in the areas they serve, but also for factors affecting security of supply that they inherited on privatisation. Such factors include Consac LV cable that is now proving to be unreliable and different system architecture, such as the use of 20kV rather than 11kV rural distribution.
- 2.23 Several companies have expressed the view that design considerations should be taken into account in setting the standard. One company, assuming short interruptions would be excluded, said that they would position auto-reclosing circuit breakers so that, statistically, they should have acceptable performance against the required standard. If the standard is subsequently revised there will be an additional cost in both introducing additional auto-reclosers and repositioning the existing units.
- 2.24 As indicated in para. 2.5, some companies consider that the standards should only relate to interruptions of 3 hours or more in order to align with the required restoration for demand over 1MW in the industry design standard ER P2/5. If that

should be adopted then the number of interruptions could probably be set lower than if shorter interruptions were included.

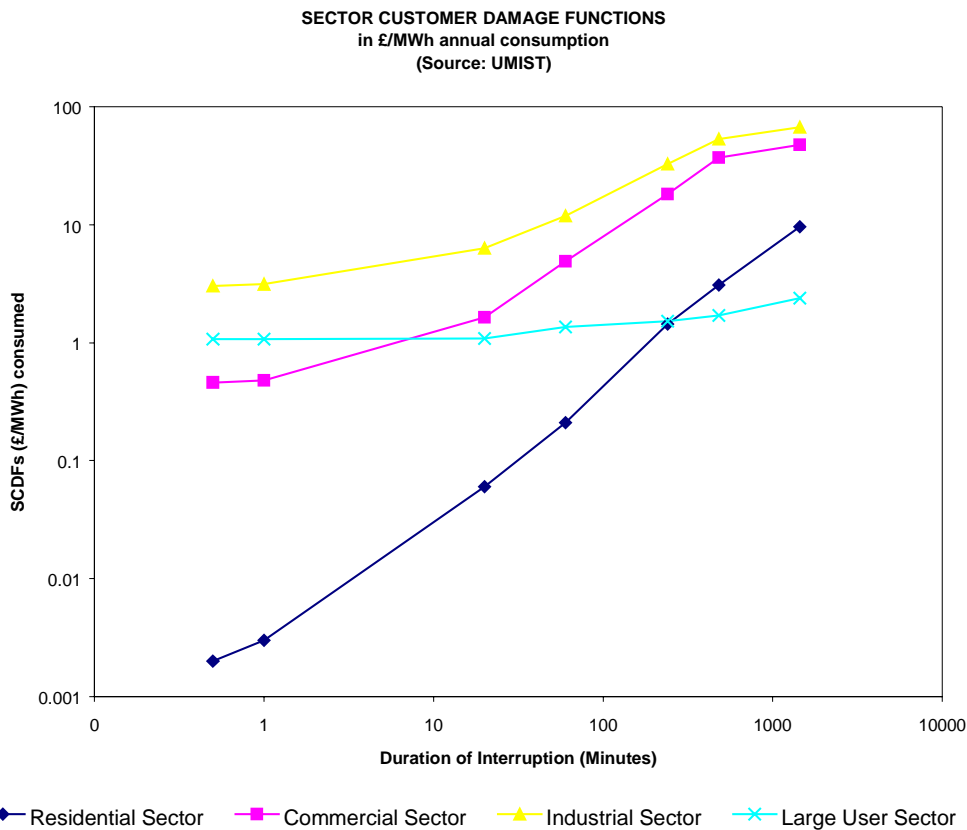
Size of GS compensation payments and impact on companies

