# Peer Review of the Reactive Post Fault Survey Methodology

## Capacity to Customers ($C_2C$) Project

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## VERSION HISTORY

| Version | Date | Author | Status (draft, etc) | Comments |
|---|---|---|---|---|
| Version 1 | 29 August | Ken Willis | Draft | |
| Version 2 | 1 December | Ken Willis | Final | |

## APPROVAL

| Name | Role | Signature & date |
|---|---|---|

## GLOSSARY OF TERMS

| Abbreviation | Term |
|---|---|
| $C_2C$ | Capacity to Customers |
| CAPI | Computer Aided Personal Interview |
| CATI | Computer Aided Telephone Interview |
| I&C | Industrial & Commercial |
| LCNF | Low Carbon Network Fund |

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# 1. EXECUTIVE SUMMARY

The Reactive Post Fault Survey research will test the hypothesis ($H_1$) that customers on $C_2C$ circuits, who have experienced a $C_2C$ fault, have noticed a discernable effect on their power quality.

The research methodology outlined by Impact Research is an excellent and rigorous examination of the effect of $C_2C$ on customer perceptions. The sample size proposed by Impact Research, of 1000 customers, should be adequate to test the hypothesis, for domestic customers, and for industrial and commercial (I&C) customers, as a whole. Whether the sample size is large enough, to derive statistically significant results on the perception of power quality and tolerance, will depend on how much segmentation of data is undertaken in the analysis.

The interviewing approach proposed is excellent: asking customers in an unprompted manner if they recall experiencing power problem to their property recently, and if so the date, time and duration of the fault. This approach, with interviewers being conducted as soon as possible after the fault occurred, will ensure that any recall error is minimised.

The proposed analysis of the data is practical, investigating whether customers have perceived or experienced a discernable effect on their power quality by customer type (domestic versus I&C); region; and fault duration. Any more detailed analysis e.g. by region needs to standardize for socio-economic or I&C structure of customers, to ensure that results are not just a function of the socio-economic or I&C sample profile of customers in each region.

# 2. THE OBJECTIVE OF THIS PEER REVIEW

This peer review considers the suitability of the Reactive Post Fault Survey methodology proposed by Impact Research to provide robust quantitative research that will assist in answering the $C_2C$ hypotheses. The peer review is also intended to maintain standards of quality, improve performance, and provide credibility.

This review has been undertaken by Professor Ken Willis. Ken Willis is Emeritus Professor of Environmental Economics at Newcastle University. His research concentrates on environmental valuation (using stated preference, and revealed preference travel-cost and hedonic price models) and cost-benefit analysis; covering biodiversity, cultural heritage, energy, forests, landscape, quarries, recreation, transport, waste disposal, and water quality and supply.

He is currently the Editor of the Journal of Environmental Economics & Policy. He has undertaken research projects on Renewable Energy and Its Impact on Rural Development and Sustainability in the UK, for the Department of Trade and Industry; on The Growth Potential for Micro-generation in England, Wales and Scotland, for the Department of Business, Enterprise & Regulatory Reform; a Cost-Benefit Analysis of Sustainable Public Procurement, for the Department for Environment, Food & Rural Affairs; and consumer values and uptake rates for photovoltaic systems by households in Cyprus.

Ken also has a wealth of experience in evaluating the suitability of market research methodologies and the application of advanced statistical analysis techniques onto market research data. Given his expertise within the energy sector he is well placed to provide a peer review of the $C_2C$ Reactive Post Fault Survey methodology.

The rest of this report focuses on an assessment of the Reactive Post Fault Survey methodology prepared by Impact Research for Electricity North West and is based entirely on the informed opinion of Ken Willis.

## 3. REACTIVE POST FAULT RESEARCH OBJECTIVES

The Reactive Post Fault Survey Methodology Report, by Impact Research for Electricity North West (ENW), clearly documents the research hypothesis. The Report describes in detail the method Impact Research will adopt to engage customers to test whether a $C_2C$ demand side management and generation side response will be indiscernible to customers.

The Report provides the context for the Reactive Post Fault Survey Methodology by outlining the previous steps in the research programme.

The Reactive Post Fault Survey research will test the hypothesis ($H_1$) that customers on $C_2C$ circuits, who have experienced a $C_2C$ fault, have noticed a discernable effect on their power quality.

## 4. RESEARCH AND SURVEY METHODOLOGY

The research methodology outlined by Impact Research is an excellent and rigorous examination of the effect of $C_2C$ on customer perceptions.

