

**TECHNICAL SUPPORT REPORT  
FOR OFGEM**

**DEVELOPMENT OF INITIAL  
THOUGHTS DOCUMENT ON  
MULTIPLE INTERRUPTION  
STANDARDS DEFINITIONS**

**by  
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# REPORT

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## **1. Introduction - The scope of study and key issues for developing successful guaranteed and overall standards**

### **Background**

- 1.1 Proposals for the overall and guaranteed multiple interruption standards were published in the Distribution Price Control Review (DPCR) draft proposals and the October update. A guaranteed standard was proposed from April 2000 with penalty payments for customers suffering more than five interruptions per year, and an overall standard was being considered. Distribution companies considered that such standards were inappropriate at the time due to the difficulties in obtaining measured data in this area. In addition target levels and penalties were too harsh given the networks being operated.
- 1.2 The DPCR final proposals acknowledged the difficulties of measurement of this information, and deferred the introduction of standards in the area of multiple interruption to allow the levels of the standard to be informed by collection and analysis of performance data.
- 1.3 A new overall standard will be introduced in April 2002 which covers the maximum number of supply interruptions experienced by customers. Ofgem's initial view is that the standard should be in the order of 99 per cent of customers' experience no more than 5 interruptions per year. This is subject to further analysis and may reflect geographical and network differences.
- 1.4 A new guaranteed standard will also be introduced from April 2002 which identifies a penalty payment for each customer experiencing more than a specified number of interruptions. The DPCR final proposals also state that any company, which cannot provide robust and accurate data on the number of interruptions suffered by customers, can expect to incur a revenue penalty.

### **Scope of study and work**

- 1.5 The scope of the work includes the development of a questionnaire to survey the Distribution Companies on their thoughts and capabilities to meet the proposed multiple interruption standards. The impact of alternative standards and the relative merits of different approaches will also be included.

### **Key Issues**

- 1.6 Any guaranteed standard implemented should be 'simple' to understand from the customers point of view
- 1.7 The target levels for the guaranteed standard should be

## **2. Review of the Distribution Company Survey Undertaken**

### **Objectives**

2.1 The objective of the survey was to collate the thoughts and capabilities of the Distribution Companies in the following area :

- Definition of an interruption for the multiple interruption standards
- Measurement Systems to provide multiple interruption performance data
- Guaranteed Standard assessment and payment
- Network differences

In addition, the survey should collate information on the performance of Distribution Companies to inform of the level of targets for the multiple interruption standards

## **3. Review of the Distribution Company Responses**

### **Customer Research**

3.1 Whilst many companies have or are undertaking customer satisfaction research, few have specifically surveyed in the area of multiple interruptions. One company reports that their surveys indicate that customers can be tolerant to short interruptions if they are preventing long term interruptions

3.2 One survey indicates that 90% of customers accept that supplies need to be interrupted for maintenance and that their customers prefer more short interruptions and fewer longer interruptions. This view was reinforced by the results of other customer satisfaction research.

### **Definitions**

3.3 A wide range of responses were received on the definition of interruptions for the overall and guaranteed standards, a number of definitions were proposed:

- All interruptions
- All interruptions > 3 minutes
- Amalgamation of all interruptions from one incident
- Days (on which all interruptions occurred)
- Days (on which all interruptions > 3 minutes occurred)

3.4 A number of companies felt that a standard based on the aggregation of data across incidents or days, whilst easy for the customers to understand, could raise issues of interpretation in terms of measurement and data collection. Many companies felt that pre-arranged interruptions cause little inconvenience

to the customer and therefore should be excluded from the multiple interruption standards. Incentives to reduce pre-arranged outages form part of IIP to reduce CIs and CMLs.

- 3.5 All companies agreed that target levels for the overall and guaranteed standards should be different. Levels identified for the overall standard are not appropriate for the guaranteed standard due to the potential number of failures which would occur resulting in high levels of penalty payments.
- 3.6 A number of companies indicated that under the Electricity Act, a guaranteed standard applies to activities which should be only be exceeded in exceptional circumstance, and that applying a low target could cause some customers to exceed the number of failures every year. The level of the guaranteed standard should be set high enough to ensure the number of failures is consistent with the Electricity Act.

## OVERALL STANDARDS

- 3.7 A number of definitions were proposed by the companies for the overall standard, namely:
- All interruptions (excluding pre-arranged and faults from other systems)
  - All interruptions > 3 minutes (excluding interruptions outside the companys' control)
  - All interruptions > 3 minutes (excluding pre-arranged interruptions and interruptions outside companys' control)
  - Amalgamation of all interruptions > 3 minutes from one incident (excluding pre-arranged and interruptions outside companys' control)
  - Days (on which all interruptions > 3 minutes occurred) (excluding pre-arranged and interruptions outside companys' control)
  - All interruptions > 3 minutes (excluding re-interruptions and force majeure events as per Regulatory Instructions and Guidance (RIG) definition)
  - All interruptions > 3 hours
- 3.8 All but one company indicated that short term interruptions should be excluded on the basis that measurement systems are not yet accurate enough to measure all short term interruptions i.e. those which occur as a result of down stream recloser devices with no communication. Inclusion of short-term interruptions is likely to conflict with incentives for automation schemes under IIP.
- 3.9 Most companies felt that all interruptions > 3 minutes excluding pre-arranged, re-interruptions and interruptions outside the control of the company was a reasonable definition for an overall standard. However companies had differing views on the definition of 'interruptions outside control of the company' vandalism, 3<sup>rd</sup> party damage, interruptions due to other systems and interruptions due to load shedding were included.

## **GUARANTEED STANDARD**

- 3.10 A number of definitions were proposed by the companies for the guaranteed standard, namely:
- All non pre-arranged interruptions > 3 hours
  - All interruptions > 3 minutes (excluding interruptions outside the companys' control and customer inflicted interruptions)
  - All interruptions > 3 minutes (excluding pre-arranged interruptions and re-interruptions as per the IIP definition)
  - Amalgamation of all interruptions > 3 minutes from one incident (excluding pre-arranged and interruptions outside companys' control)
  - Days (on which all interruptions > 3 minutes occurred) (excluding pre-arranged and interruptions outside companys' control)
- 3.11 Many companies felt that the introduction of this standard should be deferred in order to collate and understand data for multiple interruptions, two companies argued that the standard is inappropriate and should not be introduced at all.
- 3.12 Companies felt that short interruptions should be excluded and a definition which aligns with the RIGs definition (all interruptions > 3 minutes excluding re-interruptions) or one which was based on duration as well as number of the interruptions.
- 3.13 Companies who suggested the definition of all interruptions >3 hours, felt that all interruptions should be included with the exception of pre-arranged and force majeure events. Where other definitions of an interruption was identified a larger number of exclusions were identified.

## **Network Differences**

- 3.14 The profile of company networks and the topography are different resulting in different incident numbers and customer numbers affected. The differences in the performances of the networks need to be understood before standards are set which could be unattainable.
- 3.15 132 and 33kV networks impact on a large number of customers when an incident occurs, resulting in a base figure for the multiple interruption standards for a large number of customers.
- 3.16 The design of the networks will dictate the customer number involved in incidents, dense networks result in shorter lower voltage lengths of cable and thus the customer affected by incidents.
- 3.17 11 kV incidents typically affect between 50 – 3000 customers, this is due to historical network design. Lengths of network, the protection strategies used and the population density affect customer numbers affected. The

characteristics of networks change slowly over time, as the investment is small in comparison to the asset base.

- 3.18 Figures provided indicate lengths of overhead line circuits of between 6000 and 17,000-km line result in high fault rates for circuits therefore will be more likely to have multiple interruptions.
- 3.19 The percentage of circuits exceeding 15 km varies from 11% to 34% for companies, this range illustrates the exposure of some companies to multiple interruptions. Of the circuits greater than 15km, between 2 and 15% of them have a fault rate  $> 0.3$ , demonstrating that a non-uniform nature of networks across companies.
- 3.20 LV networks contribute to 10% of the total customer interruptions; however, the number of customers affected by multiple interruptions due to intermittent faults on LV cables will be high. The pattern is not an indication of endemic problem; however, companies using CONSAC cables have been exposed to high failure rates on LV networks.
- 3.21 Investment strategies aim to improve overall quality of supply. Quality of supply to customer groups experiencing high numbers of HV interruptions and the weather resilience of the system. The amount of money provided for investment on the network is low in comparison to the asset base. By setting a standard for multiple interruptions which is too onerous, investment priorities could change perversely to improve supply only to relatively small number of customers, detracting from the overall performance of the network.
- 3.22 Companies argued that a uniform standard, which applied to all companies, would be inappropriate due to the significant network differences. Setting of thresholds for the standards need to reflect the starting positions of each company.
- 3.23 Generally it was considered reasonable that network lengths, the proportion of overhead line, network design and the use of CONSAC cable should be taken into consideration when applying the multiple interruption standard.