- 2.25 A starting point for considering the size of Guaranteed Standard payments could be the negative value experienced by consumers as a result of the interruptions of supply. Studies on the valuation of System Customer Outage Costs⁹ ¹⁰ carried out by UMIST were summarised in a price control consultation document¹¹ and are set out in the diagram below. They show that for residential consumers and for most business consumers the cost to consumers is strongly related to the duration of the interruption. For a domestic consumer with 4,000kWh annual consumption the cost of a 3-minute interruption would be only around 4p, while a 3-hour interruption would result in an outage cost of around £4.
- 2.26 This is consistent with several surveys carried out by companies, consumer bodies, and regulators that suggest that consumers are most concerned with the duration of interruptions. The number of interruptions, although a matter of concern, seems to be of secondary importance. It has been pointed out that interruptions of more than 3 hours have more serious impacts on consumers as arrangements for more than one household meal may be affected and by then, in winter periods, heat stored in the thermal capacity of homes will generally have been dissipated.
- 2.27 Several companies have suggested that sums payable under Guaranteed Standards should be set at such a level that they do not exceed the annual Distribution Use of System revenue from the provision of supplies to the individual consumers concerned. While they will naturally wish to contain the potential cost of such payments, it should be noted that the legislation provides for "compensation" rather than for a full or partial refund of charges.

⁹ Kariuku KK and Allan RN Assessment of customer outage costs due to electricity service interruptions: residential sector, IEE Proc C, 1996, 143, pp163-170

¹⁰ Kariuku KK and Allan RN Evaluation of reliability worth and value of lost load, IEE Proc C, 1996, 143 pp 171-180

¹¹ Review of Public Electricity Suppliers 1998 – 2000, Distribution Price Control Review: Consultation Paper, Offer/Ofgas May 1999. Annex 4



2.28 Companies are concerned about the financial implications of guaranteed standard (GS) payments. If more than a small percentage of consumers are entitled to GS payments the financial impact on companies will be very significant. For example, if a company has 2m consumers and 2% were entitled to a GS payment of £50 then the total cost for that year would be £2m.

2.29 Much will depend on how the Guaranteed Standard is defined. Companies have provided preliminary information on the level of failures that they would expect, depending on the definitions adopted. This information, which is summarised in the EA Technology report, shows how the definitions of interruption adopted, and the maximum number of interruptions allowed, has a very big influence on the level of failures. Companies are concerned that with some definitions there could be a high failure rate, unless the maximum number of interruptions is set quite high. That would probably be unattractive to consumer representatives and result in masking of the truly worst-served consumers.

2.30 Depending on the definitions adopted, the financial impact may be greater on some companies than others. It has been argued that the definitions should not be tightened progressively, as this would require continual changes in system configuration. However, if it is considered necessary to reduce the initial impact on companies of a new guaranteed standard, it may be possible to do this by introducing compensation payments at a relatively low level. They could then be increased in stages after companies had had time to reduce their exposure to the compensation payments.

Payment of compensation under Guaranteed Standards

2.31 Ideally companies should be able to identify when and where consumers are entitled to a compensation payments and should make payments automatically in such circumstances. This avoids further inconvenience to consumers and avoids some groups of consumers, such as the elderly, being disadvantaged through having to make a claim before receiving compensation. [GS 10 requires companies to write to consumers within 10 days notifying them of payments owed under the standards]

2.32 For the proposed GS standard, however, such an approach does not appear to be feasible due to the difficulties in identifying consumers affected that have been outlined in paras 2.12 – 2.14. It is likely that a significant proportion of failures against the standard will be due to LV faults, though the proportion will vary depending on what level is set for the standard. Consequently, there does not appear in the short term to be any alternative but to rely to some degree on consumers initiating claims for compensation under guaranteed standards.

2.33 Another issue is whether claims and payments should be made via the consumer's supplier, or directly between the consumer and distribution company. Some payments are currently made via the supplier. Under provisions of the proposed regulations, it is possible for the supplier to serve as the "hub" for such payments.

Rules and reporting arrangements

2.34 When the main policy issues concerning Multiple Interruption Standards have been resolved, it will be necessary to put in place clear rules and reporting

arrangements. There will be obvious benefits if there can be a large degree of commonality with the detailed arrangements set out in the IIP Regulatory Instructions and Guidance (RIGS).

