

Bringing energy to your door

CLASS Trial design and associated test schedule

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1 INTRODUCTION

1.1 What is CLASS?

In 2012 Electricity North West was granted £9 million from the Low Carbon Network Fund for the CLASS project.

CLASS (Customer Load Active System Services) will trial an innovative approach which aims to increase the capacity of the electricity network. It has the potential to provide a low-cost solution which uses voltage control to manage electricity consumption at peak times and provide the Transmission System Operator (TSO) with an alternative source for a number of ancillary services, while still providing customers with the same standard of service.

The ability to manage peak demand and offer alternative sources for ancillary services could provide a useful tool to help meet the increasing demand for electricity and brings a number of other advantages:

- Facilitates the connections of low carbon technologies onto the electricity network such as heat pumps, electric vehicles and wind and solar power generation
- Avoids or defers the cost and disruption of expanding our network of overhead lines, underground cables and substations
- Reduces costs for all electricity customers
- Can be rolled out on a national level

1.2 The CLASS Trials

The objective of the CLASS Trials is to demonstrate that the CLASS solution can be applied to reduce peak network demands and provide at GB level, a new mechanism for frequency management and voltage control to support the TSO. The Trials will also enable a developed understanding of the relationship between voltage and connected substation demand whilst confirming that any active voltage management techniques to deliver the CLASS solution will not affect customers.

Extensive tests are planned for the period of April 2014 to end of March 2015 to robustly evaluate the application of the CLASS principles and deliver results and learning that is transferrable to all UK DNOs.

The CLASS solution will be trialled on 60 Primary substations across the ENWL network capturing approximately 350 000 customers.

1.3 Trial Design and Test Schedule

The purpose of this document is to present the agreed design methodology and subsequent test schedule for each CLASS Trial. This will allow all relevant parties to understand what, where and when the CLASS techniques will be applied.

The point of reference for the CLASS Trial design methodology is the CLASS Full Submission document. However, where required this has been developed through consultation with our internal and external stakeholders in order to reach an agreed approach and resultant test schedule.

This document should be considered as a 'living document', as it will be updated with any lessons learnt from the earlier trials.

1.4 Overview of the CLASS Trials

An outline of the CLASS Trials is presented below.

Table 1 - List of CLASS Trials

Reference	Description	Objective	Technique	Trial Period	Customer Survey Requirement
Τ1	Load modelling	Establish voltage- demand relationship	Raise and lower tap positions	Across entire annual cycle	Νο
T2	Peak demand reduction	Demand response for peak reduction	Lower tap position	Peak demand	Yes
T3a	Stage 1 frequency response	Response to reduce demand	Switch out transformer	Anytime	Yes
T3b	Stage 2 frequency response	when system frequency falls	Lower tap position	Anytime	Yes
Τ4	Reactive power absorption	Reduce high volts on transmission network	Stagger tap position	Minimum demand	Νο

2 TRIAL 1 – LOAD MODELLING

2.1 Why we need to carry out this Trial

At the centre of the CLASS project is the basic principle that the demand of certain loads can change with voltage. Therefore, employing active management of transformer tap changers can increase or decrease network demand during certain periods and bring benefits to both the distribution network and whole GB system. The actual demand response to dynamic voltage control is dependent upon the composition of the connected load. In order to confidently predict the response of the demand, accurate load models need to be developed for different load compositions. Typically, most network operators for the purposes of network planning and operation have assumed predefined static load models, most commonly being a combination of constant power and constant impedance. However to fully quantify the potential benefits of the CLASS solution the behaviour of loads has to be described through more rigorous load models.

In order to understand the actual load response to the actions of dynamic voltage control, real time data capture will be carried out to record such events. This data will then be used by the University of Manchester to develop suitable load models and estimate model parameters.

2.2 Trial Objective

The objective of this Trial is to develop a voltage-demand matrix that will mathematically quantify the relationship for every half hour across the annual cycle, for different types of connected load.

2.3 Site Selection

A methodology has been developed by the University of Manchester to aid with the selection of the Primary substations to be included within the CLASS Trials. The transferability and potential application of this approach to other distribution networks was considered in the development of the methodology. The methodology was developed to ensure the selection of representative samples covered different load classes and loading levels within each of the 15 major Grid Supply Point regions in the Electricity North West operating area. This will ensure that a broad spectrum of demand types and customers are to be included within the Trials, to provide and facilitate a robust investigation of the voltage-demand relationship.