### **IT and Data Systems**

- 3.24 Companies felt that the accuracy required under IIP (95% overall and 90% LV) could provide the accuracy required for the overall standard.
- 3.25 As a large proportion of multiple interruption events occur on the LV system, the accuracy required for an automatic assessment system for the guaranteed standard could not be met with the systems required for IIP accuracy.
- 3.26 One company's data indicated that at a level of 5 interruptions, 60% of failures were due to HV faults. At a level of 8 interruptions, the HV failures were responsible for only 5% of customer numbers.

- 3.27 Only a full phase connectivity model, with control functions to identify network configuration, could provide the accuracy required for automatic assessment of the guaranteed standard. The expenditure for this would be in the order of £5-10 million and therefore can not be cost justified.
- 3.28 Most companies have in place a system which can, or will by April 2002, assess claims automatically for faults on the HV system and above. Claims including LV failures will need to be assessed manually.
- 3.29 One company will not have a system to measure multiple interruptions until 2003, even with the system being developed automatic assessment of claims, will only be carried out on interruptions caused by HV networks, all LV interruption will be assessed manually.
- 3.30 None of the companies will be able to automatically assess claims as this requires a phase connectivity model but it was agreed that systems could be partially automatic with manual intervention.
- 3.31 The implications of not having a full connectivity model is that some valid claims could be rejected, whilst invalid claims accepted. Companies indicated that this would have to be assessed on a probability basis.

### **Measurement Period**

- 3.32 Companies indicated that for simplicity, for both the customer and the companies, the reporting period for both overall and guaranteed standards should align with other regulatory reporting structures i.e. April – March.
- 3.33 A reporting structure, which used rolling years, would be confusing for customers and would cause difficulties for IT systems that would need to keep track of a large number of starting dates.

### **Customer Payment**

- 3.34 It is acknowledged that the process needs to be simple for the benefit of customers.
- 3.35 Due to the inability of companies' systems to make automatic payments, companies indicated that customers should make a claim when they felt the standard had been exceeded.
- 3.36 This should be in writing or by telephone with details of the failure (i.e. dates and times of supply interruptions). Some companies indicated that this should be via the supplier, with the supplier then contacting the Distribution Company, others felt that contact could be with the Distribution Company.
- 3.37 Claims should be made within a reasonable time of the failure, in line with other as payment policies this was suggested to be within one month. As claims will need to be verified manually the payment time to the customer

should be extended. Again it was suggested there should be one month. One company suggested the payment should be deferred to the end of the year. A number of companies felt that as the standard was a payment to customers experiencing greater than a number of interruptions, only one payment per year should be made. An alternative suggestion was a staged approach to payment similar to the 18-hour standard (GS2) where the payment reduces for further failures.

- 3.38 One company indicated that £50 was a suitable figure for the failure, another suggested a proportion of the Use of System charge of around 50%. Most others argued that this standard is focussing on inconvenience rather than hardship and as such payment should be lower than GS2 and a figure around £20 was more appropriate.

### Multiple Interruption Performance

- 3.39 Companies provided data for the assessment of the level of multiple interruption performance on their networks.
- 3.40 Data was requested on the definition proposed in the questionnaire (also detailed in paragraph 3.3) and any alternative the companies felt were appropriate. As systems are still being developed to provide information for the multi interruption standard, the responses were variable.
- 3.41 Only one company could provide values for all of the definitions required with the exception that pre-arranged outages were excluded. Data from other companies was limited in its applicability to the definitions requested with many companies unable to provide data that included short-term interruptions.
- 3.42 A summary of the performance data received from the companies is provided below. The figures in the tables indicate the percentage of customers exceeding the specified number of interruptions (e.g. 2.8% of customers in company 1 will experience 10 interruptions or more per year)
- 3.42a) All interruptions (long and short)

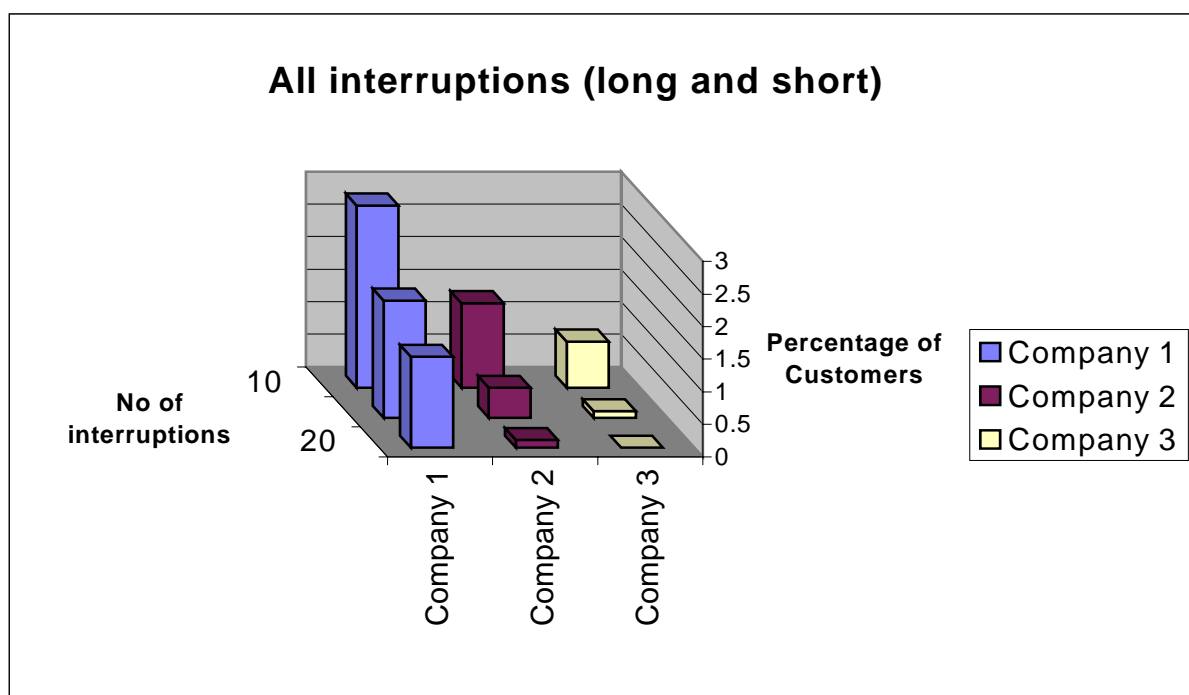
No of Interruptions	Company 1	Company 2	Company 3
10	2.8	1.30	0.71
15	1.8	0.46	0.10
20	1.4	0.12	0

### Exceptions (In values provided)

Company 1: pre-arranged and short interruptions from non-monitored devices

Company 2: pre-arranged, short interruptions from non-monitored devices, re-interruptions and service faults

Company 3: pre-arranged and all voltages except 11kV



### 3.42b) All interruptions >3 minutes

No of Interruptions	Co 1	Co 2	Co 3	Co 5	Co 6	Co 8	Co 9	Co 10	Co 12	Co 13
3	7	3.83	2	3.5	2.7	3.45		10.8	4	1.8
5	2.5	0.94	0.16	0.8	0.8	0.9	1.1	3.1	1.2	0.4
6								1.6	0.5	0.05
7	0.8	0.19	0.01	0.2	0.15	0.25	0.1	0.9		
8								0.5		
10	0.3						0.01	0.21		
15	0.1						0.001			