Data accuracy, audit and penalties

- 2.35 The price control proposals stated that “methods of collecting data must be auditable and accurate to within +/- 5%, excluding interruptions arising from single low voltage events where companies must use reasonable endeavours to identify consumers affected”. The IIP RIGs require an overall accuracy of 95%. This appears to be adequate for an Overall Standard but, as already discussed, raises issues about the operation of a Guaranteed Standard.
- 2.36 To date, performance under GS and OS standards has been subject to each company’s own quality assurance procedures. By contrast reported IIP performance is to be audited under a comprehensive audit programme which will be managed by Ofgem. Once again, there will be benefits in this area if duplication can be avoided. Arrangements adopted for Multiple Interruption Standards will have to be well defined and rigorously applied, but will also need to take account of problems of data accuracy.

Possible future developments

- 2.37 In considering possible multiple interruption standards that might be introduced under this initial phase of development, account should be taken of possible future developments. This is important for two reasons;
- It would be helpful if the new standards were consistent in scope and definition with those that might be operated in future years, so that a transition was simplified.
 - It is doubtful whether every issue can be addressed adequately by the new standards. Concerns about issues not adequately covered may be eased if there is some reasonable prospect of a more comprehensive mechanism being developed in the medium-term.

2.38 One possible future development is Advanced Metering. Although at this stage it could not be justified purely on the benefits it would provide to the operation of Multiple Interruption Standards, it might well be introduced at some consumer's premises for other reasons. It would therefore be advisable, for example, if interruptions arising from one incident were not counted as a single interruption as this would not be readily recognisable by advance metering. Such metering could however capture data relevant to concerns about large numbers of very short interruptions, or about some consumers experiencing large aggregate supply unavailability due to particular combinations of incident numbers and duration.

Timetable for introduction

2.39 Multiple Interruption Standards are required for operation from 1 April 2002. This requires making of the necessary regulations by 11 March 2002 and of determining any Overall Standards to a similar timetable. The timetable for development of the standards is set out in para 1.11 but it is clear that there will be little time available for the development of data capture arrangements not already in place. Companies have had an indication of the broad requirements for some time but detailed requirements will not be confirmed until close to the date for their implementation. It does not therefore seem likely that it will be possible to introduce arrangements that have novel data capture requirements.

3. Multiple Interruption Standards - A possible way forward

General Approach

- 3.1 It should be apparent from the preceding chapter that there are many inter related considerations to be taken into account in developing Multiple Interruption Standards. There is a very large number of ways in which the various alternatives might be combined, though many combinations do not appear to be viable given the conflicting pressures and the time constraints on this project.
- 3.2 In an attempt to simplify the process Ofgem has identified from preliminary information gathered from interested parties, an approach that seems to offer the prospect of workable arrangements. Its rationale and the main features of the arrangements proposed are outlined, step by step, in this chapter. It is emphasised that it is not Ofgem's intention to limit consideration to just one main approach. If consultees can identify other combinations that offer a good prospect of workable and effective arrangements that would be very helpful.

Multiple Interruption Overall Standard

- 3.3 A Multiple Interruption Overall Standard will provide an indication of how many of a company's consumers experience an unsatisfactorily large number of interruptions. It will be a new form of measure. No such system performance data has been collected in the past. In other respects, though, it has much in common with the measurements being introduced under IIP. They too are concerned with assessing the overall performance across a distribution company's network. There would clearly be benefits if both IIP and a Multiple Interruption Overall Standard could share common definitions, data collection and audit requirements.
- 3.4 Defining interruptions for the purpose of the Overall Standard as those of 3 minutes or more would exclude short interruption in line with statements on "transient" interruptions at the price control. It would also be consistent with studies, outlined in paras 2.26 – 2.28, that show that for many consumers very

short interruptions have a very low cost. The standard would, in effect, be specifying that consumers ought not to experience the results of more than a given number of incidents (producing loss of supply for 3 minutes or more) in a period of one year.

