Review of ER P2/6 – Industry Workshop Summary

Capacity to Customers (C_2C) Project

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Contents

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Approval

Name	Role	Signature & date
Paul Turner	*C_2C Technical Manager*	

Glossary of Terms

Abbreviation	Term
BSP	***Bulk Supply Point***
C_2C	***Capacity to Customers***
DCUSA	***Distribution Connection and Use of System Agreement***
DG	***Distributed Generation***
DNO	***Distribution Network Operator***
DSR	***Demand Side Response***
ER	***Engineering Recommendation***
ESQCR	***Electricity Safety, Quality and Continuity Regulations***
ETR	***Engineering Technical Report***
GSP	***Grid Supply Point***
LCN Fund	***Low Carbon Network Fund***
LMAs	***Load Managed Areas***
MIC	***Maximum Import Capability***
MPAN	***Meter Point Administration Number***
NETS SQSS	***National Electricity Transmission Security and Quality of Supply Standard***
NOP	***Normal Open Point***
Ofgem	***Office of the Gas and Electricity Markets***
RIGs	***Regulatory Instructions and Guidance Documents***
RTS	***Radio Teleswitch***
SDRC	***Successful Delivery Reward Criteria milestone***
SLC	***Standard Licence Condition***

All other definitions shown starting with a Capital letter are as per LCN Fund Governance Document v5.

1 EXECUTIVE SUMMARY

This report summarises the views expressed at an industry workshop held on 24th January 2013 at the IET London. The workshop was hosted by Electricity North West as part of the C_2C project to gather industry views on the issues of accommodating Demand Side Response, and specifically post fault demand response, in system security assessments.

Within the C_2C project, it had been noted that compliance with system security standard, Engineering Recommendation (ER) P2/6, could present an obstacle for the widespread application of Demand Side Response and specifically post fault demand response. The objectives of the workshop were to explore industry views on:

1) how post fault demand response could be accommodated within system security assessments complying with ER P2/6
2) the need for system intact assessments or a system operating standard, presently only implicit within ER P2/6

There were numerous learning points from the workshop, namely:

- Despite considering that vagueness within the existing ER P2/6 wording permits some flexibility, it was concluded that clarification of the inclusion of Demand Side Response within security standards was necessary in the short term.
- It was judged that permitting an allowance for responsive demands within Group Demand through appropriate explanation within Engineering Technical Report (ETR) 130 was most appropriate.
- Monitoring responsive demands was viewed to be the most accurate way of establishing an accurate allowance within security assessments, recognising the complexity of defining a methodology for establishing an estimate as an alternative.
- Preference was expressed for the definition of system intact assessment requirements within industry documents in the long term, although it was agreed that defining limits of penetration of responsive demand would be complex.
- Factors affecting such a limit raised during the workshop included:
  - the social impact of short duration interruptions
  - the reliability of remote control
  - the effect of higher loading on network equipment.
- A limiting penetration of post fault response demand up to 200% of the traditional load (100% additional post fault responsive demand) was judged appropriate when considering an HV ring circuit.
- A limit on penetration of up to 150% of the traditional load was judged appropriate for higher voltage systems due to increased caution based mainly upon the perceived social impact of the increase in short duration interruptions. It was agreed that these limits should be set by each individual DNO.

2 INTRODUCTION

An industry workshop to explore views on how Engineering Recommendation (ER) P2/6[1] accommodates Demand Side Response (DSR) was hosted as part of the Electricity North West's Capacity to Customers (C_2C) project[2].

The C_2C project, which is supported by Ofgem's Low Carbon Networks (LCN) Fund, aims to use new technology and innovative commercial contracts to increase the amount of energy that can be transmitted through the electrical infrastructure that is already in place throughout the region. C_2C is based upon the use of automated switching to provide post fault demand response to manage power flows when operating with abnormal network configurations after a fault.

It has been recognised that ER P2/6 could potentially restrict the future widespread application of DSR and specifically further application of post fault demand response, as being trialled within the C_2C project. Uncertainty regarding DSR is just one of the factors supporting the wholesale review of ER P2/6 suggested in the open letter[3] from the Chair of the Distribution Code Review Panel.

The anticipated timescales of changes to ER P2/6 arising from the wholesale review of ER P2/6 are not expected to be suitable for the more imminent application of DSR. Consequently, as part of the C_2C project, Electricity North West is considering the need for modification of ER P2/6 in the short term to include explicitly the effects of DSR and has consulted with the industry on the requirement.

The workshop objective was to gather views on the planning and operation of future networks incorporating use of DSR techniques such as the C_2C operating regime. In particular implications for future planning standards and operational procedures were discussed along with the best way to modify ER P2/6 in the short term.

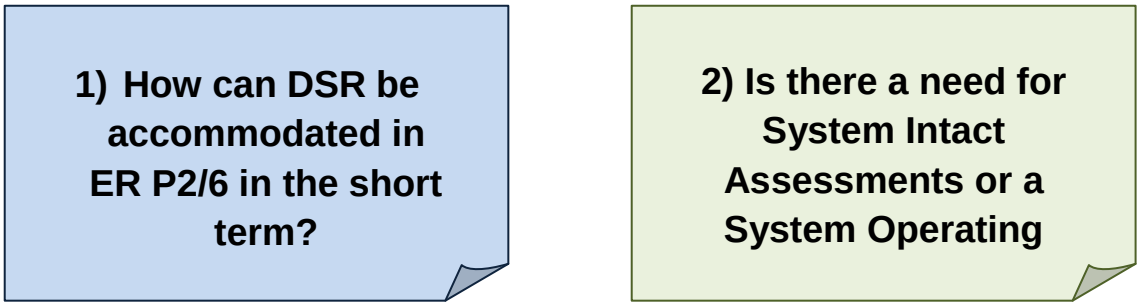
[1] Energy Networks Association, Engineering Recommendation P2/6 - Security of Supply, July 2006.

