

## **Appendix E London Power Networks (LPN)**

### **5.1 Summary**

London Power Networks (LPN) holds the electricity distribution licence for the London area. LPN has contracted with 24seven to carry out services including the operation and maintenance of the networks under LPN's distribution licence. 24seven is therefore responsible for providing the information to LPN that is then reported to Ofgem. A full time IIP team currently exists, although in time this will be incorporated into their ongoing operations.

LPN/24seven have been very pro-active in meeting IIP requirements. They have given the IIP a high level of priority and have committed a high level of resources to become IIP compliant. In general, IIP is perceived by LPN/24seven as an opportunity for business improvement.

LPN/24seven have a systematic and thorough programme of training to broaden IIP understanding. Internal audit programs are carried out regularly to ensure IIP compliance. Staffs at all levels receive thorough training. Comprehensive IIP documentation is available to all members of staff explaining the processes for reporting.

A significant part of the variance between audited and reported Customer Interruptions (CI) and Customer Minutes Lost (CML) could be explained by the introduction of a more accurate connectivity model to the LV feeder between the faults occurring and the date of the audit. Other relatively minor variances encountered at HV and LV resulted from: network configuration changes and inaccuracy of reporting (additional restoration stages, restoration stages incorrectly recorded as re-interruptions, missed restoration stages and incident start times taken from the moment the restoration work started rather than the time of first becoming aware of the incident). Overall there were no major problems in recording incident start times.

There is a risk of transcription errors during the transfer of information from field staff to control staff and also when inputting data into the Fault Reporting System (FRS) and the Ofgem template. Field operatives do not always record the information correctly. This is potentially a source of error. Incorrect reading of the incident logs and incorrect description of the incidents were found to be the major source of errors under the old fault reporting system.

The new connectivity model has removed a number of uncertainties and inaccuracies in relation to the previous algorithmic approach. Some connectivity errors were witnessed during the audit. However, the model is continuously being updated, which should result in improving accuracy. The audit team did not have any reasons to disagree with the estimated accuracy figures.

### **5.2 Introduction**

London Power Networks (LPN) and EPN are both owned by the LE Group and operate with a combined management structure across the two companies. LPN holds the electricity distribution license for the London area.

LPN has contracted with 24seven to provide services including the operation and maintenance of the networks under LPN's distribution licence. 24seven is therefore responsible for providing the information to LPN that is then reported to Ofgem. Main IIP duties fall under 24seven's Commercial

Division, Electricity Division and Customer Connections office who are responsible for gathering, processing and making available the required information.

The Electricity Division is in charge of day-to-day network operation carrying out real-time management of the EHV, HV and LV distribution systems. The Commercial Division is responsible for strategic asset management including development of the networks. The Customer Connections office is responsible for supporting new service connections and disconnections.

To accomplish compliance with IIP a project team (called Project Lynx) was established within 24seven dedicated to delivering an end-to-end IT solution for IIP across both LPN and EPN. The aim was to provide a consistent reporting format from integrated systems coupled with a full network connectivity model, which associates customers to LV feeder ways. The final solution is the Network Management System (NMS) which is a fully integrated control and fault management product. This incorporates the Energy Network Management and Control (ENMAC) system, trouble call logging and customer information, fault dispatch and management and real time information and reports. This system enables IIP compliance. The NMS has been fully functional since 01 April 2002, although it was run in parallel with the old system from the middle of February 2002.

No-supply calls and other network related calls are dealt with by 24seven's Call Centre, with an overspill facility provided by Hays. The Telephony Incident Management System (TIMS) has been identified as the most effective call management system for 24seven. The new TIMS solution is automated and driven by incidents within the Trouble Call System (TCS).

BT Networks answers customers' calls within 3 seconds. BT Networks is able to automatically detect whether the customer is in a fault-affected area based on the call-line identification (CLI) of the customer's phone number. The system can also deal with calls received from mobile phones, and determine whether these are from a customer in a fault affected area. If the customer is affected by a fault then the customer is given advice on fault restoration, which is held within the Network Management System (NMS). This is done via updated recorded messages on fault restoration. The callers are also given the phone number to reach a call agent directly. Callers that are not affected by a fault are directly routed to the call agent.