- 3.5 Several companies have suggested that there would be benefits if the Overall and Guaranteed Standards shared common definitions and data collection arrangements. Although the underlying reasoning has not been explained, they infer that this will avoid undue duplication and/or scope for confusion. Such an approach would however impose severe constraints on arrangements for Overall Standards because of requirements arising from the customer specific nature of Guaranteed Standards. Similar benefits would, however, be achieved if there was a high degree of commonality between IIP and the Multiple Interruption Overall Standard and the latter would then be free of constraints arising from the nature of the Guaranteed Standard.
- 3.6 It is therefore envisaged that arrangements for the Multiple Interruption Overall Standards should closely follow arrangements for the IIP system performance measures. This will be considerably more efficient for all concerned, both in their introduction and continued operation. Common definitions, data collection and audit arrangements could be employed. The only significant difference would arise from the need to consider actual fault histories. For example, if only one phase of an LV circuit was affected by a fault it would be necessary to record which phase was affected.

Multiple Interruption Guaranteed Standard

- 3.7 Guaranteed standards, like overall standards, specify a level of service that "ought to be achieved". The main difference, however, is that guaranteed standards provide for compensation for individual consumers if the specified standard of service is not achieved. In order not to be administratively cumbersome, arrangements for a Multiple Interruption Guaranteed Standard should focus on:
- Cases where reasonably significant amounts of compensation would be appropriate

- A relatively small number of “worst served” consumers

- 3.8 If interruptions were to be defined for the Guaranteed Standard as those of **three minutes** or more duration, there would be large numbers of consumers entitled to small amounts of compensation. From studies described in para 2.25 it appears that for six interruptions of 3 minutes or more compensation should be in excess of 24pence for domestic consumers. Company estimates collated in the EA Technology report suggest that in a typical year around 1% to 3% of a distribution company’s consumers might be entitled to compensation under such a standard. Providing low levels of compensation to large numbers of consumers would be expensive, administratively cumbersome and of doubtful value to consumers. Such arrangements would also fail to discriminate between consumers who had experienced the inconvenience of relatively short interruptions and those who had been without supply for a number of hours on several occasions.
- 3.9 If, on the other hand, interruptions were to be defined as those of **three hours** or more then substantial compensation would be appropriate. Two companies have provided an indication on their expected number of failures if the standard was set at a maximum of 3 such interruptions. These are for 0.3% and 0.04% of their total customer numbers, though the lower figure only includes 11kV failures and both exclude pre-arranged outages. With failures on this scale, and with the consumer outage costs indicated in paragraph 2.25, it would be appropriate to set the compensation payment for failure at a level that consumers would regard as significant. This should, perhaps, be set at £50 as some of the interruptions will be for more than 3 hours. That would be consistent with other GS payment values.
- 3.10 The difficulties in accurately identifying affected consumers have been discussed in paras 2.12 –2.14. There appears to be little alternative to placing an obligation on consumers to initiate claims for compensation in at least some, if not all circumstances. If the number of occasions when there is an entitlement is relatively small and the circumstances fairly significant (i.e. interruptions of three hours or more duration), the standard would be much simpler to administer than if larger numbers were entitled to payments for more, fairly short, interruptions. Consideration need to be given to how it can be made easy for customers to

make claims when they believe they are entitled to a compensation payment. It might, for example, be possible to provide a diary sheet/ claim form in advance or allow recording and claims via the internet.

- 3.11 If the Guaranteed Standard was for a relatively small number of 3-hour interruptions the effect of notified pre-arranged interruptions on performance levels could be quite significant. Planned work on rural overhead lines and on underground urban low voltage cables often requires an outage which is longer than 3 hours. If consumers had been subject to some planned interruptions during the year it would only need one or two faults for them to be entitled to compensation payments. The effect of that might be to discourage companies from carrying out planned interruptions.
- 3.12 Although superficially attractive this could have the effect of discouraging companies from carrying out work to improve networks, where the work required a planned interruption of more than 3 hours duration. It is therefore considered that if the Guaranteed Standard is set for a low number of longer duration interruptions, then notified pre-arranged interruptions should be excluded. It is of course axiomatic that consumers have adequate advanced notification of pre-arranged interruptions (At least 2 days notice is required under Electricity Supply Regulations 1988) and are therefore able to make representations if they consider that the plans are unreasonable.
- 3.13 Similarly, transmission failures could have a significant impact on performance levels against a guaranteed standard that is based on only a small number of 3-hour interruptions. However it is unusual for transmission failures to result in interruptions of more than 3 hours duration. (In some years there have been no NGC transmission failures in this category.) Should such an interruption occur, large numbers of consumers would be affected and the results, so far as the Guaranteed Standard is concerned, would have the same shortcomings as would arise if the standard had been set at a lower level. In effect, a much larger number of consumers would be classified as "worst served consumers" than in a typical year. Transmission failures are intended to be reflected in data inputs under IIP but will not significantly affect the relative position of the "worst served consumers". It might therefore seem advisable to exclude them from the definition of interruptions for the purpose of the Multiple Interruption