[2] http://www.enwl.co.uk/c2c

[3] http://www.energynetworks.info/storage/P2 Security of Supplies Open Letter.pdf.pdf

3 WORKSHOP ISSUES

The workshop was hosted to discuss and gather industry views on the following issues:



3.1 Accommodating DSR in ER P2/6

Presently, ER P2/6 does not explicitly specify the consideration of the intermittent and controlled nature of loads provided by DSR to be evaluated in security of supply assessments. However, it is essential that the benefits from any wide spread application of demand side response are not restricted by our industry standards.

It is proposed that changes to ER P2/6 are required to explicitly allow for DSR to ensure that the full benefits of the growing number of novel operational techniques can be realised without the need for derogations.

3.2 Short Term Requirement

It is suggested that this issue needs to be considered in the short term as distribution network operators begin to trial the use of DSR for the deferment or avoidance of network reinforcement, whilst strict compliance with ER P2/6 is necessitated through its inclusion in the Distribution Licence[4]. Ofgem's recent consultation[5] on changes to LCN Fund governance suggests that more future projects supported by the LCN Fund will explore techniques to reduce or shift electrical demand, so increasing the need to resolve uncertainties regarding ER P2/6 compliance and DSR.

Demand side response is already being trialled; specifically the LCN Fund is supporting this through a number of projects, for example the aforementioned C_2C project, "Customer-Led Network Revolution" delivered by Northern Power Grid, Western Power Distribution's FALCON project, "Low Carbon London" delivered by UK Power Networks and Southern Electric Power Distribution's "Innovation Squared" project. It is anticipated that the number of trials of demand side response will increase, particularly within Tier 1 LCN Fund projects.

The requirement to be able to make allowance for the operation of responsive demands with confidence whilst remaining compliant with ER P2/6 is likely to be soon, meaning that the changes must be made in the short term.

[4] Distribution Licence : Standard Licence Condition 24.1 states "The licensee must plan and develop its Distribution System in accordance with: (a) a standard not less than that set out in Engineering Recommendation P.2/6 of the Energy Networks Association so far as that standard is applicable to it;"

[5] http://www.ofgem.gov.uk/Networks/ElecDist/lcnf/Documents1/Electricity demand reduction.pdf

3.3 Need for System Intact Assessments / System Operating Standard

Traditionally network planning is based upon ER P2/6 restoration requirements and checks that the loading level is within the rating of the system with the worst case critical outage. Introduction of widespread responsive demand, depending on its behaviour, may require system planners to undertake an assessment of the intact system, based upon the capacity of the network without an outage.

It has been suggested that it may be appropriate to include operational limits for an intact system within ER P2/6 for consistency. The National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS), applicable to GB transmission systems, includes definition of system normal operational requirements in addition to system planning criteria. ER P2/6 is the equivalent distribution network standard, but differs because it only provides planning requirements and operational limits are inferred rather than specific.

4 WORKSHOP OBJECTIVES

The overall objective of the workshop was to provide an understanding of the industry's views regarding the workshop issues discussed in the previous section. Specific objectives are listed in Table 1:

Table 1 : Workshop Objectives

1) How can DSR be accommodated in ER P2/6 in the short term?	2) Is there a need for System Intact Assessments or a System Operating
Objectives – gather views on:	Objectives – gather views on:
Does P2/6 presently accommodate DSR?	With regard to gathering information to determine appropriate limits, what is the acceptable level of penetration of post fault demand response customers within a system, considering how it responds to events that directly affect or pose risks to assets or customers?
Is there need in the short term for changes to ER P2/6 to accommodate DSR?	What factors influence the acceptable level of penetration of post fault demand response?
What is the most appropriate way of making any necessary changes?	

5 WORKSHOP EVENT

The workshop, held at IET Savoy Place in London on Thursday 24th January 2013, was well attended by representatives of all DNOs, including several members of the Distribution Code Review Panel.

The workshop agenda is included in Appendix A of this report. A list of attendees is included in Appendix B.

The workshop proceedings started on the general point; does the industry perceive that DSR is presently accommodated within ER P2/6? The debate progressed in the afternoon to discuss the preferred way to accommodate DSR in the short term without doubt and also the level of detail of any necessary changes to ER P2/6.

The audience's acceptability of a range of operating regimes was assessed by presenting scenarios at various voltage levels with increasing levels of penetration of post fault demand response. Dependencies of the proposed system operation, the effects of the system operation on system assets and the risks to customers were presented for each scenario. Views were sought on the most important factors affecting an individual's view of the acceptability of the scenario. The strength of views was judged throughout the discussions.

Open discussions were facilitated throughout the workshop so that views could be shared. To encourage participation from all attendees a series of specific questions, often refined or clarified through group discussion during the workshop, were presented and a voting system used to gather everybody's opinions. The voting system was based on three colours, so that an individual could indicate agreement, disagreement or uncertainty in response to a statement, as illustrated in Figure 1. These colours are used to illustrate the workshop audience's responses in section 6 of this report.

The workshop was successful in gathering useful information and the value of such small gatherings of interested parties was highlighted by a participant who encouraged further meetings of this type.

Figure 1 : Workshop voting system.

6 WORKSHOP RESULTS

This section presents each of the eleven workshop questions along with a description of the associated scenario, a list of the background points, consequences and dependences presented to the audience, voting results and audience comments.

6.1 Question 1: From your company's point of view could responsive demand be employed without breaching ER P2/6?

Objective:	The objective of asking this question was to establish the audience's view on "does ER P2/6 presently accommodate DSR?" in light of the confusion due to different interpretations of ER P2/6 and conflicting industry views expressed informally and gathered through previous consultations.