### Exceptions (In values provided)

Company 1: pre-arranged

Company 2: pre-arranged, re-interruptions and service faults

Company 3: pre-arranged and all voltages except 11kV

Company 5: pre-arranged, best interpretation of LV

Company 6: pre-arranged, best interpretation of LV

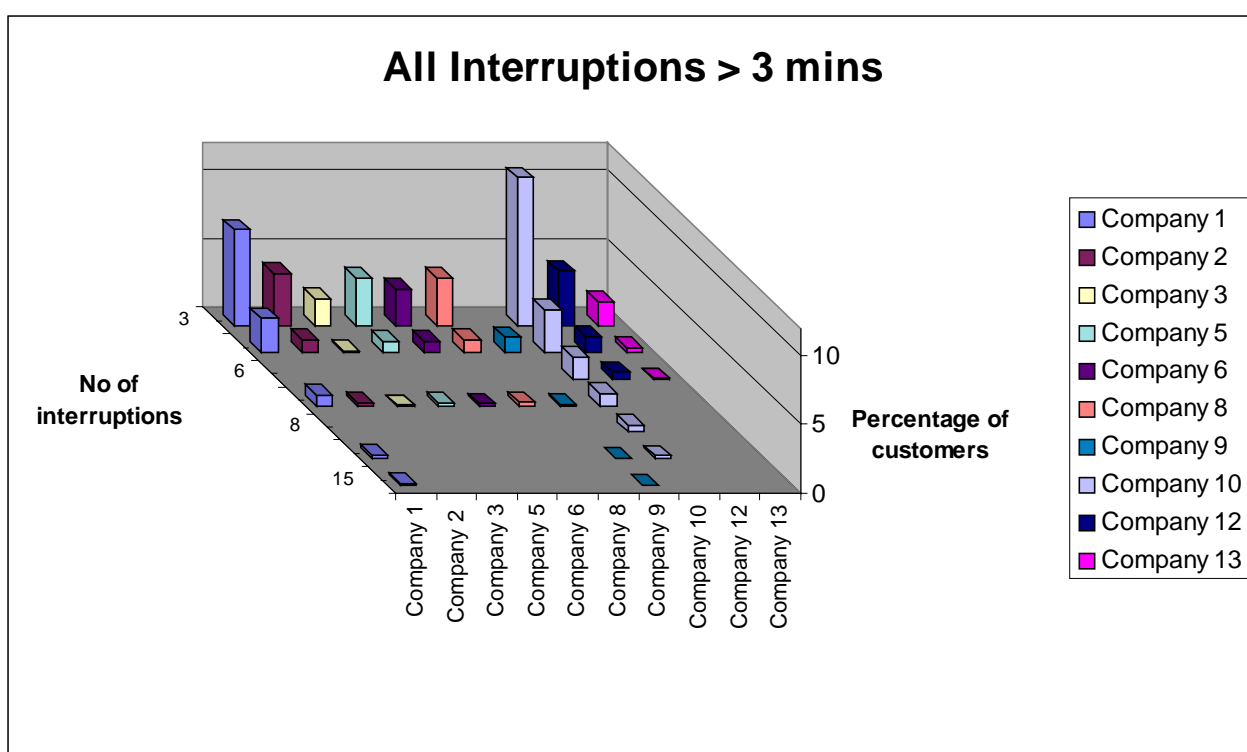
Company 8: pre-arranged and all voltages except 11kV

Company 9: pre-arranged and re-interruptions

Company 10: pre-arranged and 132kV

Company 12: pre-arranged, 33kv faults, cable faults

Company 13: pre-arranged, 33kv faults, cable faults



### 3.42c) Amalgamation of all interruptions from 1 incident

No of Interruptions	Co. 1	Co. 5	Co. 6	Co. 7	Co. 8
3				18.5	
5	8	0.6	0.6	6.08	1.07
7				1.91	
8				1.05	
10	2.6	0.02	0.01		0.015
15	1.7	<0.01	<0.01		0

### Exceptions (In values provided)

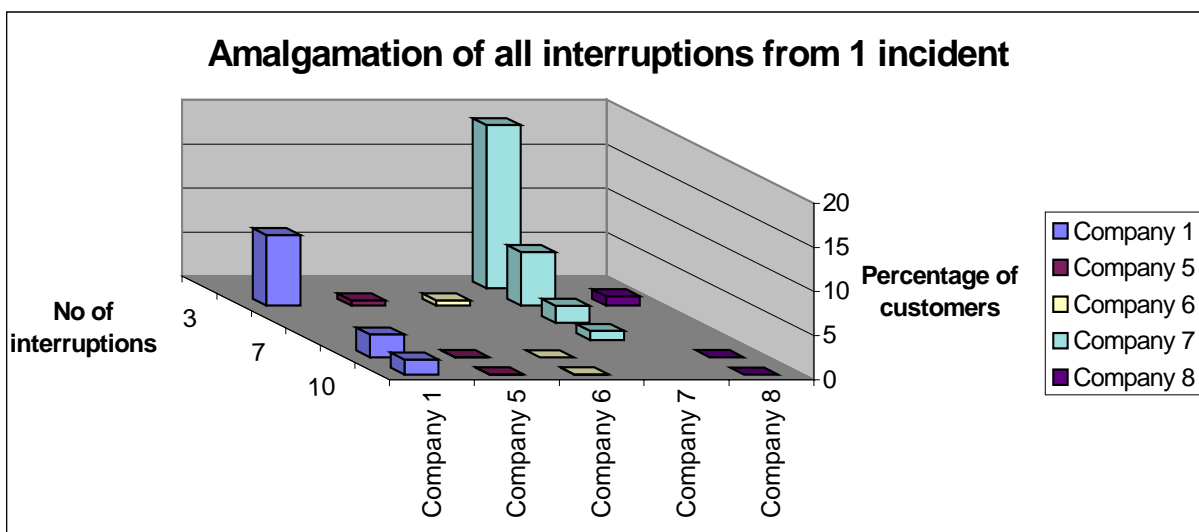
Company 1: pre-arranged

Company 5: pre-arranged, short interruptions and best interpretation of LV

Company 6: pre-arranged, short interruptions and best interpretation of LV

Company 7: short interruptions and LV incidents

Company 8: pre-arranged, short interruptions, all voltages except 11kV and a 0.5% increase for 33kV



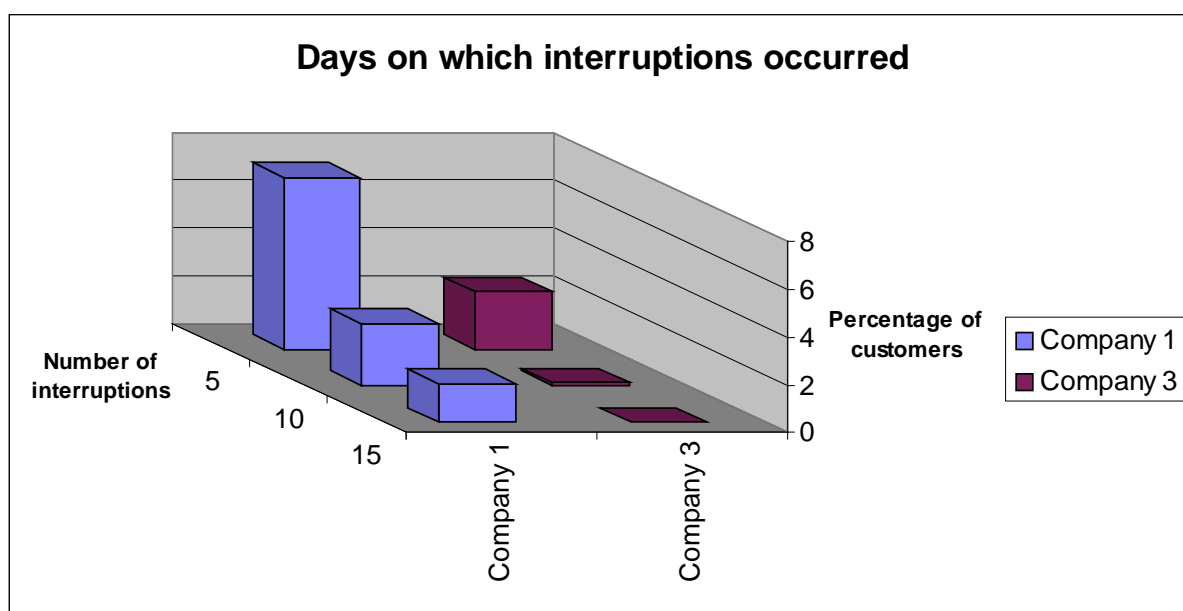
3.42d) Days on which interruptions occurred