Guaranteed Standard, though it is acknowledged that such interruptions might not be readily identified, and the reason for their exclusion understood, by consumers.

- 3.14 Companies generally favour basing both the Overall Standard and the Guaranteed Standard on the number of interruptions in the conventional regulatory/financial year. They have pointed out the desirability of consistency with IIP and keeping the winter months, when most faults occur, within one reporting period. However, if the Guaranteed Standard performance relates to a small number of 3 hour interruptions and consumers initiate claims that are then checked by the companies, it may be practical to have a standard that relates to more customer friendly time periods. Consumers may favour a rolling rather than a fixed year with “the clock re-set” after a successful claim. That would have the effect of increasing compensation paid to consumers who were “exceptionally badly served”.
- 3.15 It is envisaged that interruptions from a single incident would not be amalgamated, (unlike IIP and the proposal here for the Overall Standard), as such an approach would not be readily understood by consumers making a claim. Also it would not be compatible with any medium term development using advanced metering. Ofgem is also mindful of the fact that Multiple Interruptions of less than 3 hours duration will be monitored under the Overall Standard and large numbers of such interruptions would produce adverse IIP performance. Short interruptions (< 3 min) will also be monitored under IIP.
- 3.16 It might be advisable, as discussed in paras 3.11 – 3.13 above, to exclude interruptions due to pre-arranged interruptions and from generation and transmission system failures. However, it is considered that those associated with extreme weather related incidents on the distribution system should perhaps be included as there would be difficulties with definitions and in developing arrangements that consumers might consider equitable. This is an area of difficulty in the operation of the existing Guaranteed Standard 2 (restoration within 18 hours) and consideration needs to be given to what might be a consistent and equitable approach.

3.17 Ofgem's initial view, therefore, is that arrangements for Multiple Interruption Guaranteed Standards should be different from the IIP arrangements, and from those advocated for the Multiple Interruption Overall Standards. They should instead be very closely related to consumers' understanding of what comprises an interruption, and be limited to those of significant duration. It is proposed that the Guaranteed Standard should specify that consumers should suffer no more than 3 interruptions (other than excluded interruptions) of 3 hours or more duration. Consumers experiencing more interruptions would be entitled to compensation of £50.

3.18 Some of the significant differences between IIP plans and proposals and Ofgem's initial thoughts on Multiple Interruption standards are summarised in the following table. It also includes possible levels for the two standards. However, these are included for illustrative purposes only, as more analysis will be needed to establish the appropriate numbers of interruptions to be allowed.

	IIP definitions and proposals	Multiple Interruptions– Initial thoughts	
		Overall standard	Guaranteed standard
Duration of interruption	3 minutes or more	3 minutes or more	3 hours or more
Interruptions from a common incident	Count as one interruption	Count as one interruption	Count as separate interruptions
Number of interruptions allowed	Target average figure for each company	DPCR initial view 5	Initial analysis indicates 3
Interruptions to be excluded	Under consideration: Embedded generation & Transmission failures	To match IIP arrangements	Pre-arranged outages? Transmission failures? Generation failures? Vandalism?
Identification of affected consumer	Generally using connectivity model to outgoing LV cable from substation	To use connectivity model to outgoing LV cable from substation (as IIP) plus recording of affected phase	Consumers to make claims
Year	April-March	April-March	Rolling year with "reset" after claim?
Required Accuracy	RIGs require 95%	DPCR specifies +/-5%	All valid claims to be paid – as for other GS/OS standards
Quality control/Audit	Ofgem to manage audit of information	Extension of IIP audit	