Background, the following information was shared prior to discussion of the question:

- Compliance with Engineering Recommendation P2/6 is a distribution licence condition
- A derogation to ER P2/6 was obtained from Ofgem for the C_2C trial
- ER P2/6 facilitates single customers with managed loads
- DCUSA's Load Managed Area provides a mechanism for avoiding reinforcement using control of demand

Consequences of agreeing that responsive demand can be employed without breaching ER P2/6 are:

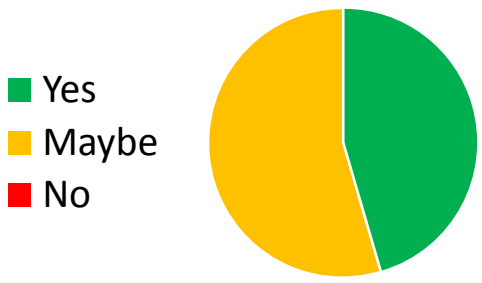
- No need for derogations for responsive demand
- No need for interim change to ER P2/6

Agreement that responsive demand can be employed without breaching ER P2/6 depends on a view that:

- the existing ER P2/6 is flexible enough already

Results:

	Votes
Yes	5
Maybe	6
No	0



Audience Comments:

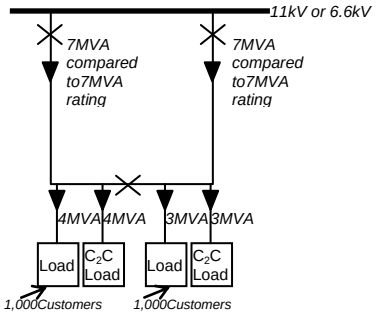
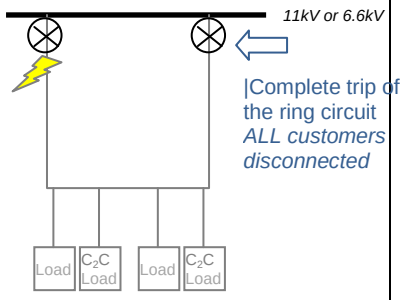
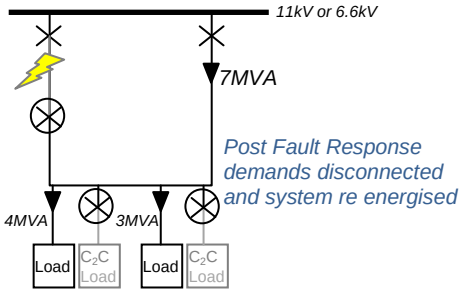
- Comments that the vagueness of the wording permits flexibility when adopting an interpretation.
- Comments that ER P2/6 derogations are in place for generation customers operating with managed contracts whilst they await system reinforcement.
- Comments regarding uncertainty regarding the need for a derogation for teleswitching.
- Comment that whilst Ofgem is willing to grant the derogations, the safest method is to apply if there is any uncertainty in the requirement.
- On a personal level more audience considered that derogations were not required, but expressed more conservative views on behalf of their company.

6.2 Question 2: Is the proposed C_2C HV circuit operation acceptable?

Scenario: C_2C (post fault demand response) applied to a HV Ring

Operation of a 11kV or 6.6kV ring such that :-

- Traditional loads result in 100% loading of the remaining circuit for a circuit outage
- C_2C customer loads result in both circuits loaded to their rating with no circuit outages
- Both circuits are intertripped in response to a fault
- Traditional customers are disconnected, but are reinstated within three minutes, experiencing a short duration interruption
- C_2C customers are disconnected and the system re-energised in abnormal configuration

Initial Circuit Condition	Fault Clearance	Next Step
		

Objective	The objective of asking this question was to judge the acceptability of the proposed C_2C HV circuit operation and learn what factors influence views on the level of acceptability.

Consequences of the proposed HV circuit operation:

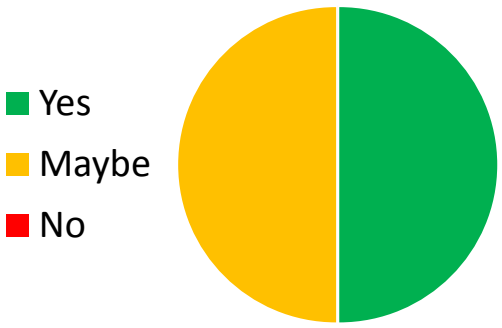
- Increased frequency of short duration interruptions
- Increase from 1000 to 2000 customers experience short duration interruption
- Potential increased network equipment ageing

Dependencies of the acceptability of the proposed HV circuit operation:

- Depends on automated control operation at typically less than five sites

Results:

	Votes
Yes	6
Maybe	6
No	0



Audience Comments:

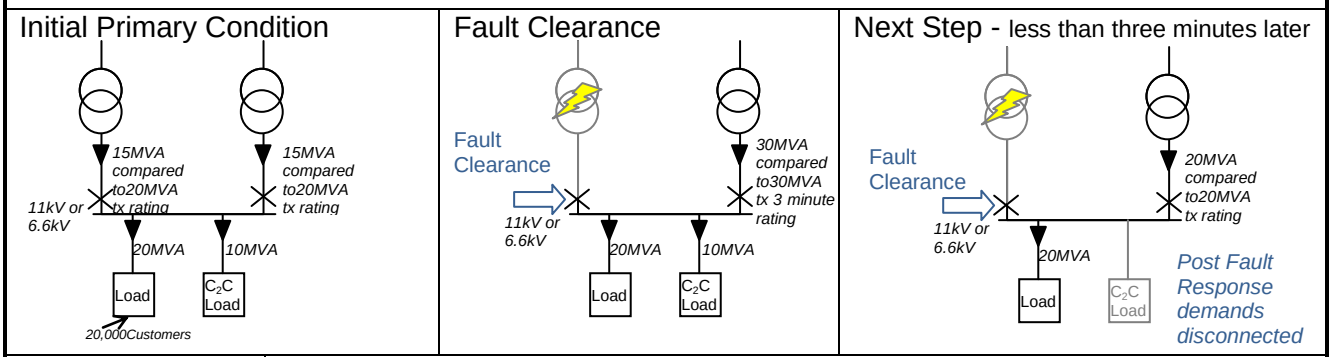
- Many attendees commented that the acceptability of the proposed HV circuit operation depended on the reliability of the remote control.
- Concerns were expressed regarding the frequency of short duration interruptions and the risk of customer complaints if numbers increased.
- It was suggested that individuals were not concerned about how many others were experiencing the same short duration interruption and therefore an increase in numbers was of no consequence. But, it was agreed that the scale of the associated loss of reputation was of concern.
- Concerns were discussed regarding power quality and the loss of damping load during outages.
- Concerns were expressed about the dependency on remote control, since experience has shown protection and communication systems to be unreliable.
- Concerns regarding protection not tripping both feeder breakers were discussed.
- There were concerns about the effects of interconnecting circuits with historically low fault rates with circuits with high fault rates.