Messages played to customers are recorded in TIMS by Control Room staff using the CallTouch system and NMS details. The CallTouch System is used to convert faults on the network to a view by geographic area, while NMS provides information about the fault-affected areas. Control Engineers and Dispatch Staff set up the messages in TIMS and Call Centre agents use information available in TIMS to manage customer calls and provide the most up to date feedback on restoration.

### **5.3 Audit Process**

This section describes the audit.

#### **5.3.1 Resources**

The audit was carried out between 08 July and 12 July 2002, based entirely at the 24seven's offices in Ipswich.

The visiting auditors were:

- David Hoyle of British Power International

- Sergio Gonzalez of Mott MacDonald.

In addition, LPN and 24seven provided a high level of resources to support the audit.

### 5.3.2 Induction

A comprehensive introduction to the company systems was provided. The opening presentation was complemented with a large amount of training material used by 24seven to instruct its staff to ensure they comply with the RIGs.

The presentation included an introduction to the 24seven and LPN/EPN team followed by a briefing on the following topics:

- overview of 24seven's approach to IIP
- overview of Control Centre
- overview of 24seven IT systems & structure
- connectivity accuracy and improvements.

A tour around the premises of the Control Centre and the Call Centre followed the presentation.

During the opening presentation the visiting auditors were briefed on how the connectivity model operates and how primary traded MPANs are identified, introduced, modified and updated. This included capturing new MPANs. The process starts with an extraction of the number of customers originally stored in the Meter Point Registration System (MPRS), which is then routed to PANTHER a repository database containing data relating to MPANs and customer connectivity.

Customers are inputted into a table and are arranged together with their Line Loss Factor Code (LLFC) and their current status, i.e. whether they are currently energised or de-energised. Subsequently, a look-up function is used to identify and separate primary MPANs from secondary MPANs. Automatic overnight updates from MPRS to PANTHER reconcile information on transfers, connections, disconnections, and address details from the previous day transactions within MPRS. An exception report is produced.

Documentation on the PANTHER system was made available to the audit team.

The original way of counting customers in place during 2001/02, was based on 156 customers per distribution transformer. The new model was introduced in February 2002, although it was not used to record CI or CML for 2001/2. Despite the audit of incidents looking at figures produced by the old connectivity model, the audit assessed accuracy using the latest and most accurate model.

Geo-spatial disposition of MPANs in the new connectivity model is carried out through an algorithm that links customers to the nearest cable without manual intervention. This is carried out through the association tool, STRUMAP. The model is updated within the 14 day guideline within the RIGs. The connectivity model is also used to determine the LV feeder number and the connecting transformer.

The integrated IT system (NMS) provides information on real time data, network performance, customer history and real time customer information. The Drawing Office completes updates of network changes, field diagrams and corresponding screen geo-spatial display.

The presentation also included a description of the internal training undertaken to ensure that

managers and staff comply with IIP. The visiting auditors corroborated that LPN/24seven have given IIP a high level of commitment. The training package information provided to the auditors contains handouts of presentation slides, IIP posters, briefing newsletters, a booklet produced by 24seven describing new fault reporting rules and a quick guide to the asset management system - Mincom Information Management System (MIMS).

### **5.3.3 Questionnaires**

Four questionnaires were used to support the audit process. The questionnaires aimed at measuring progress made by LPN/24seven since the interim review in the following areas:

- MPANs: checking the company's progress in correctly counting MPANs
- Connectivity model: checking the company's progress in accurately locating MPANs on its network
- RIG definitions: checking the company's interpretation of the Ofgem guidelines
- Template: checking the company's routines for providing Ofgem with the information it requires.

The completed questionnaires were agreed with the DNO and copies were left before conclusion of the audit. The visiting auditors have concluded that LPN/24seven management is committed to implementing IIP and supporting the business through it. LPN/24seven have produced a rigorous and precise system to comply with Ofgem's requirements.

