Information and Incentives Project

Review of Proposals for Rebasing of Targets – SPN

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1 Summary

Ofgem has appointed the Consortium of Mott MacDonald and British Power International to provide an audit opinion on the re-basing of IIP targets for those electricity distribution companies that have a re-opener clause in their licences. Where a detailed statistical approach has been used in the rebasing submissions, ERA Technology has been called upon to offer technical advice.

SPN is one such electricity distribution company and the present report provides a final audit opinion on the submission that SPN has lodged with Ofgem in support of its claim for the re-basing of its IIP targets.

The Consortium is of the opinion that, for incidents at the higher voltages[1], SPN has adopted a sound approach to the direct comparison between the old and new measurement systems.

The Consortium concludes that Ofgem can have confidence in using SPN's submitted figures as the basis for calculating the re-basing of SPN's IIP targets at the higher voltage levels.

At the LV level, SPN does not have databases that provide for comparison between incidents reported via its old and new measurement systems. The company has calculated the adjustments to its IIP targets at the LV level using the results of the IIP audit carried-out by the Consortium during 2002. The Consortium considers this to be a reasonable approach but recommends that the approach used in the main audit report for extrapolating the audit results be used for the LV rebasing calculations.

The company contends that the rebasing of its targets, at all voltages, should use a value greater than the estimated mean value of the difference between the two measurement systems, and has proposed the upper 95% confidence limit value. It contends that the use of the estimated mean increases its net downside risk because of the asymmetrical nature of IIP penalties and rewards. A full explanation of SPN's argument is given in section 3.3.1.

The Consortium cannot support this part of SPN's claim and is of the opinion that the mean value should be adopted as the basis for the re-basing of SPN's targets.

[1] Where 'higher voltage' indicates HV and above

2 Introduction

As part of the final proposals for the IIP incentive scheme, Ofgem made a number of revisions to companies' 2004/5 targets for the number and duration of interruptions to supply to take into account the effects of:

- changes to definitions that were introduced in February 2001 to improve the consistency of reporting; and
- changes in measurement systems that companies had made, or were introducing, to improve the accuracy of their reporting.

Ofgem has advised the Consortium of Mott MacDonald, British Power International and ERA Technology that there is still uncertainty over the impact of the changes that have been made to the measurement systems of several companies. Ofgem has appointed the Consortium to assess this aspect of these changes within specified companies. The distribution licences of these companies provide for each of the companies re-opening discussions with Ofgem if it considers that the introduction of the new measurement systems mean that its existing targets are inappropriate.

SPN, the company that holds the electricity distribution licence for operating the distribution network in the 'South Eastern' area, is one of the companies with this re-opener clause in its licence.

This report provides a review of the submission that SPN has made to Ofgem in support of its request for the re-basing of its IIP targets.

3 Audit Process

This section illustrates the audit process.

3.1 Resources

Representatives of the Consortium were present at an initial meeting held on 31 October 2002 when SPN presented its submission to Ofgem.

The significant changes that the company has experienced concern both the number of customers affected by an incident and the duration of interruptions. SPN has concluded that this was due to the consistent application of the newly introduced measurement systems.

It was agreed that a meeting would be held at SPN's offices, to explore and audit the methodology used by the company to gather the evidence that is contained in its submission. This meeting was held at SPN's offices in Haywards Heath on 21 November 2002.

The visiting auditors were:

- Geoff Stott of British Power International
- Blair Walter of Mott MacDonald.

Chris Watts and James Hope from Ofgem's IIP and Quality of Supply team were present throughout the visit.

SPN submitted further evidence under cover of its e'mail of 06 January 2003 and this was discussed at a follow-up meeting held at 24seven's offices in Ipswich on 21 January 2003.

The visiting auditors were:

- Geoff Stott of British Power International
- Blair Walter of Mott MacDonald
- Alan Friday of ERA Technology (via telephone from SPN's offices at Haywards Heath)

Chris Watts and James Hope from Ofgem's Quality of Supply Team were present throughout this follow-up meeting.

3.2 Induction

The visiting auditors had previously visited SPN's control room at East Grinstead in June 2002 and had seen at first hand how the inputs were made to SPN's measurement systems at the higher voltages.