6.3 Question 3: Is the proposed cautionary C_2C Primary operation acceptable?

Scenario: Cautionary C_2C (post fault demand response) applied to a Primary substation

Operation of a Primary substation such that :

- Traditional loads result in 100% loading of the remaining transformer for an outage
- C_2C customer loads result in both transformers 75% loaded with no transformer outages
- An outage of one transformer results in the remaining transformer, immediately after the fault clearance, being loaded up to its three minute rating (say 150%)
- Traditional customers are NOT disconnected for a fault and do NOT experience a short duration interruption
- C_2C customers are disconnected within three minutes of fault clearance and the loading of the remaining transformer reduces to its long term cyclic rating



Objective:	The objective of asking this question was to judge the acceptability of the proposed Primary substation operation and understand what factors influence views on the level of acceptability.

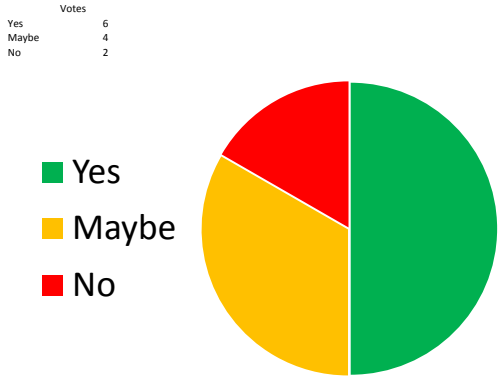
Consequences of the proposed cautionary Primary operation:

- No Increase in the frequency of short duration interruptions
- No Increase in the number of customers experiencing short duration interruptions
- Potentially increased network equipment ageing

Dependencies of the acceptability of the proposed cautionary Primary operation:

- Depends on operation of remote control at typically less than ten sites (depending on the number of C_2C customers)

Results:



Audience Comments:

- Comments were made that overloading the remaining primary transformer subsequent to an outage, would be more acceptable if the overload was limited to approximately 120%, rather than 150%.
- There were concerns that overloading to 150% would result in tripping the remaining transformer and loss of supplies to the whole primary.
- It was acknowledged that protection changes could be made to avoid this.
- Also, there were concerns that the remote control may not operate quickly enough.
- One participant commented that they would be more comfortable with an overload below the transformer's 3 hour rating, allowing time for manual operation of a backup system if the remote control failed.

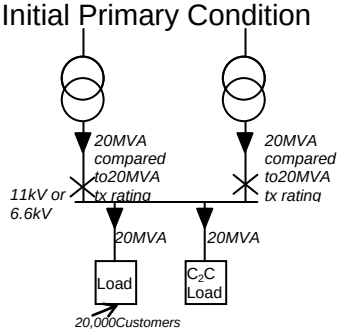
6.4 Question 4: Is the proposed progressive C_2C Primary operation acceptable?

Scenario: Progressive C_2C (post fault demand response) applied to a Primary substation

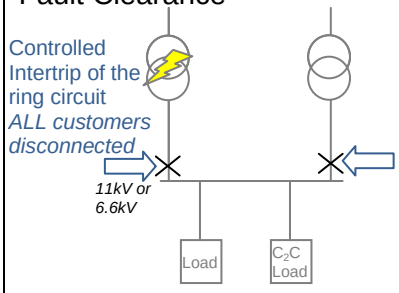
Operation of a Primary substation such that :

- Traditional loads result in 100% loading of the remaining transformer for an outage
- C_2C customer loads result in both transformers 100% loaded with no transformer outages
- Both transformers are intertripped in response to a fault
- Traditional customers are disconnected, but are reinstated within three minutes, experiencing a short duration interruption
- C_2C customers are disconnected and the system re-energised in abnormal configuration with the loading of the single transformer within its long term cyclic rating

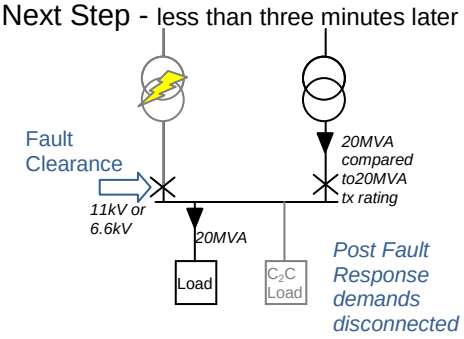
Initial Primary Condition



Fault Clearance



Next Step - less than three minutes later



Objective:	The objective of asking this question was to judge the acceptability of the proposed progressive Primary substation operation and understand what factors influence views on the level of acceptability

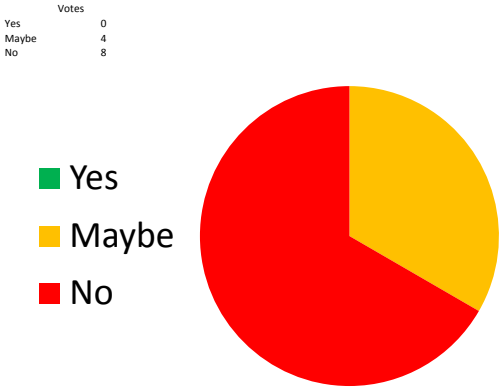
Consequences of the proposed progressive Primary operation:

- Increase in frequency of short duration interruptions
- Increase in the number of customers experiencing short duration interruptions
- Potentially increased network equipment ageing

Dependencies of the acceptability of the proposed progressive Primary operation:

- Depends on operation at typically less than ten sites (depends on number of C_2C customers)

Results:



Audience Comments:

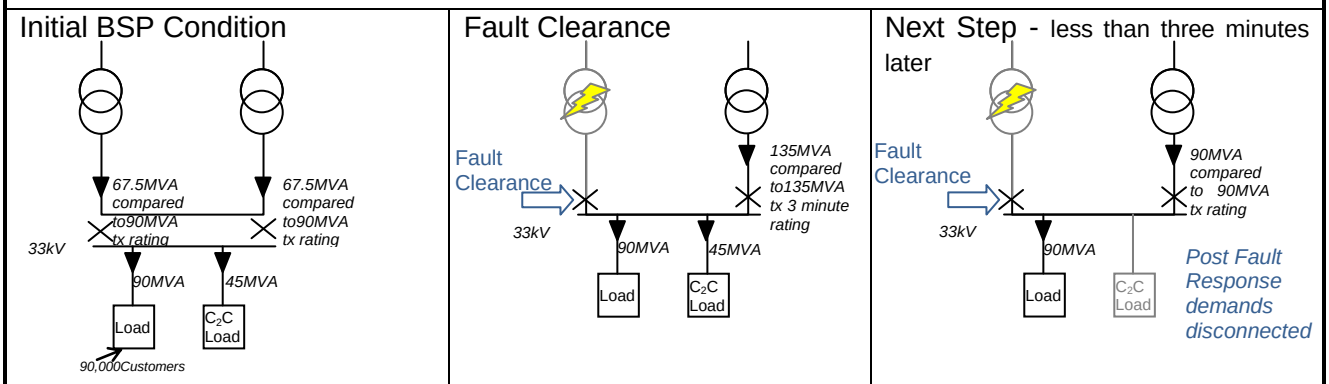
- The NO votes were based upon the unacceptability of the increased number of short duration interruptions.
- A participant commented that it was inappropriate to degrade the service to "traditional" customers as a consequence of offering C_2C contracted customers cheaper connections.
- It was commented that the increase in loading could induce more faults.
- The track record of loading equipment between 100 – 200% was questioned.
- It was commented that such potential significant overloads would be more acceptable if associated with a single large contracted customer with hard wired remote control, rather than multiple customers with remote control depending upon communication systems.

6.5 Question 5: Is the proposed C_2C Bulk Supply Point operation acceptable?

Scenario: C_2C (post fault demand response) applied to a Bulk Supply Point (BSP) substation

Operation of a BSP substation such that :

- Traditional loads result in 100% loading of the remaining transformer for an outage
- C_2C customer loads result in both transformers being 75% loaded with no transformer outages
- An outage of one transformer results in the remaining transformer, immediately after the fault clearance, being loaded up to its three minute rating (say 150%)
- Traditional customers are NOT disconnected for a fault and do NOT experience a short duration interruption
- C_2C customers are disconnected within three minutes of fault clearance and the loading of the remaining transformer reduces to its long term cyclic rating



Objective:	The objective of asking this question was to judge the acceptability of C_2C applied to a BSP and understand what factors influence views on the level of acceptability

Consequences of the proposed BSP operation:

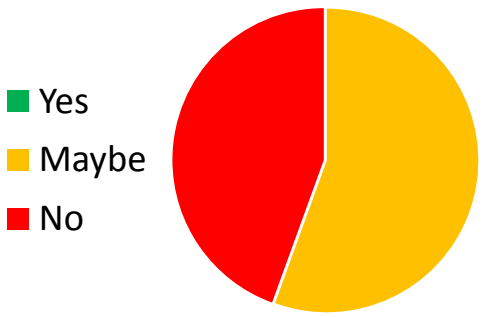
- No Increase in frequency of short duration interruptions
- No Increase in the number of customers experiencing short duration interruptions
- Potentially increased network equipment ageing

Dependencies of the acceptability of the proposed BSP operation:

- Depends on remote control operation at typically less than fifty sites (depending on the number of C_2C customers)

Results:

	Votes
Yes	0
Maybe	5
No	4



Audience Comments:

- A participant commented that they felt more comfortable with overloading equipment at the higher voltage levels due to their better understanding of the thermal operation of such equipment.
- Also, commented that the pre-fault loading would erode the potential capacity post fault due to the higher initial operating temperature.

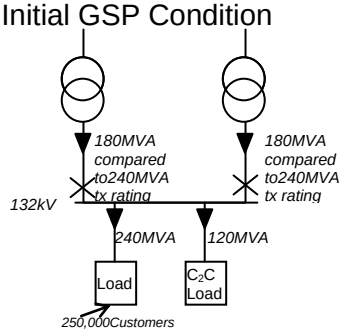
6.6 Question 6: Is the proposed C_2C Grid Supply Point operation acceptable?

Scenario: C_2C (post fault demand response) applied to a Grid Supply Point (GSP) substation

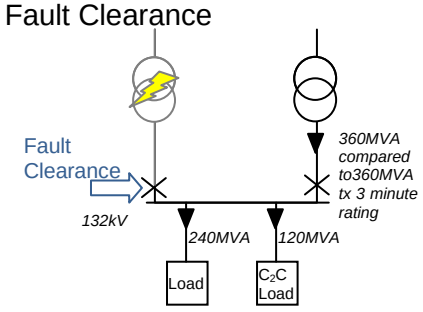
Operation of a GSP substation such that :

- Traditional loads result in 100% loading of the remaining transformer for an outage
- C_2C customer loads result in both transformers being 75% loaded with no transformer outages
- An outage of one transformer results in the remaining transformer, immediately after the fault clearance, being loaded up to its three minute rating (say 150%)
- Traditional customers are NOT disconnected for a fault and do NOT experience a short duration interruption
- C_2C customers are disconnected within three minutes of fault clearance and the loading of the remaining transformer reduces to its long term cyclic rating

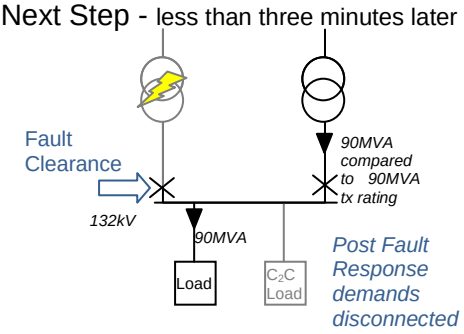
Initial GSP Condition



Fault Clearance



Next Step - less than three minutes later



Objective:	The objective of asking this question was to judge the acceptability of C_2C applied to a GSP and understand what factors influence views on the level of acceptability.