Each Primary substation in the Trial has been categorised according to its customer composition, based on peak load sharing per Common Distribution Charging Methodology profile class¹. Three generic load classes have subsequently been derived:

- 1. Largely Industrial and Commercial primaries where the demand at time of peak demand is supplying industrial and commercial load types (ie Profile Classes 3 to 8)
- 2. Largely Domestic primaries where the demand at time of peak demand is largely supplying domestic loads (ie Profile Classes 1 and 2)
- 3. Mixed primaries where there is roughly equal share of domestic and non domestic loads at times of peak demand

Further to the categorisation above, factors such as geography, socio-economic activity and in the case of the large industrial and commercial customers the types of processes and

¹ Common Distribution Charging Methodology profile classes are set out in the Distribution Connection and Use of System Agreement (DCUSA) document

Design approach to CLASS Trials and associated test schedule (VT/23012014/v1.0)

equipment connected have been considered when selecting the fifteen sites where measurements will be undertaken for the load modelling studies. Consideration of these factors may demonstrate potential variance in demand response across the three categories and provide a more granular approach to classifying the voltage-demand relationship for a particular load type.

Large Industrial and Commercial	Largely Domestic	Mixed
Trafford Park North	Fallowfield	Buckshaw
Dickinson Street	Romiley	Victoria Park
Kitt Green	Wilmslow	Hyndburn Road
Avenham	Egremont	Blackfriars
Central Manchester	Ashton (Golborne)	Bridgewater

Table 2 - List of Primaries for Load Modelling Trial by category

2.4 Approach to determining the test schedule

In order to understand the load response to dynamic voltage control across the annual cycle for the Primary substations included within Trial 1, a representative number of tests will be conducted across the annual period to fully quantify the response for every half hour. When examining daily and annual load profiles for each Primary they typically show a level of similarity in terms of profile shape and demand value, for example over a season or a 24 hour period.

For example, figure 1 is the 2012/13 daily maximum and minimum demand values for Dickinson Street Primary. By examining the average maximum value, the annual load profile can be split up into two discrete seasons, April to November and December to March.



Figure 1: 2012/13 daily maximum and minimum demand values for Dickinson Street Primary

The annual profile also highlights for this particular Primary a cycle of high and low days throughout the year. Figure 2 shows the daily load profile for an example number of high days in season 2. The similarity in terms of profile shape and demand values permits the assumption that all high days across season 2, depending upon the time of day, will exhibit the same demand response for a change in voltage. This therefore allows the number of tests that need to be carried out to quantify the voltage-demand relationship to be streamlined to a number of representative periods.



Figure 2: Daily load profile for an example number of high days in season 2

The daily profile can be further separated into periods of changing and static demand. These periods occur at similar times for a high day in season 2 and therefore the assumption can be made that by testing in each of these four discrete periods the demand response for a high day in season 2 can be quantified.

A test schedule for each Primary in Trial 1 has been developed by following this same level of analysis and inspection to determine representative periods for testing across the annual cycle. An example is provided below for the Dickinson Street primary.

Table 3: Example test Schedule for Dickinson Street Primary

Number and	Daily Variations	Time Variations	Number of tests		
length of seasons	within a season	within a day	Voltage reduction	Voltage boost	
	High Day (Tuesday – Saturday)	01:00 – 06:00	3	3	
		06:00 - 09:00	3	3	
		09:00 -17:00	3	3	
Season 1 (1 st April 20 th		17:00 – 01:00	3	3	
November)	Low Day (Sunday – Monday)	02:00 – 07:00	3	3	
		07:00 – 11:00	3	3	
		11:00 – 17:00	3	3	
		17:00 – 02:00	3	3	
Season 2	High Dav	00:00 – 06:00	3	3	
(1 st December –	(Monday – Thursday)	06:00 – 09:30	3	3	
31 [∾] March)		09:30 – 17:30	3	3	

		17:30 – 24:00	3	3
		01:00 – 07:00	3	3
Low Day	Low Day	07:00 – 10:00	3	3
	(Saturday – Sunday)	10:00 – 18:00	3	3
		18:00 – 01: 00	3	3

In order to have sufficient data points to build up an accurate load model and output the voltage-demand relationship matrix for this Primary, it is proposed that each test will be repeated three times.

2.5 The importance of testing voltage increase and reduction

As the volume of renewable generation increases there is an increasing probability that at certain times generation on the network may exceed demand or available network capacity leading to a constraint on the network. This constraint may result in curtailed generation output or further investment in network infrastructure. For the future, a technique where the constraint can be managed through voltage controlled demand management will provide a cost effective solution. Using the CLASS solution to increase network voltage and correspondingly the network demand, could result in balancing of demand and generation at times of possible constraint. Therefore, within this Trial it is aimed to understand demand response for both increase and decrease of network voltages so that the CLASS Solution can be deployed across a range of emerging network conditions. During the trial in each designated test period a test to reduce network voltage will be followed by a test to increase the voltage.

2.6 How we will conduct a test

Typically, tap changer operation at a Primary substation may occur between 2 and 20 times a day with each operation changing the secondary voltage by approximately 1.5%. This normal operation could provide sufficient data for the purposes of Trial 1. However, to ensure that every required test period is covered and the full dynamics of the voltage regulation is captured, tests will be initiated in specific periods as outlined in the test schedule for each Primary.