By way of a refresher during the visit to Haywards Heath, the SPN team demonstrated the operation of the company's computer-based information systems. From the information held in these databases it was possible to compare the report of an incident at the higher voltage levels as recorded on the old measurement system to the report of the same incident as recorded on the new measurement systems.

A comprehensive introduction to the company systems had already been given to representatives from the Consortium during the visit to audit the sample of incidents as part of the wider IIP audit work being undertaken during 2002. It is not intended to reproduce that team's findings here.

3.3 Evidence submitted by SPN

3.3.1 General

In order for SPN to understand the reasons for the changes it has experienced in reported performance at the higher voltages, the company undertook a considerable amount of internal auditing and study. At the higher voltages, SPN's new measurement systems had been undergoing trials since June 2001, which provided the opportunity for the company to 'run' its new measurement system alongside its old measurement system. By this means, the company has collated and matched the reports for 1623 separate incidents that affected its higher voltage systems between June 2001 and March 2002. The auditors consider this to be a reasonable sample size for the analysis. SPN has been advised by an external consultant that the difference observed in the sample of higher voltage incidents is not a random occurrence and that it is statistically significant.

An integral part of SPN's new measurement systems is the automation of previously manual processes, including the automatic capture of re-interruptions at the higher voltages. Another feature of the new measurement systems is the introduction of an unlimited number of restoration stages in place of the previous NaFIRS system that limited the number of restoration stages to eight.

SPN's new LV connectivity model was introduced in March 2002 and the company was therefore not able to 'run' its old and new LV measurement systems in parallel as it has done at the higher voltages. However, the 2002 IIP audit compared the CI and CML of a randomly selected sample of 104 LV incidents reported using the old measurement systems against the new LV connectivity model, thus providing an indication of the impact of the new measurement system. The company has used the difference in the sample as determined by the audit to estimate the difference in the entire population of LV incidents associated with the introduction of the new connectivity model. This extrapolation uses the ratio of the number of LV incidents in the audit sample to the number of LV incidents in the entire population to determine the expected difference in the entire population of LV incidents. However, the methodology used to extrapolate the results of the main 2002 IIP audits was based on the ratio of CI and CML rather than the number of incidents which gives different results as discussed further in Section 4.

In its submission, SPN has included a statistical analysis to determine 95% confidence limits using the "Central Limit Theorem". The company contends that the rebasing of its targets, at all voltages, should use a value greater than the estimate of the mean difference between the two measurement systems, and has proposed the use of the upper 95% confidence limit.

SPN's rationale is that if the estimated adjustment is less than the actual adjustment, then the targets will be set too low and hence will be harder to achieve. It accepts that if the estimated adjustment is greater than the actual adjustment, then the targets will be set too high and hence will be easier to achieve. However, because of the asymmetrical nature of the IIP scheme, the increase in downside risk if the estimated adjustment is less than the actual adjustment is significantly greater than the upside benefit if the estimated adjustment is greater than the actual value. Therefore, to offset this net increase in downside risk, SPN proposes that a value greater than the point estimate should be used to rebase targets.

SPN is also claiming that the change to the IIP definition of a customer has resulted in a reduction in the number of its connected customers by the elimination of duplicate MPANs. The number of connected customers forms the denominator in the formulae for reported performance and the company is therefore asserting that an element of the increase in its reported performance, and therefore a part of its claim for the re-basing of its targets, is due to this change in definition.

SPN has used the output from these studies as the evidence in support of its submission to Ofgem under the re-opener clause in its distribution licence.

At the meeting on 21 November 2002, the company tabled an updated version of this evidence for evaluation of methodology and accuracy by the visiting auditors.

SPN submitted further argument for consideration under cover of an e'mail dated 06 January 2003.

3.3.2 Counting of customers affected by incidents on SPN's distribution systems

(i) Measurement systems - capturing re-interruptions at the higher voltage levels

Historically, SPN's method of indicating that a re-interruption had occurred was flawed. The company relied upon the accuracy of manually completed control room logs and the memories of the control engineers to identify and record where customer supplies had been re-interrupted.

The company's IIP-compliant Network Management System overcomes this shortcoming by using an algorithm that automatically identifies re-interruptions against any restoration stage that is properly a re-interruption. Under cover of its e'mail of 06 January 2003, the company has provided evidence to support its claim that this change will affect its reported performance.