## **5.4 Accuracy of Measurement Systems and Reporting Process**

### **5.4.1 Stage 1 of the Audit Framework – Accuracy of the Measurement Systems**

#### **(i) MPANs**

LPN/24seven have identified primary traded MPANs using their unique Line Loss Factor Code (LLFC) and status (energised or de-energised). The company has also used the LLFC coding to identify any multiple MPANs. Only those MPANs identified in the RIGs (e.g. unmetered supplies and export) have been excluded from the process. The methodology outlined to the audit team was the same as the one formally agreed by Ofgem.

The systems currently being used have been updated since the Interim Review. These systems are extremely well documented and are supported by a commitment to training and internal audit. The audit team concluded that these systems were robust, and there was no evidence to conclude that the level of accuracy of the count was different to the company's estimate of approximately 100%. Any potential sources of error were agreed to be small and were largely the result of a reliance on external systems for data.

The random sample of five addresses was taken and the process for allocating MPANs was demonstrated. In each of the cases the MPAN was correctly assigned.

#### **(ii) Connectivity Model**

The audit of the connectivity model based on the questionnaire was carried out by one of the visiting auditors supported by a member of the 24seven team. This process took approximately half a day,

LPN has now implemented a fully integrated model with full documentation. This model uses a geo-spatial algorithm to link customers to the nearest LV feeder without manual intervention. The association tool 'STRUMAP', is integrated into the Network Management System and assigns new MPANs to the model as they are processed onto the system.

The original specification of the model was reviewed by the audit team, as well as the Change Documentation. The new model has reduced the number of uncertainties that were apparent with the old approach

At present 0.79% of MPANs are not allocated to the model due to a deficiency in the postcode/address data on which the system relies. Proactive action to reduce the numbers involved is occurring.

LPN has included a model for calculating accuracy within its connectivity model. For each MPAN an accuracy level is assigned depending on the configuration of the network in a tightly defined radius of the premise. These accuracy levels were believed to be conservative at this stage and are likely to be reviewed as the system develops. This model predicts a level of accuracy of 93.45% at LV feeder level and 98.03% at distribution transformer level.

On undertaking the audit of incidents a very small number of instances were identified of customers being assigned to the incorrect feeder, apparently caused by unaccountable error with the association tool. Any occurrences that were spotted were immediately corrected, although the numbers were agreed to be immaterial.

The company is very confident of the above predictions of accuracy. Potential sources of error were discussed and agreed to be small. These are areas also under constant review.

The accuracy of the HV connectivity model had not been estimated by LPN at the time of the audit but was believed to be higher than accuracy at the transformer level.

### **(iii) Stage 1 Conclusions**

No deviations from LPN's method of identifying customers by primary traded MPAN, as approved by Ofgem, were found during the audit visit.

No inconsistencies have been found in the auditing of LPN's MPAN processes and it can therefore be concluded that the company's estimation of approximately 100% for the accuracy of its MPAN count is correct.

Only minor inconsistencies were found during the audit of the LPN's connectivity model and it can therefore be concluded that the company's estimation of approximately 93.45% at feeder level and 98.03% at transformer level are correct.

LPN is addressing all areas of inconsistency identified by the audit. We can therefore conclude that LPN has inherently accurate measurement systems in place.

### **5.4.2 Stage 3 of the Audit Framework – Accuracy of the Reporting Process**

### **(i) Audit of HV Incidents**

A sample of 10 HV incidents was audited at LPN/24seven. The HV incidents could not be simulated because the connectivity model currently does not incorporate fault simulation capabilities. Instead, printed diagrams were made available and used to scrutinise the reported fault.

LPN had prepared the switching logs and incident logs for each incident in advance of the visit. The visiting auditors cross-checked the customer numbers and times reported on the Fault Reporting System (FRS) with the figures reproduced by looking at this documentation.

It was not possible to manually count the customers connected to the affected part of the network given the large numbers involved. However, using the printed diagrams and the information contained within the logs discussed above it was possible to establish which parts of the network had been affected by a given incident. The new connectivity model was then used to provide the count of customers affected by looking at the number of customers associated with each distribution transformer affected by the incident.