No of interruptions	Company 1	Company 3
5	7.2	2.39
10	2.6	0.13
15	1.6	0

**Exceptions (In values provided)**

Company 1: pre-arranged

Company 3: pre-arranged and all voltages except 11kV



## 3.42e) Days on which interruptions &gt; 3 minutes occurred

No of interruptions	Co 1	Co 3	Co 4	Co 5	Co 6	Co 9	Co 12	Co 13
2	13.3	7.93	6.2	6.5	4.3		8.9	4.2
4	3.6	0.51	1.9	1.1	0.8	1.5	2.1	0.6
6	1.2	0.03	0.6	0.2	0.2	0.7	0.6	0.1
10						0.01		

**Exceptions (In values provided)**

Company 1: pre-arranged

Company 3: pre-arranged and all voltages except 11kV

Company 4: pre-arranged, 33kV and 132kV incidents

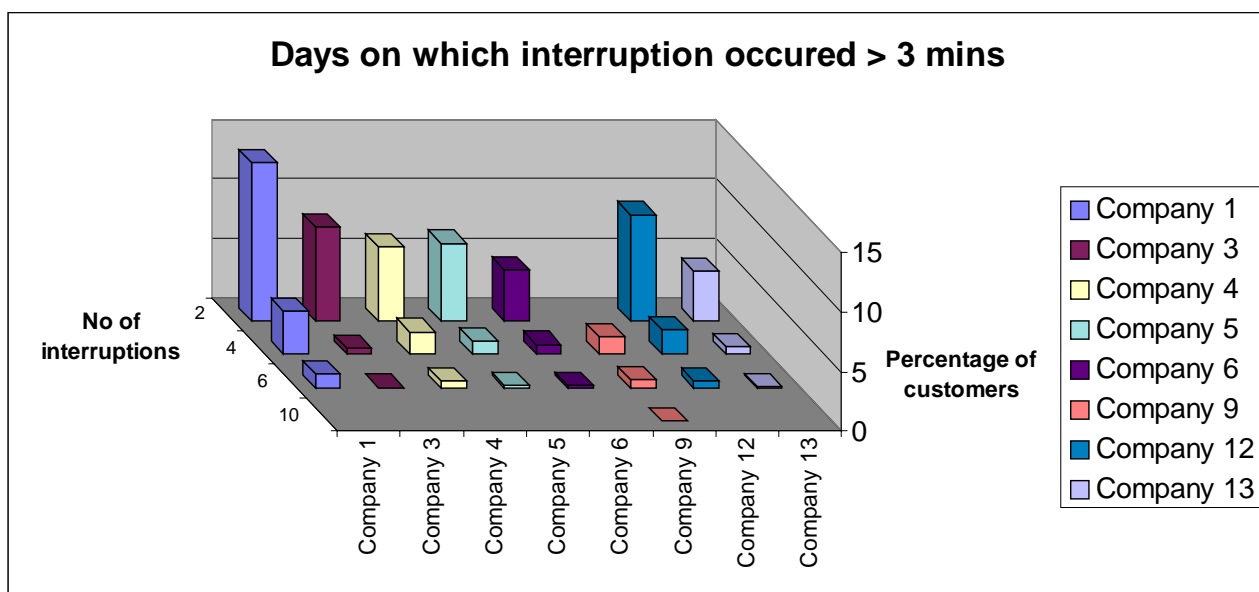
Company 5: pre-arranged and LV incidents

Company 6: pre-arranged and LV incidents

Company 9: pre-arranged

Company 12: pre-arranged, 33kv faults, cable faults

Company 13: pre-arranged, 33kv faults, cable faults



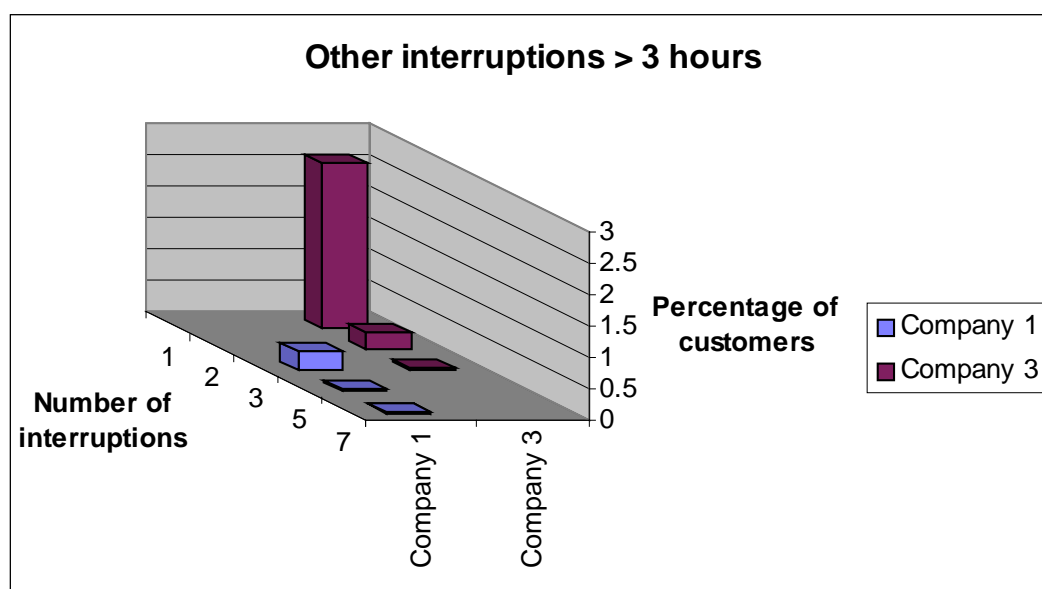
## 3.42f) Interruptions &gt; 3 hours

No of interruptions	Company 1	Company 3
1		2.63
2		0.27
3	0.3	0.04
5	0.05	
7	0.01	

**Exceptions (In values provided)**

Company 1: pre-arranged

Company 3: pre-arranged and all voltages except 11kV



3.43 From the figures provided by the companies, the table below indicates the financial penalties that could be incurred for different levels of the guaranteed standard. Average values of customers affected (across companies) have been used to provide the estimations.

Interruption Definition	Estimated Customers affected (*see NB)	Estimated Penalties @ £20	Estimated Penalties @ £50
a) set at 10	32,000	> £0.64m	> £1.6m
a) set at 15	16,000	> £0.32m	> £0.8m
a) set at 20	10,000	> £0.20m	> £0.5m
b) set at 3	91,000	> £1.82m	> £4.5m
b) set at 5	25,000	> £0.50m	> £1.3m
b) set at 7	13,650	> £0.27m	> £0.7m
c) set at 5	65,400	> £1.31m	> £3.3m

d) set at 5	100,800	> £2.01m	> £5.0m
d) set at 10	29,400	> £0.59m	> £1.5m
d) set at 15	16,800	> £0.34m	> £0.8m
e) set at 2	131,400	> £2.63m	> £6.6m
e) set at 4	27,000	> £0.54m	> £1.4m
e) set at 6	8,100	> £0.16m	> £0.4m
f) set at 3	3,570	> £0.07m	> £0.18m

\* N.B. See Paragraph 3.45 below

3.44 The values in the table are conservative values of the penalties that could be incurred by the companies. These estimations do not include pre-arranged interruptions.

3.45 The values are average values of both customer numbers and percentage of customers that are exceeding the proposed levels.  
E.g. f) set at 3: The customer numbers affected is calculated by averaging the company 1 and company 3 customer numbers and multiplying by an average of the company 1 and company 3 percentage affected figure.

#### **4. Initial thoughts on alternatives for development of guaranteed and overall standards for multiple interruptions**

##### **Overall and Guaranteed Levels**

4.1 Ofgem will need to consider the implications of the Electricity act on the setting of levels for the guaranteed standard, to enable a view on what a reasonable number of failures should be.

4.2 High numbers of failures would result in a costly assessment process and large penalty payments for companies. A level of interruptions set too high in order to reduce the penalty payments would be inappropriate for the customers.