The Computer Aided Telephone Interview (CATI) survey proposed by Impact Research is appropriate: it is more cost-effective then a Computer Aided Personal Interview (CAPI) survey, whilst minimising self-selection bias compared to an on-line survey.

The sample size proposed by Impact Research, of 1000 customers, should be adequate to test the hypothesis, for domestic customers, and for industrial and commercial (I&C) customers, as a whole. The split between domestic customers (750) and Industrial and Commercial (I&C) customers (250) is reasonable. Impact Research is right to suggest spreading this sample of customers across a number of fault occurrences. 50 fault occurrences should provide a good coverage of areas, timings, and different types of customers within the domestic and I&C samples.

Most supply interruptions are likely to be short duration interruptions (SDI), which customers may or may not detect depending on their electricity appliances (type and number, and whether the appliance automatically resets time after an interruption) and whether the customers is on the premises at the time of the interruption. The sample needs to ensure, if the analysis is to be segmented by duration of the interruption, there is an adequate number

of observations in different supply interruption categories to derive statistically meaningful results. This could be achieved through stratified random sampling, if deemed necessary.

Whether the sample size is large enough, to derive statistically significant results on the perception of power quality and tolerance, will depend on how much segmentation of data is undertaken in the analysis, e.g. by different times of day, length of supply interruption, socio-economic group or industrial classification, region or area, prior fault history on circuits, etc. for domestic and I&C customers.

## 5. FIELDWORK

The interviewing approach proposed is excellent: asking customers in an unprompted manner if they recall experiencing power problem to their property recently, and if so the date, time and duration of the fault. This approach, with interviewers being conducted as soon as possible after the fault occurred, will ensure that any recall error is minimised.

Impact Research aim to interview customers affected by a $C_2C$ fault within a maximum of 5 days of the fault occurring, but more usually about 48 hours after the fault. Interviews should be completed as soon as possible after the fault occurrence to minimize recall bias. There are practical limitations on how soon interviewing can start, given that the ENW technical team have to inform the ENW customer delivery team of a fault occurring, and then ENW have to inform Impact Research who subsequently have to identify customers affected from their database before interviewing can commence. However, the time scale for this process needs to be minimized as much as possible. In reporting the results of the reactive post fault survey, it would be useful to include some statistics on the distribution of interviews completed within 24 hours, 24-48 hours, 48-72 hours, etc. of the fault occurring.

The questionnaire covers appropriate topics: length of supply interruption; knowledge of any dips and surges in power supply; demographic profile of customer; and awareness of recent power faults. Consumers' acceptability of supply interruptions may be conditioned on their past experience of supply interruptions. Studies have shown that consumer acceptability is conditioned by previous experience (see for example Samuelson and Zeckhauser, 1988; Levy-Garboua and Montmarquette, 2002). Thus it might be useful to ask customers about their perceptions and experience of supply interruptions over the previous 12 months or 2 years.

The questionnaire should note the postcode of the customer. This will allow some analysis on whether there is a spatial variation in discernible effects by customers of variations in power quality.

## 6. ANALYSIS

The proposed analysis of the data is practical. The analysis will look at whether customers have perceived or experienced a discernable effect on their power quality by customer type (domestic versus I&C); region; and fault duration; with further analysis by customer type and fault duration, and customer type split by region.

Regional variations in domestic customer perceptions may arise because of differences in the socio-economic composition of customers, and or fault duration. Any regional analysis needs to standardize for the socio-economic composition of domestic customers across regions, and fault duration. Similarly for I&C customers, the analysis needs to standardize for I&C structure. A binary logit model of individual customer responses could be undertaken to assess which variables, including an instrumental variable for 'region', account for a noticed discernable effect on power quality. This would indicate whether customers in each region had statistical significant different perceptions.

## 7. CONCLUSION

The Reactive Post Fault Survey Methodology proposed by Impact Research is, admirable. The research methodology will provide an accurate and reliable test of the hypothesis that customers on $C_2C$ circuits, who have experienced a $C_2C$ fault, will have noticed a discernable effect on their power quality.

## 8. REFERENCES

Levy-Garboua, L and Montmarquette C. (2002). The demand for the arts, in R. Towse (ed.) *Handbook of Cultural Economics.* Edward Elgar, Cheltenham.

Samuelson, W. and Zeckhauser R. (1988). Status quo bias in decision making. *Journal of Risk and Uncertainty* 1: 7-59.