The auditing workbook was populated with the information provided from the switching logs and incident logs. Despite the small number of incidents reviewed the auditors found out that a few restoration stages were incorrectly reported.

For some incidents additional restoration stages had been entered in error, whilst for another incident two restoration stages were reported as one. For one incident, a restoration stage had been incorrectly recorded as a re-interruption. Although the aggregate variance of CI was comparatively small the corresponding CML showed a larger variance.

Some of the variance between reported customer numbers and numbers shown on the connectivity model could be attributed to changes in the network between the time of the incident and the time of the audit being undertaken. There were, however, a small number of incidents that had reporting errors.

The reporting of incident start times and restoration times was more accurate than customer numbers with only a few minor transcription errors being discovered.

The audit of HV incidents did not identify any incidents too complex to assess. The information had been methodically recorded to the degree that the auditing team was able to distinguish unnecessary restoration stages, some of which were accounted for as re-interruptions.

Overall the visiting auditors concluded that variances in CI and CML stemmed mainly from:

- the old methodology for calculating customers (i.e. the 'averaging' method using distribution transformer capacities)
- changes in the network between the occurrence of the incident and the time of the audit
- inaccuracy of reporting – including general transcription errors and misinterpretation of notes.

There is a risk of introducing transcription errors during transfer of information from switching logs and incidents logs to MIMS, ENMAC and NaFIRS.

### **(ii) Audit of LV Incidents**

A sample of 103 LV incidents was examined. Most of the incidents had only one or two restoration stages, although one had four.

Faults where only part of an LV feeder was affected were a source of inaccuracy as the company relied on estimates of customers numbers by the field engineers. Reporting of time proved to be very accurate. The start times for all LV incidents were when the company first became aware of the incident.

As for the HV incidents some of the incidents had restoration stages missing or additional restoration stages. This was mainly due to incorrect reading of the incident logs or incorrect description of the incidents. In addition, a small number of incidents should have been separated into two incidents.

In the process of auditing the incidents a few customers in the connectivity model were found to have been attached to the wrong distribution transformer, distant from the customer's address. In a couple of incidents the connectivity model was unable to pick up any customers. This proves that the connectivity model can still be improved. The auditors witnessed the correction of some incorrect associations, demonstrating that the model is being updated.

### **(iii) Interpretation and implementation of the definitions and guidance from the RIGs**

LPN has devoted a significant amount of resources to produce systems and implement training programmes to ensure that all appropriate staff have a thorough understanding of the RIGs. The RIGs have been embedded into the 24seven Fault Reporting System, and comprehensive documentation has been provided to all appropriate staff. The audit team reviewed the methodologies and systems used in recording start and completion of an incident, short interruptions, and restoration stages. Differences between HV and LV systems were investigated.

The audit concludes that there is a high level of confidence that LPN has correctly incorporated the RIG definitions into its systems.

Despite a significant change to the systems in place during the course of the year the processes remain largely unchanged. These are now supported by an increase in internal auditing and additional training.

### **(iv) Stage 3 Conclusions**

The following general conclusions can be drawn from the HV incident auditing:

- Measurement of time is largely automatic on the HV system, and therefore the chance of error is low. However, manual intervention and interpretation of notes relating to the incident have caused the errors found.
- The system did not facilitate a definite answer to queries raised on several incidents and, in these instances, differences were attributed to input error.

The following general conclusions can be drawn from the LV incident auditing:

- Manual intervention is a major source of inaccuracy - this will be addressed by improvements to training programmes that are currently being introduced.

- The improvement in systems during the year, supported by extensive documentation, and internal audit should combine to improve accuracy.

Overall the visiting auditors concluded that:

- There were no problems in recording incident start time.
- Field operatives do not always record the information correctly. This is potentially a source of error.
- The connectivity model provides a more accurate number of CI and CML than the averaging method.
- The connectivity model is still at a learning stage. LPN is continuing to improve the accuracy of the model.
- Incorrect reading of the incident logs and incorrect description of the incidents were found to be the major source of errors.