The data collected in each test by changing the voltage by 1.5% will be sufficient to confidently build load models that will be accurate for voltage changes of up to 6%.

During this test period, both parallel Primary transformers will each be tapped by one tap position, which will change the voltage depending on tap changer type and position by approximately 1.5%. The new tap position will then be held for 15 minutes to capture any recovery phase of the demand.

In order to capture any discernible effects caused by any initial dynamic response of the load following a change in voltage, high resolution monitoring will be deployed. However, with regard to the future deployment of dynamic voltage control, the period of interest will be the minimum response that can be sustained over the 15 minute period.



2.7 Summary of Trial 1

The key attributes of Trial 1 are summarised in the table below.

Table 4: Summary of Trial 1 - Load Modelling

Objective	Where	When	Technique	Parameters of test
Data capture to determine voltage-demand relationship	15 Primary Substations across 3 load categories	Across annual cycle – see test schedule per Primary	Raising and lowering by one tap position followed by 15 minutes of no voltage regulation	~1.5% voltage reduction for 15 minutes

3 TRIAL 2 – PEAK DEMAND REDUCTION

3.1 Why we are carrying out this Trial

The ability to actively reduce peak network demand in a manner undetectable by customers has the potential to significantly reduce the need for network investment. Peak demand management using the CLASS solution has the potential to provide a low cost, quickly deployable solution that retains optionality for network operators where there is a degree of uncertainty in the long term; for example, with regard to demand on a network or realisation of new smart grid technologies, uptake of DG and energy efficiency measures.

For a network operator, demand reduction through dynamic voltage control on a local distribution network at times of peak has the potential to defer investment on both Primary transformers and upstream assets. For this purpose, the peak demand at a Primary substation is of interest, as is the relevant maximum apparent power demand reduction that can be sustained, so that system flows remain within network thermal capacity without causing demand disconnection due to under-voltages.

3.2 Trial Objective

This Trial seeks to demonstrate that at peak load when voltage reductions of up to 6% are applied across a range of Primary substations, the demand at that substation is reduced and customers do not observe any adverse effects on their electricity supply. In addition to this the technology required to deliver this on a business as usual basis will be tested.

3.3 Trial Parameters

In a supporting document to the CLASS submission² it was evaluated for the ENWL area that in the next five years with an annual demand increase of 1% the reinforcement of 4.2% of our Primary transformer population could be deferred by a 3% load reduction and 5.6% reinforcement deferment by a 6% load reduction when applied at peak demands.

The actual active and reactive power reduction following a voltage reduction will be dependent upon the type of load connected. Recent practical evidence has shown that the downstream active power reduction when applying a voltage reduction is generally linear. Therefore, to deliver the benefits of the CLASS solution articulated in the study work by the University of Manchester, tests will be conducted on an incremental voltage basis up to a maximum of a 6% reduction.

Across the ENWL network, for current Primary substations exceeding capacity the duration of the excursion outside of rating typically lasts for 2 coincidental half hour periods. Therefore, all tests will be enabled for 60 minutes.

3.4 Site Selection

As set out in the CLASS full submission, this method will be tested on a subset of the CLASS trial area on 14 Primaries. These sites have currently been assigned ENWL Load Index 5³ status or approaching this level and cover all three load categories.

² Feasibility study notes on system benefits from flexible transformer tap changer operation, P. Mancarella, University of Manchester, June 2012.

³ ENWL Load index 5 equates to demand (as a percentage of firm capacity) of greater than 103% for more than 9 half hours in a year.

CLASS is also interested in understanding the feasibility of demand reduction for peak management on rural networks. Many 11kV feeders are designed with voltage regulation being the main consideration, and that a further voltage reduction at peak times may lead to under voltage issues. A number of rural networks have been included within the site selection to assess this.

3.5 Approach to Testing

In order to determine if a specific level of voltage reduction at peak demand causes perceptible effects on a customer's electricity supply, a tiered approach to testing is planned.

A first round of tests will be conducted where a 3% voltage reduction is applied. A series of customer post-event surveys will then be conducted and assessed in conjunction with LV monitored data to determine any adverse effects. The results from this round of surveys will then determine whether two further rounds of tests with a 4.5% and 6% voltage reduction respectively, will be applied to all Primaries within this trial. Customer surveys will then be conducted to evaluate the effects of each level of testing before moving on to the next level of voltage reduction.

All of these tests will be scheduled based on historic loading data of when previous excursions above capacity occurred, so to test at a representative time for when this service would be required.

The voltage reduction will be instigated from the CLASS dashboard and prior to any test the starting voltage will be adjusted to nominal.