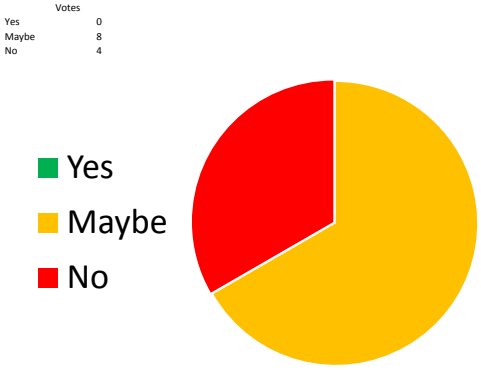
Consequences of the proposed GSP operation:

- No Increase in frequency of short duration interruptions
- No Increase in the number of customers experiencing short duration interruptions
- Potentially increased network equipment ageing

Dependencies of the acceptability of the proposed GSP operation:

- Depends on remote control operation at typically less than one hundred sites (depending on the number of C_2C customers)

Results:



Audience Comments:

- Most points were similar to those raised for application of C_2C to a BSP substation.
- The issue of low probability high impact faults and the associated possible long interruption of supplies to C_2C customers during repair time were discussed.
- It was highlighted that agreement of any penetration at GSP level would require agreement with National Grid.
- It was explained that there would not be any issues if the DNO system was compliant with ER P2/6 at the NGC/DNO boundary.
- Consequently, NGC would need to be able to control C_2C customers.

6.7 Question 7: Should system intact limitations be defined in the Security Supply Standard as an interim measure?

Objective:	The objective of asking this question was to establish the audience's view on the requirement for system intact or operations limitations within the security standard, especially after the preceding detailed discussions about the acceptable level of penetration at different voltage levels.

Background, the following information was shared prior to discussion of the question:

- Influences on the acceptable level of penetration of Post Fault Response demand, raised during the preceding discussions, were summarised as an introduction to the question; including:-
  - Equipment ratings
  - Reliability of automation
  - Social acceptability of short duration interruptions.
- It was agreed that system intact / operational limits would not be easily quantified.
- Including the system intact assessment in a DNO internal document was discussed as an alternative to including the system intact assessment in the security of supply standard.

Consequences of including system intact assessments in a security of supply standard:

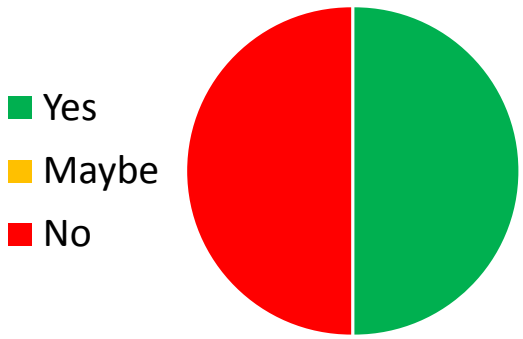
- Achieve consistency
- Requirement to change ER P2/6

Dependencies for including system intact assessments in a security of supply standard:

- Industry view

Results:

Votes	
Yes	6
Maybe	0
No	6



Audience Comments:

- The difficulties of defining limits for system intact assessments were recognised by the audience.
- However, there was clearly a preference for specification of operational limits in industry documents.

6.8 Question 8: Is there a need to adjust the generation contribution in ER P2/6?

Objective:	The objective of asking this question was to establish the audience's view on the need for changes to ER P2/6 to clarify consideration of generation with interruptible contracts.

Background, the following information was shared prior to discussion of the question:

- ER P2/6 presently explicitly addresses generation's availability, operating regime and intermittency.
- Contribution to system security from generation operating with an interruptible contract, specifically C_2C connection, will require consideration of additional factors, specifically:
  - Unavailability due to Contract during system outages
  - No/reduced allowance for C2C generators for N-1 & N-2 system assessments

Audience Comments:

- It was highlighted by a participant that ER P2/6 already accommodates the influence of interruptible contracts applied to generation through point (e) of section 4 which states "When using this Engineering Recommendation to assess the contribution from DG, it is recommended that account is taken of the forecast operating plans and probable operating regimes and capabilities of the DG plant".
- The intermittency of generation associated with interruptible contracts would also be catered for by the detail explanations within ETR 130. (Specifically "Establish whether each DG unit will remain connected under the FCO/SCO conditions...." in figure 5.4.)

6.9 Question 9: Does responsive demand fit best with "Group Demand", "Neither/alternative" or "Network Capability"?

Objective:	The objective of asking this question was to establish the audience's view on how responsive demand should be incorporated within ER P2/6.

Background, the following information was shared prior to discussion of the question:

- ER P2/6 assessments are based upon Network Capability being sufficient to supply all or most of a Group Demand within specified times depending upon the size of the demand.
- The alternatives for making an allowance for responsive demand were:
  - Subtract from Group Demand
  - Add to Network Capability
  - Neither of the above; an additional factor in the evaluation of system security

Alternative 1: Subtract a Responsive Demand Allowance from Group Demand ……..

Advantages

- Group Demand is an amount to be restored and there is no need to restore Responsive Demand
- Group Demand is often the basis of load forecast and including an allowance for Responsive Demand could complicate the forecast task
- Means that the Group category will not change due to C_2C connections

Disadvantages

- Responsive Demand is un-differentiable when measuring Group Demand and so should stay in there!

Alternative 2: Add a Responsive Demand Allowance to Network Capability……..