## 5.5 Overall Impressions

LPN has been very pro-active in meeting IIP requirements. Staff at all levels receive thorough training. Comprehensive IIP documentation is available to all members of staff explaining the processes for reporting.

LPN/24seven have given IIP a high level of priority and have committed a high level of resources to become IIP compliant. LPN/24seven have a systematic and thorough programme of training to broaden IIP understanding. Internal audit programmes are carried out regularly to ensure IIP compliance.

The variances in CI and CML were mainly due to changes in the process of counting customers, input errors, and changes to networks configuration. The visiting auditors are confident of the levels of accuracy predicted for the connectivity model. Improvements to this were demonstrated and are ongoing.

## 5.6 Conclusions

Table E-1 presents the results of the 2002 audit of the LPN London licence area in line with the auditing framework. Under- and over-reporting are indicated in the table. The overall accuracy results have been determined by extrapolating the audit sample variances to estimated variances in the annual total figures reported to Ofgem and then summing the LV and HV estimated variances to give an estimated overall variance, which is then used to determine accuracy against overall reported figures.

**Table E-1**

Stage	Item	Accuracy
Stage 1	MPAN Measurement	Approx 100%
Stage 1	LV Connectivity Model at Feeder Level	93.45%
Stage 1	LV Connectivity Model at transformer level	98.03%

Stage 1	HV Connectivity Model at HV level	Not been estimated at the time of audit. Considered higher than LV values.
Stage 3	LV Incident Reporting Accuracy – CI	70% (under)
Stage 3	LV Incident Reporting Accuracy – CML	76% (under)
Stage 3	HV Incident Reporting Accuracy – CI	74% (under)
Stage 3	HV Incident Reporting Accuracy – CML	94% (under)
Stage 3	Overall Incident Reporting Accuracy – CI	73% (under)
Stage 3	Overall Incident Reporting Accuracy – CML	83% (under)

The figures shown in Stage 1 above for the connectivity model relate to the ‘new’ model that is currently in operation.

It should be noted that percentage accuracy figures are based on a comparison between figures reported using the ‘old’ connectivity model and those generated by the ‘new’ model. Hence the above figures for incident reporting accuracy include the change in system numbers arising from the introduction of the new connectivity model.

### 5.7 Reporting to Ofgem’s information Template

LPN completes the Ofgem template manually. This introduces the potential for error in terms of correctly transcribing the incident information from the reports generated by FRS, into the template.

The audit checked to see whether the figures derived from the FRS reports had been correctly transcribed into the template. The FRS reports were also rerun to ensure the figures obtained were consistent with those reported.

The following key findings were made:

- The number of HV circuits reported in FRS is different to the figure reported to Ofgem due to the recording of all faults within FRS. This figure includes incidents where no customers were affected and short interruptions, neither of which is reported to Ofgem.
- Minor transcription errors were discovered.
- Calculations appear to have been performed correctly.

### 5.8 Recommendations

The auditors have identified the following points for further improvement:

- Seek ways of reducing errors in the transfer of information from logs to the FRS.
- Make sure staff correctly input the incident records, in the precise chronological order, and explain all the restoration stages.
- Make sure staff precisely discriminate between a restoration stage, a re-interruption, and incidents that should be recorded separately.
- It may help the audit trail if a comment could be added when compiling the fault reports so that the method of estimating the numbers of customers interrupted could be established.

## 5.9 Learning Points

The audit team has identified the following as learning points for the audit process:

- It will be beneficial if distribution companies populate the auditing documentation prior to the arrival of the visiting auditors. Having all questionnaires, incident worksheets and any other additional auditing material populated allows the audit to progress quickly.
- Having copies of incident reports printed out and working in parallel results in a more effective audit.
- The duration of the restoration stages may be prolonged by the customers' needs or requests. There should be a way of including this in the fault reports.
- Some restoration stages are difficult to replicate or analyse. It is helpful to have reserve incidents.
- The team approach of the audit and flexibility put into practice enabled a more thorough and detailed audit.