(ii) Measurement systems - number of customers affected by an interruption

The company asserted that, historically, the number of customers affected by incidents on its distribution system had been determined by various means:

- use of a connectivity model that had not been properly updated
- the best estimate of field operatives and control engineers
- a manual combination of restoration stages within the overall restriction of eight stages contained in the NaFIRS reporting system.

In support of its assertions, the SPN team referred to the company's old method of producing incident reports by manual data transfer between its network management system and its incident reporting system. The recently introduced automatic data transfer link has now replaced the manual process, thus removing this potential source of error.

(iii) Measurement systems – counting of CML

SPN's old measurement system contained algorithms that summated the number of CI and the number of CML for each incident. These were correctly summated at the incident level, but the subsequent extraction process that input the figures into company reports treated each of the summations as whole integers. Whilst this was accurate for the CI count, it was inaccurate for the CML count.

SPN's new measurement systems do not contain this error. Consequently SPN is claiming that a proportion of its CML target should be re-based due to this change in its measurement systems.

(iv) Measurement systems - connectivity model

SPN's new connectivity model was audited in July 2002 as part of the wider IIP audit work undertaken during 2002, where it was found to be accurate. At that time it was concluded that: "SPN has inherently accurate measurement systems in place".

In its supporting evidence for the submission to Ofgem, SPN has tabulated the 1623 matched incidents on its higher voltage systems, including the numbers of customers generated by the IIP-compliant measurement systems as compared to the number of customers reported under its old measurement systems.

For each of the 1623 matched incidents the company's study also indicates the number of restoration stages reported under each of the measurement systems.

For the LV incidents, the company has provided the spreadsheet used to extrapolate the variance observed in the sample to the estimated variance of the entire data set.

4 Summary of Findings

4.1 Measurement systems - capturing re-interruptions at the higher voltage levels

The visiting auditors tested the company assertions regarding the identification of re-interruptions at the higher voltage levels against the IIP requirements. They agreed that the historic method was flawed and concluded that the more recently introduced measurement systems would give more accurate and consistent results.

During the audit of the matched incidents, the visiting auditors were able to cross check the number of re-interruption stages as recorded on each of the measurement systems. Further scrutiny of the incident reports produced via the company's new measurement system provided corroborating evidence that re-interruptions are now being correctly recorded on the new measurement systems.

The visiting auditors conclude that SPN's new measurement system is accurately identifying re-interruptions at the higher voltage levels.

From scrutiny of the evidence contained in SPN's submission of 06 January 2003 the Consortium concludes that SPN has accurately calculated the correction for this change to its measurement systems.

4.2 Measurement systems - historical methods

The visiting auditors tested the company assertions regarding the historic measurement systems against their personal knowledge of the industry and the findings from IIP audit visits.

The visiting auditors concluded that the reported numbers of customers using these historic methods would produce results that were less accurate than the new systems.

4.3 Comparison of measurement systems at the higher voltage levels - company methodology

A sample of the 1623 matched incidents at the higher voltage levels was audited for approach, methodology and accuracy. Incidents were chosen at random from the submitted tabulation. During this sampling, a cross check was conducted to ensure that the selected incidents were drawn from across the company's geographic area so as to investigate the possibility of any geographic bias having been introduced.

For each incident so chosen, the audit trail back to source data was subjected to close scrutiny and the methodology checked for consistency of application and reasonableness of approach. The number of customers affected, the number of restoration stages and the recording of any re-interruptions were also checked between the two measurement systems.

The audits also checked the count of CML as represented on each of the reporting systems. The checks confirmed that the inaccuracies of the old reporting system had been superseded by the accuracies inherent in the new measurement and reporting systems. Fourteen incidents were audited and, in each case, the results were found to be both consistent and accurate in all respects.

The visiting auditors are satisfied that the comparison of the old and new systems during trialling of the new measurement system between June 2001 and March 2002 could not have been influenced by the people operating the old (then current) measurement system to distort the results.

SPN's tabulated comparison of the matched incidents at the higher voltage levels is therefore judged to be a fair and reasonable representation of the effect of the introduction of the new measurement systems.

The Consortium concludes that SPN's tabulation of the matched sample of incidents at the higher voltage levels can be confidently used as the basis for any re-basing calculation for this element of SPN's claim.