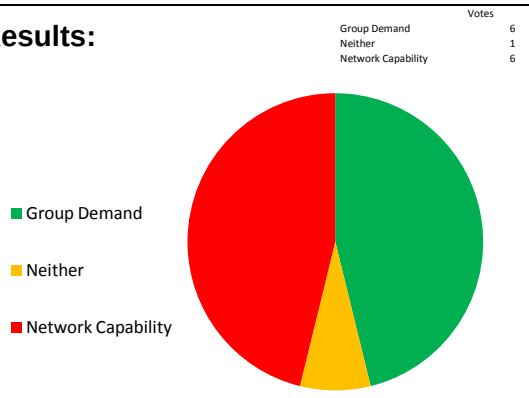
Advantages

- Network Capability is already adjusted so why not adjust it by a further allowance

Disadvantages

- Responsive Demand Allowance doesn't feel like a network capability, more like a demand

Results:



Audience Comments:

- It could be considered a disadvantage that a Group's category was not changed by the connection of responsive demand.
- The majority of the audience commented that the best place for an allowance for responsive demand was with Network Capability.
- It was suggested that it would be easier to include an allowance for responsive demand within Group Demand by modifying ETR 130 in the short term.
- A participant commented that energy storage already fits within Network Capability.
- Including the allowance for responsive demand within Network Capability was judged to be a possibility for the long term revision (ER P2/7).
- The point was raised that Ofgem were consulting on changes to the RIGS and that it is proposed that DSR should be included within Network Capability.
- It was commented that proposals for change for both options should be developed to assess how simply each could be implemented.
- One participant expressed a preference for including the allowance for responsive demand within Network Capability because it would be an allowance rather than a measured value.
- The audience showed a preference for a Group's class to increase due to the connection of responsive demand to ensure higher voltage systems provided adequate system security.

6.10 Question 10: How should an allowance for responsive demand be evaluated?

Objective:	The objective of asking this question was to establish the audience's view on how an allowance for responsive demand should be evaluated.

Background, the following information was shared prior to discussion of the question:

- The advantages and practical difficulties of measuring demands connected under interruptible contracts were presented.
- It was suggested that estimation of an appropriate allowance could include consideration of:
  - Voltage level of evaluation and connection
  - Availability of demand
  - Failure of operation of automation
  - Contractual restrictions

Audience Comments:

- Metering/monitoring was preferred by the audience.
- It was agreed that a factor should be applied to reflect the reliability of remote control.
- It was suggested that these factors must be defined in an industry document to provide support should a DNO be required to justify their application of such a factor.
- The use of duplicate remote control systems to reduce reliability risks in the interim was suggested as a way of avoiding the need for reliability factors which would be difficult to quantify.
- It was suggested that it may not be appropriate for C_2C customers to also participate in other DSR schemes to ensure that their historic metering did not reflect other influences. This was considered important so that the metering could be taken to be a good reflection of the future and the basis of the allowance in the security of supply assessment.

6.11 Question 11: Is minimum change to ER P2/6 sufficient to accommodate responsive demand in the short term?

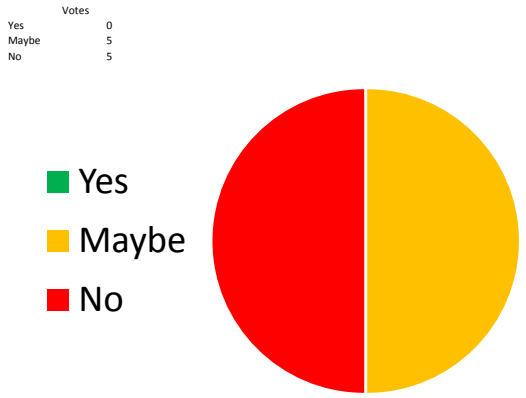
Objective:	The objective of asking this question was to establish the audience's view on the necessary level of detail required for any change to ER P2/6 to accommodate responsive demands.

Background, the following information was shared prior to discussion of the question:

- The following minimum change was suggested:

"**Group Demand**
The DNO's estimate of the maximum demand of the group being assessed for ER P2/6 compliance with appropriate allowance for diversity ***and customers with interruptible contracts***."

Results:



Audience Comments:

- A disadvantage of clarifying the definition of Group Demand was noted to be that it would no longer allow the existing vagueness to be exploited in other ways.
- Preferences were expressed for changes to ETR 130 in the short term, rather than changes to ER P2/6

7 SUMMARY OF WORKSHOP FINDINGS

7.1 How can DSR be accommodated in ER P2/6 in the short term?

7.1.1 Need for Short Term Change?

The audience agreed that clarification with regard to DSR in system security assessments was required in the short term, despite the view of many that the existing inexplicit wording of ER P2/6 allowed flexibility.

There was a shared view that ETR 130 would be the most appropriate location for the clarification.

7.1.2 How to Estimate the Allowance?

Metering was viewed to be the preferred method for making allowance for responsive demand due to the complex factors that would need to be included in an estimate but this would be left to each individual DNO to decide.

7.1.3 Where an Allowance should be made?

Views on whether an allowance for responsive demand should be accommodated within Group Demand of Network Capability were divided. However, when the short term nature of the change was taken into consideration, there was a preference for including the allowance for responsive demand within Group Demand via ETR 130.

7.2 Is there a need for System Intact Assessments or a System Operating Standard?

7.2.1 Acceptable Level of Penetration of Responsive Demand

The acceptable level of penetration of post fault responsive demand was considered in the workshop to provide the information necessary for the development of limits of interruptible customer connections, for application in system intact assessments or a system operating standard.

Overall, the DNO audience were cautious about the acceptable level of penetration of post fault responsive demand.

- Application to HV circuit – up to 200% of traditional loading Acceptable ✓

Nobody opposed the application of the C_2C concept to a HV ring up to an additional 100% of the traditional loading, so that supplies to the whole ring would be removed in response to a fault with a consequential increase in the number of consumers experiencing short duration interruptions.

- Application to Primary substation – up to 150% of traditional loading Acceptable ✓

Application of C_2C operation to a Primary substation when penetration was limited to the transformer short time rating, so that intertrpping was avoided, was also acceptable to most.

- Application to Primary substation – up to 200% of traditional loading NOT Acceptable ✗

Greater levels of penetration requiring intertripping, meaning that all consumers connected to the Primary experienced a short duration interruption, were not considered acceptable by most.

- Application to BSP substation – up to 150% of traditional loading possibly acceptable ?✓

The majority of the audience were willing to consider application of post fault responsive demand at BSP substations at penetrations up to 150% of the traditional loading.

- Application to GSP substation – up to 150% of traditional loading possibly acceptable ?✓

The majority of the audience were willing to consider application of post fault responsive demand at GSP substations at penetrations up to 150% of the traditional loading. It was raised that any level of penetration at a GSP, the National Grid system boundary with a DNO, would be limited by National Grid co-operation.