4. Multiple Interruption Standards - Issues for Consideration

General

- 4.1 There are many issues impacting on possible Multiple Interruption Standards. It is expected that consumers and their representatives, companies, contractors and equipment suppliers will each have a contribution to make on how they can be resolved both in the short term and in the medium to longer term. Responses will be welcome on all aspects discussed in the preceding chapters of this "Initial Thoughts" document and on any other aspect that is considered to be relevant. Views would be particularly welcome on the following:

Multiple Interruption Overall Standard

- 4.2 Views are sought on:
- Is it satisfactory for definitions and arrangements for the Multiple Interruption Overall Standard be closely allied to those for IIP or should they be more closely related to what might be practicable for the Multiple Interruption Guaranteed Standard?
 - If they are to be aligned to IIP arrangements what additional definitions and data collection arrangements will be needed to supplement those in place for IIP. What would be a satisfactory maximum number of interruptions for such a standard?
 - If it is considered that the Overall Standard should be more closely linked to a Guaranteed Standard how should opposing pressures be reconciled? Companies will favour restrictive definitions, many exclusions, and a high number of allowed interruptions in order to limit their administrative and financial burden, while customer concerns and views on adequate compensation will be reflected in opposing views. What definitions and exclusions should be adopted? How should performance be audited?

- Depending on the definitions adopted, should there be different Overall Standards for different companies and for different parts of a company's territory?

Multiple Interruption Guaranteed Standards

4.3 Views are sought on:

- Would a 3-hour definition for interruptions and a maximum of three such interruptions adequately reflect a level of service at which compensation should become payable?
- What exclusions should apply for such a standard? Would it be reasonable to exclude transmission and generation failures but include all other causes of failure?
- Would £50 be a satisfactory level of compensation in such circumstances? What would be the likely financial impact on companies?
- What would be the cost of implementing and operating such a standard?
- Would it be possible to provide automatic payment in some such circumstances? To what extent would it be necessary to require consumers to initiate claims and provide supporting information?
- If it will be necessary for consumers to make claims, what arrangements should be put in place to make this as easy as possible? How should payment arrangements be audited?
- If all compensation payments are to be initiated by claims from consumers could they be based on a rolling year, which restarted after payment had been made? If not a rolling year, what time period is preferred?
- If an alternative to a 3-hour definition is preferred what should that be and what would be the maximum number of interruptions

allowed? What exclusions should be allowed? How would consumers to whom payments were due be identified and what would be the financial and administrative costs?

- Would it be more equitable to have different guaranteed standards in different parts of a company's territory and if so how should these be defined?

5. The need for an Overall Standard for telephone response

Background

- 5.1 Experience during winter storms, when some companies had difficulty providing an effective response to enquiries from consumers affected by supply interruptions, led to a requirement in the current distribution price control for a new Overall Standard on telephone response to be introduced from April 2002. It was indicated that the standard was to cover substantive telephone response times, with 90% of calls to be answered within 15 seconds in normal circumstances and 80% to be answered within 30 seconds in exceptional circumstances. Companies were to have suitable telephone systems operational by April 2002.
- 5.2 Since then, however, IIP proposals have been developed that cover telephone response. It is proposed¹² that companies will be incentivised on a relative basis against a quality of telephone response output measure. That measure will be derived from an average of a company's performance on the speed of telephone response and the results of an Ofgem survey of consumers who have had recent telephone contact with distribution businesses.
- 5.3 Speed of telephone response will therefore be a key element in the calculation of this measure of performance under IIP. Relevant statistics will have to be collected, published and audited to IIP requirements. It therefore appears that there might be an undesirable degree of duplication if there was also to be an Overall Standard covering the speed of telephone response. The best course of action would therefore be to rely on the IIP measures and not proceed with the development of a new Overall Standard.
- 5.4 This approach does, however, rely on the IIP proposals being implemented by April 2002. It would also require an adequate weighting for speed of response in the overall telephone response IIP output measure and subsequently in the allocation of IIP penalties. That would be necessary in order for the IIP