##### **Definitions**

###### **ALL INTERRUPTIONS (long and short)**

4.3 This definition would be easy to understand from the customers' point of view, as all interruptions would be included no matter what the reason for the interruption.

4.4 The difficulty associated with the definition from most of the companies' perspective is the inclusion of short interruptions. At present short interruptions are only being monitored on a company-wide basis and do not have to be attributed to circuits.

4.5 The number of interruptions when including short interruption rises significantly, one company reported that some customers had seen 32

interruptions (long and short – excluding re-interruptions, pre-arranged and interruptions due to service faults) during one year.

- 4.6 Whilst the numbers of interruptions being seen under this definition would be monitored and recorded for the overall standard, an example figure could be 97% of customers should see no more than 10 interruptions (excluding pre-arranged).
- 4.7 The guaranteed standard failure would need to be set much higher to reduce the number of failures that would be seen, 3% of customers equates to an average 60,000 customers. A more manageable figure for failures of the guaranteed standard, as previously explained, would be in the region of 100-200. This means the level would need to be set in excess of 20, which is unlikely to be acceptable to customers.
- 4.8 Some companies argued that pre-arranged outages should be excluded from the assessment, as they were not seen to be an inconvenience to the customer.

#### **ALL INTERRUPTIONS (>3 minutes)**

- 4.9 This definition removes the need to take short interruptions into account by excluding all interruptions greater than 3 minutes.
- 4.10 Companies who identified this definition as their preferred one were divided as to whether pre-arranged interruptions should be included or not. However all performance data provided excluded pre-arranged interruptions.
- 4.11 This definition would be suitable for an overall standard given the difficulties companies have in obtaining short interruption data. An appropriate level for the overall standard given the performance data provided would be 97% of customers should see no more than 5 interruptions greater than 3 minutes (excluding pre-arranged)
- 4.12 For use as a guaranteed standard definition, the level would need to be increased to in excess of 10 interruptions to reduce the number of customers affected and hence the potential penalties that Distribution Companies would see to a reasonable number.

#### **AMALGAMATION OF INTERRUPTIONS FROM 1 INCIDENT**

- 4.13 The exclusion of short interruptions would align this definition with that in the RIG, i.e. interruptions greater than 3 minutes excluding re-interruptions.
- 4.14 Whilst this would be suitable for an overall standard, the definition for the guaranteed standard could be confusing for customers who wouldn't appreciate nor understand that some interruptions were due to the fault restoration process rather than a fault.

- 4.15 It is reasonable to align the definition of the overall standard with that of the RIG to simplify the data collection for Distribution Companies, however the use of this definition for the guaranteed standard is inappropriate due to the confusion that could occur.
- 4.16 Where the performance figures provide for this definition included short interruptions (but exclude pre-arranged), a manageable overall standard would be 92% of customers should not exceed 5 interruptions per year. When performance figures exclude short interruptions the overall standard would be more appropriate set at a level of 99% of customers should see no more than 5 interruptions per year.

#### **DAYS (On which interruptions occurred)**

- 4.17 This definition is easy for the customer to understand, but could cause difficulties for the Distribution Companies due to the inclusion of short-term interruptions. The definition is more appropriate for the guaranteed standard than the overall standard because of the simplification of the definition.
- 4.18 However, similarly to the definition of all interruptions, the numbers of interruptions measured would be high and result in a great number of penalty payments, if the multiple interruption level was set high, it is unlikely to be satisfactory for customers.

#### **DAYS (On which interruptions > 3mins occurred)**

- 4.19 The definition here is appropriate for the guaranteed standard, it is easily understood by the customer, and takes into account the customer research undertaken on short v's long interruptions. The exclusion of short interruptions would be acceptable by the distribution companies because of the difficulties in collecting short interruption data.
- 4.20 Performance data received from the companies indicates that the level of multiple interruptions for a guaranteed standard would need to be in excess of 10 to reduce the likely penalties to a reasonable figure (<1000).

#### **INTERRUPTIONS > 3 hours**

- 4.21 This definition is not proposed for the overall standard, but for the guaranteed standard as a way of reducing the potential number of penalties that companies could incur.
- 4.22 The definition is aimed at identifying networks that are failing the P2/5 design standard for 3-hour restoration and those interruptions that are of most concern to customers. A guaranteed standard using this definition and 5 interruptions would result in payments to approximately 200 customers (derived from the performance data provided).

- 4.23 An overall standard level using this definition would be set at around 99.5% of customers should see no more than 3 interruptions longer than 3 hours per year.

### **Network Differences**

- 4.24 It is difficult to assess the differences in performance between companies whose networks and geography are completely different, because of the inconsistency in performance data that has been provided.
- 4.25 It is well documented that networks that have long overhead networks tend to have more faults than companies that are more compact in their design. The proportion of overhead to underground network should also be taken into account, as fault rates are higher on overhead lines than underground cable.
- 4.26 It is important to define what is trying to be achieved with the guaranteed standards. Is it to reduce the number of interruptions that the worst served customers see or to compensate those who have a high number of interruptions?
- 4.27 Rural networks, by their very nature, will generally be subject to higher levels of interruptions, than urban networks. Customers living in rural networks should not necessarily expect the same level of service as those in urban areas, which is not to say that they should be discriminated against.
- 4.28 Differential overall and guaranteed standards could be introduced to taken into account the proportion of overhead line a company's network has. The overall standard could specify a percentage of customers which should not exceed a specified number of interruptions and depending on the proportion of overhead line the company has will depend on what the specified number of interruptions was set at.
- 4.29 The guaranteed standard could be set differentially depending on the company's network, this would be difficult to implement and for customers to understand.

### **Assessment and Payment Systems**

- 4.30 None of the companies have, or plan to have, a phase connectivity model; as a result a fully automatic assessment of claims can not be achieved. Most companies have, or plan to have, a system that will provide multiple interruption data for customers from the HV system upwards. Interruptions due to LV faults will have to be assessed manually.
- 4.31 As the Distribution Companies are not able to monitor the LV faults per customer accurately it will be impossible to determine which customers are entitled to a penalty payment.

- 4.32 A fully automatic payment system could only be achieved with a fully automatic assessment system, as these are not justified, a manual payment system will be required.
- 4.33 A system of customer claims, via the supplier, would be most appropriate which would be assessed manually by the Distribution Companies and then if verified, a payment made.
- 4.34 The companies have identified a payment of between £20 and £50 as appropriate. Some companies consider the inconvenience caused by multiple interruptions to be less than the 18 hour interruptions monitored by GS2, and therefore a payment of £50 (in line with GS2) to be too high.

## Appendix I – Summary of Distribution Company Responses

### Customer Surveys

#### COMPANY 1

- Since 1998 customer focus groups have been working to establish customer expectations in rural and urban areas, 2001 year focusing on supply reliability and telephone response
- Customer satisfaction reduces as number of interruptions (4.3/5 at 1 interruption, 3.3/5 for 4 interruptions) and the duration increases (4.2/5 for 0-1 hour, 3.9/5 for 3-4 hours)

#### COMPANY 2

- Annual customer surveys and by regular domestic and business customer meetings, analysis indicates that customers can be tolerant to short term interruptions if they are preventing long term interruptions

COMPANY 3 - Research undertaken but not specifically on MI

#### COMPANY 4

- Domestic customer survey carried out regularly and asks how many power cuts in a year would you consider too many, responses indicate that around 40% say 1 is too many!
- Evidence indicates that customers prefer more short interruptions and fewer long interruptions
- 90% of customers accept that supplies need to interrupted to undertake maintenance

COMPANY 5 - No survey undertaken for at least 3 years

COMPANY 7 - No customer research on multiple interruption

COMPANY 8 - No customer research on multiple interruption

COMPANY 9 - No customer research in this area

#### COMPANY 10

- Research undertaken for the DPCR identified that frequency of interruption was second most important to the customer after duration. NO specific MI questions were asked

#### COMPANY 11

- Research carried out previously has not been targeted specifically at multiple interruptions

## COMPANY 13

- No formal research on multiple interruptions, but our informal feedback from our customers is that they are concerned about multiple sustained interruptions, and would prefer money to be invested rather than compensation to be paid.