7.2.2 Factors Affecting the Acceptability of Penetration

The factors affecting the audiences view of an acceptable level of penetration of post fault response demand were common to all system voltage levels, but with differing strengths of view.

7.2.2.1 Increased Short Duration Interruptions

The social acceptability of short duration interruptions and associated risk to a DNO's reputation was judged to be a strong influence on the audience's limit of acceptable penetration. However, short duration interruptions were not reported to be particularly important when considering application of post fault response to a HV circuit, where numbers of affected customers are the smallest. Potential increase in short duration interruptions was a significant factor when considering the acceptable level of post fault demand response penetration at higher voltages where the number of customers supplied is much greater. Concern was expressed regarding the impact of customer complaints arising if they experienced more short duration interruptions.

The limiting level of penetration was clearly viewed to be below that which would not

necessitate intertripping, and the consequential loss of supply to all customers, in response to a fault. Also, some preference was sensed for margin to ensure that protection did not operate unintended, again resulting in loss of supplies to all customers and an increased number of short duration interruptions.

7.2.2.2 Increased Equipment Loading

The audience were cautious about the acceptable level of penetration at all voltage levels due to uncertainty regarding effects of the higher loading of equipment than usual at the moment. These concerns were perhaps lesser at higher voltage levels because the industry had more experience and understanding of higher percentage loading further up the system. The concerns regarding higher equipment loadings which limited acceptable levels of penetration included:

- Lack of experience and understanding of short term ratings
- Inappropriate operation of protection
- Lack of understanding of the impact on equipment aging.

7.2.2.3 Communication and Automation Reliability

Experiences with unreliable communication and automation were shared amongst the audience. A lack of confidence in communication and automation caused some uncertainty in the correct operation of the post fault operating regime and this was reflected in a cautious approach to the limits of penetration of post fault response demand. Where there were few post fault demand response connections, the concern was that failure of the automation at just one of the customers could have significant effect on the successful operation of the overall scheme. Higher up the distribution network, it was considered that some of the risks were reduced due to the potential number of post fault demand response customers. However, there were concerns over common mode failures and these were again reflected in a caution when assessing acceptable levels of penetration.

A variety of ideas for improving the reliability of automation, including hard wired communication to important post fault response customers, were discussed to provide initial confidence.

7.2.3 Inclusion of System Intact Assessments in Security of Supply Standard

Views on whether system intact assessments should be included in the Security of Supply Standard were split. However, all agreed about the difficulties of defining the limits of post fault response demand to be applied in any system intact assessments.

Despite the results of the audience's votes regarding this point, there was clearly a preference for the specification of operational limits in industry documents.

8 CONCLUSIONS

This report summarises information shared at an industry workshop held on 24th January 2013 at the IET London hosted by Electricity North West as part of their C_2C project. All UK DNOs were represented by the 15 attendees. The workshop provided an opportunity to discuss how Demand Side Response, and specifically post fault demand response, should be accommodated within security of supply assessments.

A preference was expressed for clarification of the treatment of DSR within security assessments in the short term through changes to ETR 130, in particular an allowance within the definition of Group Demand.

It was considered that system intact assessments should be defined within industry documents in the long term, although it was agreed that defining limits of penetration of responsive demand would be complex. Factors affecting such a limit included the social impact of short duration interruptions, the reliability of remote control and effect of higher loading of network equipment. A limiting penetration of up to 200% of the traditional load (100% additional post fault responsive demand) was judged appropriate when considering an HV ring circuit. However, a limit of up to 150% of the traditional load was judged appropriate for higher voltage systems due to increased caution based mainly upon the perceived social impact of the increase in short duration interruptions.

APPENDIX A – WORKSHOP AGENDA

Accommodating Demand Side Response in Engineering Recommendation P2/6

Thursday, January 24th 2013

Siemens Room, IET, Savoy Place, London.

Time		Item	Host
10.00 **10:15**	–	**Arrival and coffee**	
10:15 **10:30**	–	**Introduction**	**Paul Turner** C_2C Technical Workstream Manager
10:30 **10:45**	–	**Past, Present and Future of ER P2/6**	**Mike Kay** Network Strategy Director
10:45 **11:00**	–	**Introduction to Capacity to Customers (C_2C) Project**	**Steve Cox** Future Networks Manager
11:00 **11:30**	–	**Does ER P2/6 accommodate Responsive Demand?**	**Gill Williamson** Parsons Brinckerhoff
11:30 **12:30**	–	**How could Responsive Demand be accommodated in P2/6?** • **Need for Intact System Assessments**	**Paul Turner** C_2C Technical Workstream Manager **Gill Williamson** Parsons Brinckerhoff
12:30 **13:15**	–	**Lunch and networking**	
13:15 **14:45**	–	**How could responsive demand be accommodated in P2/6?** • **Responsive Demand Allowance**	**Paul Turner** C_2C Technical Workstream Manager **Gill Williamson** Parsons Brinckerhoff
14:45 **15:00**	–	**Recap, Close and Thank You**	

Contact Details:

Paul Turner Mobile 07584608838

Accommodating Demand Side Response in Engineering Recommendation P2/6

Industry Workshop – List of Attendees

Name	Company
Saeed Ahmed	GTC
Andrew Alabarba	Low Carbon London, UK Power Networks (UKPN)
Allan Boardman	UK Power Networks (UKPN)
David Carson	Scottish Power (SP)
Steve Cox (SC)	Electricity North West (ENWL)
Alan Creighton	Northern Power Grid (NPG)
Sarah Foster	Northern Ireland Electricity (NIE)
Vandad Hamidi	National Grid (NGC)
Mike Kay (MK)	Electricity North West (ENWL)
Brian Shewan	Scottish and Southern Energy (SSE)
Paul Turner	Electricity North West (ENWL)
Victoria Turnham	Electricity North West (ENWL)
Nigel Turvey	Western Power Distribution (WPD)
Gill Williamson	Parsons Brinckerhoff (PB)
Julie Worrall	Electricity North West (ENWL)