¹² Information and incentives Project: incentive schemes. Initial proposals Ofgem July 2001 para 2.18

arrangements to apply similar pressure for swift telephone response, as might be achieved through Overall Standards coupled with penalties that might be introduced under the Utilities Act.

- 5.5 Views are sought on whether measures to encourage swift telephone response should be focussed on IIP measures rather than on the development of a new Overall standard.

6. The Future of Overall Standard 1a (Restoration in 3hrs)

Background

- 6.1 Overall Standard 1a specifies a minimum percentage of supplies to be re-connected, following faults, within three hours. The required minimum percentage for each company varies between 85% and 95%. This standard has been heavily criticised because it provides perverse incentives. For example, if a company installs auto-reclosing circuit breakers on its rural circuits in order to ensure that more interruptions are very short interruptions (and so do not count as interruptions for this standard) the effect will generally be to significantly reduce the number of interruptions of less than 3 hours duration. This will result in a deterioration in the company's performance against this standard.

Issues and possible solutions

- 6.2 While the intention behind the standard is good, there seems to be a flaw in the underlying concept. It encourages companies to take action to ensure that, for all interruptions, as many as possible are cleared within three hours but it seems to imply that the numbers in each category will not vary independently, or for any other reason. The result is a standard against which performance can be unpredictable and difficult to interpret. Deteriorating performance against the standard may actually reflect an improvement in the average availability of supply experienced by consumers. That could arise when the average number of interruptions and customer supply minutes lost are reduced but the mix of less than 3 hour and greater than 3 hour interruptions changes. That would not necessarily be an unfavourable development.
- 6.3 In view of the fact that measures are being introduced under IIP to incentivise companies to minimise the duration of interruptions, the question arises as to whether there is a need for an Overall Standard focused on supplies not restored within 3 hours. Also, if the new Multiple Interruption Guaranteed Standard that is to be introduced to satisfy the price control requirement should be based on 3 hour interruptions, it will provide data on the number of consumers making claims because they had experienced more than a specified number of such interruptions.

6.4 It may be considered that there is still a need for an Overall Standard to focus attention of restoration of supply within 3 hours. If so it should, ideally, be based on the actual number of interruptions not satisfying this requirement and not related to some other number, such as the number that have satisfied the requirement. However that would require a “target” maximum number of interruption for each company. Because companies have different numbers of consumers, that would make comparisons between companies difficult. It has been suggested that the number of interruptions lasting more than 3 hours should be related to the total number of consumers served by a company. That appears to offer a satisfactory solution as it is a fairly stable number for each company and such a measure (i.e. consumer interruptions of more than 3 hours duration per 100 consumers) would aid comparisons between companies.

Possible ways forward

- 6.5 There appear to be two possible approaches in order to overcome current problems with Overall Standard 1a:
- The simplest would be to discontinue the standard on the grounds that it was no longer needed, its original purpose, which was to focus attention on the speed of restoration of supply, having been taken over by more recent initiatives such as IIP.
 - An alternative approach would be to replace it with an Overall Standard that set a maximum number of consumer-interruptions of more than three hours duration, per 100 consumers.
- 6.6 Views are sought on the merits of these alternative proposals, and any other approaches that consultees may be able to suggest.

Appendix 1

QUESTIONNAIRE Proposed Overall and Guaranteed Multiple Interruptions Standard

Distribution price control review final proposals published in December 1999, proposed new overall and guaranteed standards for multiple interruptions. The overall standard will cover the percentage of the total customers who experience more than the maximum allowable number of interruptions (Current proposals are 1% with no more than 5). The guaranteed standard will detail the penalty payments to customers which suffer more than a given number of interruptions (Currently proposed as 5).