## Definitions

## COMPANY 1

- Recognise the argument that all interruptions, including short interruptions, should count towards a MI standard, this is appropriate for OS, but the number of failures render the definitions in the questionnaire unsuitable for GS.
- Aggregation across incidents and days would reduce the number of incidents, but would raise issues of interpretation
- Proposes that in line with customer research that GS should be based on non pre-arranged interruptions > 3hours (In-line with Ofgem research length rather than frequency)
- For the OS standard, interruptions arising from faults on other systems should be excluded as should pre-arranged outages (pressure to reduce these as part of IIP CI and CML incentives)
- For the GS standard, pre-arranged outages should be excluded but it is reasonable to include faults on other systems as the customer doesn't appreciate the difference

## COMPANY 2

- Believe it is appropriate to have different definitions for OS and GS, both having a common foundation which is based on long term interruptions (easily understood by all interested parties)
- Short term interruptions should be excluded from MI standards
- Any fault beyond the company's controls should be excluded (Faults due to other networks, re-interruptions during an incident (to align with IIP), accidental damage e.g. vandalism or 3<sup>rd</sup> party, pre-arranged interruptions and general exemptions in line with other GS)
- For the GS an exclusion based on customer 'inflicted' interruptions to avoid abuse of the guarantee

## COMPANY 3

- Days on which interruptions occurred and interruptions greater than 3hrs (preferred) would be most easily understood by the customer
- Agree that 5 seems appropriate level for GS but not if definition is in line with IIP, if use interruptions >3 hours then failure rate is 0.04% (<1,000 customers) With the same definition an OS at 1% would be set at 2 interruptions
- Arguments for 3 hour standard P2/5 based on 3 hour restoration, NGC, 33kV and 132kV outages normally less than 3 hours and Emergency load shedding is based on 3 hour interruptions
- Pre-arranged outages and exceptional circumstances (force majeure) for GS

## COMPANY 4

- Beneficial to have different definitions for OS and GS, including short term interruptions could disadvantage customers who are generally having long term interruptions
- OS - interruptions greater than 3 min,
- GS – days on which interruptions greater than 3 min occurred (removes re-interruptions and aligns with IIP)
- Interruptions due to other networks and pre-arranged outages should be excluded

## COMPANY 5

- Definition of multiple interruption for OS and GS should be the same and the preferred definition is days on which interruptions greater than 3 min occurred
- Target levels should be different between OS and GS and should also differ between companies to reflect network differences
- Definition on basis of removing re-interruptions and easily understood by customers
- Exclusions should include short interruptions due to the inaccuracy of the data currently being collected e.g. lack of communication to remote reclosers. Also included should be pre-arranged outages, interruptions outside control of Distribution Company (other networks and 3<sup>rd</sup> party), incidents covered by other GS (2), self-disconnection by a customer, load shedding and exemptions, which apply to other GS.

## COMPANY 7

- OS should be consistent with RIG (excluding short interruptions and re-interruptions and disaggregated into pre-arranged, non pre-arranged and those arising from other systems)
- Will be a number of years before companies have consistent and accurate MI data
- Believe introduction of GS should be deferred to collect and understand data, but if it is to be implemented then should be based on number and duration
- Electricity Act says that GS should only be exceeded under abnormal conditions, therefore GS should be set towards 100% of cases say 99.95% - this however raises the number of interruptions to a number which is unsatisfactory to customers. An alternative is to add a time element e.g. 3 hrs
- Definition could be no more than 5 interruptions of more than 3 hours will all sources of interruptions included

## COMPANY 8

- OS and GS interruptions greater than 3 minutes as per IIP definition
- Days would lead to extra sorting parameter in systems, without providing better reflection of customer inconvenience
- GS should exclude 3<sup>rd</sup> party and OS and GS should exclude major environmental events

## COMPANY 9

- OS and GS should be an amalgamation of interruptions greater than 3 minutes from 1 incident
- Pre-arranged interruptions, failures on other systems, unmetered supplies, 3<sup>rd</sup> party damage, vandalism and a force majeure clause

## COMPANY 10

- OS and GS - All interruptions greater than 3 hours duration, this will set targets in a manner consistent with the electricity act (S39A and S40A) would recognise the duration of incidents (inconvenience to customers and excursions from P2/5)
- If definition is as above, there is no need to exclude any faults from the standard, failures of cutout fuse should not be included (evaluated under GS1)

## COMPANY 11

- OS standard preference is an amalgamation of all interruptions from 1 incident
- Don't believe GS standard is appropriate without better understanding
- Any attempt to measure MI should be in line with RIG definitions, interruptions greater than 3 minutes excluding re-interruptions
- Faults on other systems, pre-arranged, short interruptions, supplier fuse failure, vandalism, force major issues and LV derived interruptions should be excluded

## COMPANY 13

- All interruptions greater than 3 hours because :
  - It will be easier for customers to understand; Gives a clear differentiation between dips / transients and permanent faults; Is more aligned with system design standard P2/5; Clearly excludes post fault switching interruptions in line with the IIP RIG; Is aligned with the thermal inertia of buildings (3 hours to cool down) and the disturbance of no more than one mealtime; Increases opportunity to reduce the level of failures by management action; It will produce a 'manageable' number of absolute failures, more in line with the Electricity Act, where failures should be exceptional events; It will require less exclusion than other definitions
- Cutout fuse failures, faults on other operators systems, planned interruptions, malicious damage and force majeure events should be excluded

## Network Differences

## COMPANY 1

- CONSAC cable is causing much higher fault rates than earlier or the replacement cable, whilst funding has been provided in DPR III for a replacement programme, it will continue until completely replaced to give higher interruption rates

- Extended rural HV networks will suffer more faults than compact networks; the long networks meet the P2/5 planning standard but do have more interruptions.

#### COMPANY 2

- Setting of thresholds and the number of customers involved needs to reflect the starting point of the companies with respect to network geography and design
- Account should be taken of contributions from different parts of the network together with customer density, circuit length, embargoed equipment, LV network components and susceptibility to vandalism.

COMPANY 3 - Influencing factors unknown, large amount of work required

#### COMPANY 4

- Network design (sectionalised network interrupts fewer customers for a fault), environmental (weather on overhead line networks) and economic activity (more 3<sup>rd</sup> party damage) should be taken into account when setting the MI targets.

#### COMPANY 5

- Historic design practices (proportions of o.h. and u.g., the length of the network, protection philosophy, control and automation,)
- Asset Condition and weather (salt spray e.g.)
- 3<sup>rd</sup> Party excavation

#### COMPANY 7

- % of oh line, network configuration, length of oh lines, endemic problems – A wide range of performance for MI exists

#### COMPANY 8

- Long o.h. lines, proportion of oh to u.g. network

#### COMPANY 9

- Underground to overhead proportions (u.g. faults more difficult), length of circuits, radial network designs (especially with contestable network designs)

#### COMPANY 10

- For interruptions greater than 3 hours, then 3<sup>rd</sup> party damage to cables and CONSAC cable problems should be
- If interruptions of shorter periods are to be considered then circuit length, weather will also need to be considered

#### COMPANY 11

- Proportion of OH/UG network, tree population and inherited low reliability line construction, customers per feeder and cable reliability (CONSAC)

## COMPANY 13

- Proportion of LV underground cable, length of CONSAC cable installed, design of LV and HV networks, length of HV network

**IT and DATA Systems**

## COMPANY 1

- As a significant proportion of MI events involve LV incidents and an accuracy of 90% for LV reporting (excluding LV phase and section) assessment of individual cases will need to be by hand.
- The systems will not be able to assess any cases automatically

## COMPANY 2

- Can satisfy the accuracy requirements for an OS standard with the passive connectivity model down to LV Feeder level (excluding short term interruptions)
- The GS standard, depending upon the threshold chosen, will require a phase connectivity model to accurately measure and record interruptions to individual customers
- Historic information demonstrates that LV faults cause customers to become 'worst served'
- Semi-automatic systems will identify the number of faults customers have down to LV feeder ways, single and two phase faults will rely on customers notifying and the fault management system being updated with the information
- Claims could be semi automatically be assessed, however due to the less than 100% accuracy of the connectivity model (passive and no LV phase connectivity) some valid claims could be refuted and invalid claims accepted.