4.4 Comparison of measurement systems at the LV level

SPN's LV connectivity model was introduced in March 2002 and subjected to audit in July 2002 as part of the main 2002 IIP audit, when it was found to be accurate. The 2002 IIP audit recorded the customer numbers indicated by the new connectivity model for each of the audited incidents reported on the old measurement system. A small number of pure reporting errors were highlighted by the audit, however the majority of agreed audit variances were due to introduction of the new connectivity model. The Consortium therefore considers the results of the 2002 LV audit to be a reasonable basis for the analysis of the LV measurement system changes.

SPN has used the ratio of the number of LV incidents in the entire population to the number of LV incidents in the audit sample to extrapolate the audit variance up to expected variance in the overall sample. However this approach is not consistent with the approach used by the Consortium in the main audit report. Using the ratio of number of incidents implies that the same absolute error is expected in each incident regardless of how many customers are affected by the incident. However, the introduction of SPN's new connectivity model has shown the true disposition of customers in relation to LV feeders. This showed that on average considerably more customers are attached to the affected LV feeders than had previously been estimated and the variances observed due to the new connectivity model are therefore a function of the size of the incident and the number of LV feeders affected by those incidents.

It is therefore recommended that the rebasing calculations use the expected variance in the entire LV population from the main audit report, which are based on the ratio of LV CI and LV CML in the audit sample to the entire population of LV CI and CML. Using this approach, the expected variances would be as follows:

- 50,932 for LV CI;
- 14,683,459 for LV CML.

4.5 Statistical analysis contained in SPN's submission

SPN's claim for re-basing includes separate statistical analysis of the variances between incidents reported via its old and new measurement systems.

For all the reasons given in section 3.3.1, this analysis concludes that a 95% confidence limit should be placed upon the results of these observed variances and that the value corresponding to the upper 95% confidence limit rather than the mean estimate should be the value that is used by Ofgem in

calculating the re-based values for SPN's IIP targets at both the LV and the higher voltage levels. If this argument is accepted, it would result in SPN's IIP targets being re-based to a higher level than would be the case if the mean of the variances was used for the re-basing calculation.

Whilst the Consortium can appreciate SPN's wish to incorporate the 95% confidence limit in the calculation for the rebasing of its targets at the LV level, the Consortium does not recommend that this approach be adopted. The Consortium understands that, at the time that the companies accepted Ofgem's IIP targets, the companies also accepted the degree of risk associated with that acceptance, including the fact that the targets were set some years ahead of the 'due date' and that the process for making the adjustments was not fully defined at that stage. Whilst the owners of seven licensed areas requested a re-opener clause in their licences, the owners of the other seven licensed areas chose not to accept that risk.

SPN is the only one of the seven licensed areas with a re-opener clause to request that other than the point estimate should be used as the basis for the re-calculation of its IIP targets. The Consortium is of the opinion that the acceptance of SPN's argument would effectively provide that company with an inappropriate advantage in comparison to the other thirteen licensed areas and the Consortium therefore advises Ofgem to reject this element of SPN's claim.

4.6 Conclusions

The Consortium is of the opinion that SPN has adopted a sound approach to the comparison of incidents between the old and new measurement systems at the higher voltage levels and that the results of the company's tabulation of the matched 1623 incidents can be considered as accurate for the purposes of the rebasing exercise.

The Consortium is of the opinion that SPN has adopted a reasonable approach in the calculation to be applied for the changes in the count of re-interruptions at the higher voltage levels resulting from the introduction of the IIP-compliant measurement systems.

The Consortium is of the opinion that SPN's submission for the rebasing of its IIP targets at the higher voltage levels is an accurate representation of the step changes in reported performance that the company has experienced as a result of the introduction of its IIP-compliant measurement systems.

The Consortium therefore concludes that Ofgem can have confidence in using these figures as the basis for calculating the re-basing of SPN's IIP targets at the higher voltage levels.

At the LV level, the Consortium is of the opinion that it is reasonable to use the results of the 2002 audit of LV incidents as the basis for the rebasing of LV targets. However, the Consortium considers that extrapolation of the audit results to determine the expected variance in the entire LV population should be based on the ratio of CI and CML rather than the ratio of number of incidents.

The Consortium is not persuaded by the conclusions that SPN has derived from its statistical analysis regarding the use of the upper 95% confidence limit and therefore concludes that Ofgem should use the point estimate of variance in the re-basing calculation of SPN's IIP targets at all voltage levels.