This survey will be used to gather distribution company thoughts on and capabilities to meet the proposed standards. An 'Initial Thoughts' consultation document will be issued following collation and analysis of the survey results.

Information from this survey/questionnaire will be regarded as preliminary and will not be published in a way that enables individual companies to be identified.

		Overall Standard	Guaranteed Standard
1	<p>Have you undertaken any customer expectation research on multiple interruptions ? Please provide evidence of any research results.</p> <p>Comments :</p>		
2	<p>Which of the following definitions of an 'interruption' would be the most satisfactory when assessing the number of gs/os interruptions seen by a customer. (a – e below are regardless of cause)</p> <p style="padding-left: 40px;">a) all interruptions -----</p> <p style="padding-left: 40px;">b) interruptions > 3 minutes-----</p> <p style="padding-left: 40px;">c) amalgamation of all interruptions from 1 incident---</p> <p style="padding-left: 40px;">d) days (on which any interruptions occurred)-----</p> <p style="padding-left: 40px;">e) days (on which interruptions >3 minutes occurred)--</p> <p style="padding-left: 40px;">f) Please state any alternative definitions-----</p> <p>(Please state for both Overall and Guaranteed Standard your preferred definition of an 'interruption')</p> <p>Comments :</p>		

3	Do you feel that any causes of faults should be excluded from the assessment of multiple interruptions? Comments :		
4	As regard multiple interruptions are there any factors that would be particularly influenced by inherent or inherited network differences? Comments :		
5	Would the changes being made to meet the Information and Incentives Project accuracy requirements of 95% overall and 90% for LV, provide the accuracy required for the multiple interruptions proposals by April 2002 ? If not, please indicate approximate costs and timescales to achieve the accuracy if it was required. Explain reasons for answer :	Yes/ No*	Yes / No *
6	Do your IT and DATA systems allow the number of interruption standard payments to be assessed automatically or will you operate manual systems ? Comments :		Automatic / Manual *
7	Should the 'year' be defined as a financial year in line with IIP, a calendar year in line with customer understanding or a rolling year ? Comments :	Calendar / Financial / Rolling*	Calendar / Financial / Rolling*
8	What are your views on the customer payment schemes ? e.g when should payments be made and how much should they be Comments :		
9	By April 2002, what percentage of GS claims for payment could your system automatically assess? Comments :		%

10	<p>What simple mechanism would you propose for customers to make claims for payment ?</p> <p>Comments :</p>		
11	<p>If a multiple interruption standard had been operated during the last 2 years what would have been your performance where : (a – e below are regardless of cause)</p> <p>a) ‘interruption’ defined as all interruptions (long and short) What % of customers would exceed 10 interruptions per year ? % 15 interruptions per year ? % 20 interruptions per year ? %</p> <p>b) ‘interruption’ defined as all interruptions > 3 minutes What % of customers would exceed 3 interruptions per year ? % 5 interruptions per year ? % 7 interruptions per year ? %</p> <p>c) ‘interruption’ defined as an amalgamation of all interruptions from 1 incident What % of customers would exceed 5 interruptions per year ? % 10 interruptions per year ? % 15 interruptions per year ? %</p> <p>d) ‘interruption’ defined as days on which interruptions occurred (long and short interruptions) What % of customers would exceed 5 interruptions per year ? % 10 interruptions per year ? % 15 interruptions per year ? %</p> <p>e) ‘interruption’ defined as days on which interruptions occurred (> 3 minutes only) What % of customers would exceed 2 interruptions per year ? % 4 interruptions per year ? % 6 interruptions per year ? %</p> <p>f) % defined under any alternatives from Question 2 f)</p> <p>Indicative numbers provided now will be helpful in producing the ‘initial thoughts’ document, more refined figures can be submitted at a later date for consideration in the final proposals.</p> <p>Please explain how the percentage figures were calculated and the confidence in the validity of the numbers. e.g. if the figure is an estimate then the confidence would be Low.</p>		

* please delete as appropriate