## COMPANY 3

- Accuracy for OS standard will be possible using 95% overall and 90% LV
- GS accuracy can not be obtained without phase connectivity (>£5m)
- Automatic payment will not be possible, systems will be able to assist with assessment of customer claims (manually)
- Would only be able to automatically assess claims if only HV faults counted, otherwise manual assessment

## COMPANY 4

- The systems in place will deliver the accuracy required for the worst served customers, as defined in the DPR III final proposals (i.e. within +/-5%, excluding 1 phase LV events)
- Proposed IT systems will identify customers affected by faults on the HV system upwards and for 3 phase LV faults, if failure of standard is a combination of the above faults then the payment can be assessed

automatically. Manual identification will be required where standard failure includes 1-phase LV faults.

- Dec 99 DPCR proposals recognised that companies were unable to assess failures in all cases and so no requirement for automatic systems was set

#### COMPANY 5

- Phase and feeder section model required to accurately determine the impact of all faults on all customers (>£10m + maintenance costs to achieve)
- Don't feel that the systems required can be justified
- Automatic assessment of HV fault impact, LV faults can not be assessed automatically therefore the system to assess payment claims will be manual
- By April 2002 – The systems will be able to assess 20-30% of claims automatically (HV and above only) assuming that short interruptions are excluded. Even with this system, it is likely that customers will have claimed prior to the system highlighting the need.
- At a level of 5 for the GS HV faults responsible for 60% of customer numbers, while at a level of 8 HV faults are responsible for only 5%

#### COMPANY 7

- Customer database of fault information is required, this will be developed once definition of requirements has been finalised
- Do not envisage a system which will pay customers automatically because this would necessitate a LV phase connectivity model (not cost justified). Do envisage system which could automatically provide MI data for manual assessment

#### COMPANY 8

- Automatic payment implies a phase connectivity model
- At present assessment is manual, by April 2002 the assessment will be automatic (excluding LV faults)
- 95% of claims will be assessed automatically, if post-codes were given with the claim then this could be linked to MPAN and then to fault information

#### COMPANY 9

- Accuracy for IIP is not appropriate for MI standards.
- It is not cost effective to introduce automatic payments for MI

#### COMPANY 10

- The OS standard will be met using the accuracy required for IIP, the GS would need to rely on accurate connectivity information
- Current IT systems are not capable of tracking MI against customers, until the trouble-call system is implemented, claims will be manually assessed
- Even with the trouble-call system implemented (2003+), only part of the assessment of claims can be done automatically, manual intervention will still be needed (LV 1 phase faults)

## COMPANY 11

- OS standard can be met with accuracy required under IIP,
- LV phase information is unreliable although it can be collected by the system; the collection of this information is prohibitively high and as such is not justified for the potential customer benefit.
- Automatic assessment for GS will require more accurate model so the assessment will be partially manual
- Only EHV and HV outages could be assessed automatically, no LV connectivity model or control system means the system to assess LV will be manual

## COMPANY 13

- The accuracy of the connectivity model will not provide the required accuracy for OS and GS standards
- The data model being implemented, does not include LV phase connectivity (which generates significant multiple interruptions)
- Cost of approximately £3.3m to build and manage an LV connectivity model
- Manual systems will always be required as the LV phase connectivity model will not be available and to defend unjustifiable claims
- It will not be possible to automatically assess claims as there is no LV connectivity model

**Measurement and Standard Period**

## COMPANY 1

- For simplicity, it is recommended that the regulatory year (From 1 April) for both OS and GS

## COMPANY 2

- Financial year for both standards is easily understood by the customer and aligns with other reporting structures
- Current fault management system will not allow rolling periods for each customer to be tagged and monitored for an automatic payment system

## COMPANY 3

- OS and GS should be in line with current reporting structures April – March

## COMPANY 4

- Financial year for both OS and GS to align with other OS and GS and to keep the winter months together (when highest no of faults occur)

## COMPANY 5

- Financial year for both OS and GS to align with other Standards and to keep periods of adverse weather within 1 reporting period

## COMPANY 7

- OS and GS reporting year should be financial to align with other regulatory requirements.

#### COMPANY 8

- OS and GS should be in line with the IIP data collection periods

#### COMPANY 9

- OS and GS should be financial year

#### COMPANY 10

- OS and GS financial year, a fixed period is necessary rather than rolling years for the GS as systems will need to cope with millions of start dates

#### COMPANY 11

- Rolling year to difficult for customers to understand, Fiscal year (April – March) would be appropriate for OS and GS in line with other regulatory reporting structures

#### COMPANY 13

- Essential to keep all GOSP reporting in step, it will be unreasonable to manage a rolling year for each customer

### **Customer Payment**

#### COMPANY 1

- Not convinced that GS is an appropriate tool for MI however the simplest would be payments immediately having assessed the claim
- As MI standards are focusing on inconvenience not hardship, payment should be lower than GS 2 at around £20
- Customers should write in detailing the events or fill in a standard form following a telephone call to the company
- Time-scales should be in line with existing payment policies (within 1 month of failure) and with the detail required to verify the response any payments should be made within an extended period (1 month)

#### COMPANY 2

- Payments should be made as soon as is practically possible after failure
- Simplicity is required for the benefit of the customers, £50 believed to be a suitable amount for the first failure, with a stepping down of the level of payment for subsequent failures (similar to the 18 hour GS)
- Any form of contact for a claim would be acceptable, however where the case were not directly provable through the system a mutually acceptable arrangement would be negotiated.

#### COMPANY 3

- Customers should apply in writing (with details of outages), with only one claim payable per reporting year
- Payments should be no more than £20 per customer

## COMPANY 4

- Initially failures under this standard should be claimed by customers
- Level of payment should be aligned with UoS charges, may be appropriate to set the payment at a percentage of the UoS e.g. 50%
- Customers should make claims against this standard through their supplier, in line with the supplier hub agreement

## COMPANY 5

- Standards implementation should be delayed to next DPC period to allow data to be collected and understood
- Payments should be made following submission of a customer claim to their supplier (who should then forward all relevant details), and should only be once per year at around £20

## COMPANY 7

- GS payments should only occur following a customer claim (to supplier) and verification (balance of probabilities) Have to use balance of probability as the no of interruptions from the LV system will be unknown
- The payment should be around £20 for GS period of financial year and definition of no more than 5 interruptions greater than 3 hours duration. If the definition included all interruptions then a much lower GS payment would be applicable
- If definition is excluding short interruptions and re-interruptions, target level at 5, financial reporting period and £20 payment – Payment would be in order of £1m

## COMPANY 8

- Automated MI procedure will link faults to MPAN numbers not names (data access restrictions) to make automatic payments
- Telephone claim to the call centre

## COMPANY 9

- Claims should be made on nth interruption, and again after n further interruptions within a calendar year, in writing or by telephone to the distribution call centre
- Payments should be around £20 for claims made within a reasonable time

## COMPANY 10

- If the definition is interruptions greater than 3 hours (Failures would be in order or 100 per year) then payments should be made immediately on a claim (to the supplier), one payment per year is appropriate
- A payment of £20 is appropriate and returning a large proportion of DuoS charges, it is not appropriate to have a regime where customers are compensated to more than this
- Customers should claim giving dates and times they lost supply, these could then be validated from the records and payment arranged, if the

numbers of claims is kept to a reasonable number (~100) then interpretation of approximate times and dates could be undertaken

#### COMPANY 11

- Payments should be made at the end of the fiscal year, £20 would seem appropriate once per year. £50 is equivalent to a year's distribution payment for a customer, as there is no opportunity for the distributor to avoid this penalty, £50 is too high
- Customers will need to be aware of the GS framework, a written claim to their supplier within 28 days of failure is appropriate

#### COMPANY 13

- No sound historical data to make a professional judgement on the issues of multiple interruption standards, and as a result payments should not be implemented until robust data and experience is obtained
- Only one payment should be made per qualifying period and the payment should be no more than GS2 i.e. no more than £20
- Customers should put claim in writing, via their supplier, confirming dates and times of interruptions or via telephone and a form, within 1 month of qualification
- Should be noted that the mechanism will be complex if there are large numbers of claims

### Performance data

#### COMPANY 1

- Data 7/00 – 6/01(6/01 based on static HV model so not 100% accurate)
  - Includes short interruptions(primary reclosers where remote indication available, estimates for non remote controlled reclosers based on annual counter readings), excludes pre-arranged, includes re-interruptions (where required)
- A) 10 – 2.8%, 15 – 1.8%, 20 – 1.4%  
 B) 3 – 7%, 5 – 2.5%, 7 – 0.8%, 10 – 0.3%, 15 – 0.1%  
 C) 5 – 8%, 10 – 2.6%, 15 – 1.7%  
 D) 5 – 7.2%, 10 – 2.6%, 15 – 1.6%  
 E) 2 – 13.3%, 4 – 3.6%, 6 – 1.2%  
 F) 3 – 0.3%, 5 – 0.05%, 7 – 0.01%

#### COMPANY 2

- 97/98 figures for a), short term interruptions (<1 min) exclude downstream devices – Highest figure recorded was 32 interruptions
  - 00/01 figures for b) long term interruptions (>1 min)
  - re-interruptions excluded, pre-arranged interruptions and interruptions due to service faults
  - 7 years historic data, but time-scales to formulate enquiries for data did not permit completion of the figures for the response – High confidence in figures provided
- a) 10 – 1.3%, 15 – 0.46%, 20 – 0.12%  
 b) 3 – 3.83%, 5 – 0.94%, 7 – 0.19%

## COMPANY 3

- Excludes pre-arranged, 11kV estimation only under estimation of total, low confidence in figures provided
- a) 10 – 0.71%, 15 – 0.1%, 20 – 0%
- b) 3 – 2%, 5 – 0.16%, 7 – 0.01%
- d) 5 – 2.39%, 10 – 0.13%, 15 – 0%
- e) 2 – 7.93%, 4 – 0.51%, 6 – 0.03%
- f) 1 – 2.63%, 2 – 0.27%, 3 – 0.04%

## COMPANY 4

- Unable to provide accurate information on the number of customers affected by short interruptions as the system was only implemented in April 2001
- 00/01 (Ofgem year) data from fault management system – HV network interruptions only
- Confidence in figures low, no pre-arranged interruptions, no faults on 33kV, 132kV or other networks
- b) Data being gathered
- e) 2 – 6.2%, 4 – 1.9%, 6 – 0.6%

## COMPANY 5

- No information on short interruptions, based on analysis of HV and above records and best interpretation of impact of LV incidents (low to medium confidence)
- b) 3 - 3.5%, 5 – 0.8%, 7-0.2%
- c) 5 – 0.6%, 10 – 0.02%, 15 – <0.01%
- e) 2 – 6.5%, 4 – 1.1%, 6 - 0.2% (HV and above only)
- f) 2 – 8%, 4 – 1.5%, 6 - 0.4% (e with LV included)

## COMPANY 6

- No information on short interruptions, based on analysis of HV and above records and best interpretation of impact of LV incidents (low to medium confidence)
- b) 3 – 2.7%, 5 – 0.8%, 7-0.15%
- c) 5 – 0.6%, 10 – 0.01%, 15 – <0.01%
- e) 2 – 4.3%, 4 – 0.8%, 6 - 0.2% (HV and above only)
- f) 2 – 5%, 4 – 1.3%, 6 - 0.4% (e with LV included)

## COMPANY 7

- Information already available - Excluding pre-arranged, short interruptions, re-interruptions, interruptions on other systems and LV network incidents
- c) 3 – 18.5%, 5 – 6.08%, 7 – 1.91%, 8 – 1.05%

## COMPANY 8

- short and long interruptions can not be amalgamated, 11kV figures only plus estimated 0.5% increase due to 33kV faults, absence of LV faults is not thought to have a significant effect due to the numbers of customers involved for each incident
  - can not identify whether faults on the same circuit affected the same customers (at present), low confidence in figures provided
- b) 3 – 3.45%, 5 – 0.9%, 7 – 0.25%
- a) 5 – 0.83/1.3%, 10 – 0.01/0.02%, 15 – 0/0%

## COMPANY 9

- Excludes short interruptions, pre-arranged interruptions, medium confidence in figures provided
- b) and c) 5 – 1.1%, 7 - 0.1%, 10 – 0.01%, 15 – 0.001%
- d) and e) 4 – 1.5%, 5 – 1.1%, 6 – 0.7%, 10 – 0.01%, 15 – 0.001%

## COMPANY 10

- No data systems to evaluate Multiple interruptions
- Estimations that 8000 customers will have more than 5 interruptions per year(greater than 3 min), 2500 having more than 7 caused by HV system (No means of aggregating 132, 33kV and 11kV information)
- Estimated that <400 customers would be affected by a standard of more than 5 interruptions longer than 3 hours

## COMPANY 11

- Data not available in the format specified
- Data excluding short interruptions, pre-arranged and 132kV interruptions (Moderate confidence – LV only included at LV feeders)
  - 10.8% of customers >3 interruptions
  - 3.1% of customers >5 interruptions
  - 1.6% of customers >6 interruptions
  - 0.9% of customers >7 interruptions
  - 0.5% of customers >8 interruptions
  - 0.21% of customers >10 interruptions

## COMPANY 12

- Excludes pre-arranged, EHV faults, all cable faults
- b) 3 – 4%, 5 – 1.2%, 7 – 0.5%
- e) 2 – 8.9%, 4 – 2.1%, 6 – 0.6%

## COMPANY 13

- Excludes pre-arranged, EHV faults, all cable faults
- b) 3 – 1.8%, 5 – 0.4%, 7 – 0.05%
- e) 2 – 4.2%, 4 – 0.6%, 6 – 0.1%

## Main Points from covering letters

### COMPANY 1

- Customers find multiple sustained outages inconvenient and the framework requires GS to be set at a level only exceeded in exceptional circumstances
- With customer research indications and framework requirements the GS should be based £20 for five non pre-arranged interruptions exceeding 3 hours

### COMPANY 4

- The GS should be in line with Electricity Act requirements, i.e. only failed in exceptional circumstances
- Different definitions for the OS and GS, OS all interruptions greater than 3 minutes, GS days on which interruptions greater than 3 minutes occurred (removing re-interruptions in line with IIP)
- Automatic reporting can not be achieved without phase information, during DPCR recognised difficulties in obtaining this information
- Inclusion of short interruptions would conflict with IIP incentives for automation
- NGC system and embedded generation faults which cause interruption should be excluded in addition to pre-arranged interruptions

### COMPANY 8

- GS should be set at achievable level, 7 would be more realistic but still demanding (10,000 customers would qualify for payment)
- Definition of an interruption same as IIP
- Due to uncertainty of historic data, the 1<sup>st</sup> year of implementation should be used to track outputs with realistic targets being set for the following years

### COMPANY 9

- Manual investigation of MI will always be required as LV phase connectivity models are not available
- Definition of an interruption should be greater than 3 min excluding pre-arranged, re-interruptions and events beyond management's reasonable control (in line with other GS)

### COMPANY 10

- Accept the intention to implement OS standard, implementation of GS standard is inappropriate due to the practicalities of implementation
- No historical data and would be uncomfortable with targets that we had no confidence in achieving
- Electricity act states that a GS failure should only occur under exceptional circumstances, if the standard is set too low then some customers will fail every year

- Reasoning for definition of interruptions greater than 3 hours to :

- Reduced failures to a level consistent with Electricity act; Enables a cost effective manual process for assessment of claims due to reduced number of failures; Consistent with P2/5 design standard; Bears on point where interruption becomes a serious issue for customers rather than an irritation
- GS standard should be designed for customers to claim when they believe payments are due, no economic justification for phase connectivity model which would be needed for automatic assessment and payments

#### COMPANY 11

- Any standards implemented should be consistent with existing standards for ease of understanding by customers and for reporting, both in terms of definitions and exclusions. Therefore short interruption interruptions should be excluded
- No accurate historical data to inform on standards setting. Existing data will be based upon old definitions and companies are only required to develop connectivity models for April 2002
- Customers must claim if LV incidents are to be included in the standards (as LV 1 phase faults are not measured)
- The implementation of any guaranteed standard should be considered as part of the next review and investment is needed to avoid penalties

#### COMPANY 13

- There is little robust information nationally regarding multiple interruptions, until such time that there is a GS should not be set
- The threshold of any future GS must be competently set such that failures are exceptional, a balance between the level and the number of failures must be understood
- It is unlikely there will be a sound economic basis to develop a dynamic customer to LV network connectivity model
- Land topology is a driver of network design, which is related closely to multiple interruption performance