Figure 4: Trial 2 implementation process

3.6 Evaluating the onsite technology

A key output from this trial is to understand and test the capability of the Siemens Autonomous Substation Controller (ASC). The device can be pre-set with a maximum demand value for the site and if it detects load approaching this level it automatically initiates the tap changer to start reducing the HV voltage. This would be the preferred method of implementing the peak demand reduction service in a future 'business as usual' scenario, and therefore testing its capability provides valuable learning for any wider roll out.

A series of tests at five Primaries will be conducted using this method of peak demand reduction following the tests outlined above.

3.7 Summary of Trial 2

The key attributes of Trial 2 are summarised in the table below.

Table 5: Summary of Trial 2 - Peak Demand Reduction Summary of Trial 2 Peak Demand Reduction

Objective	Where	When	Technique	Parameters of test
Application of voltage reductions up to 6% at peak times has no adverse effect on customers. The future technology used to apply the voltage reduction will also be verified.	14 Primary Substations	Peak loadings – see test schedule	Lowering tap positions	<i>Up to 6% voltage reduction for up to 60 minutes</i>

4 TRIAL 3 – FREQUENCY RESPONSE BY DEMAND MANAGEMENT

4.1 Why we are carrying out this Trial

System frequency is a continuously changing variable that is determined and controlled by the real time balance between system demand and total generation. National Grid Electricity Transmission (NGET) has a statutory obligation under Electricity Safety, Quality and Continuity Regulations (ESQCR) 2002 to maintain system frequency within 1 percent above or below declared system frequency (50.0Hz), except in abnormal or exceptional circumstances. NGET must therefore ensure that sufficient generation and/or demand is held in automatic readiness to manage all credible circumstances that might result in frequency variations.

The anticipated change towards a low inertia intermittent generation mix in the future is likely to increase the requirement to access system reserves to maintain system stability. Conventional spinning reserve used for frequency and system balancing attracts a high financial and carbon cost. The implementation of the CLASS Solution therefore has the potential to be a cost effective, fast acting and flexible alternative. In particular, the CLASS Solution has the potential to provide a new mechanism for system management for the TSO and significantly reduce the cost of the ancillary services market, and ultimately, the costs to consumers.

4.2 Implementing the CLASS Solution for Frequency Response

There are two types of Frequency Response, dynamic and static response. Dynamic Frequency Response is a continuously provided service used to manage the normal real time changes on the system. While static Frequency Response is usually a discrete service triggered at a defined frequency deviation.

Following an incident where system frequency has exceeded operating limits (49.8 - 50.2 Hz) a combination of Frequency Response and Reserve services are called upon to correct system frequency. The speeds at which these services are implemented determine whether they are used within the Primary timescale (2 - 30 seconds) or Secondary timescale (30 seconds - 30 minutes).





The CLASS Solution aims to utilise the capability and arrangement of our existing assets to provide Static Frequency Response, the details of which are listed below.

Table 6: Summary of CLASS Solution for provision of Frequency Response

CLASS Solution	Asset Ca Response time (seconds)	apability Max. duration (minutes)	Number of Primary Substations included in Trial
Stage 1: Primary Transformer The disconnection of one of a paired arrangement of Primary transformers will result in the voltage supplying the substation load to instantaneously reduce triggering a demand reduction. ⁴ Disconnection of a primary transformer is achieved by automatic on site detection of a low frequency signal.	< 2	30	10
Stage 2: Tap changer Operation Change of secondary (HV) volts at a Primary substation by raising or lowering tap positions and consequently changing level of demand.	~30	30	60

Stage 1 is capable of providing a Static Low Frequency Response which acts within the Primary and Secondary timescale.

Stage 2 is capable of providing a Static Frequency Response which acts over the Secondary timescales (30 seconds – 30 minutes).

NGET currently procure these Frequency Response requirements through a number of commercial services which are open to demand side and distributed energy sources. The table below describes these current commercial services, and which stage of the CLASS Solution could be aligned to the service giving consideration to the service parameters.

Table 7: Summary of CLASS Solution alignment with current commercial services

Commercial Service	CLASS Solution
Frequency Control by Demand Management (FCDM)	Stage 1
Provides frequency response through interruption of demand customers, when the system frequency transgresses the low frequency relay setting on site. The demand customers who partake will provide the service within 2 seconds of instruction and deliver it for up a minimum of 30 minutes. FCDM is required to manage large deviations in frequency, for example caused by the loss of a significantly large generator.	
Firm Frequency Response (FFR) is designed to compliment other forms of frequency response and delivers firm availability. Providers must have the capability to operate in a frequency sensitive mode for dynamic response or change their active power level via automatic relay for a non-dynamic response. The service requires a high speed response of 30 seconds for a minimum duration of 10 minutes.	Stage 1 and Stage 2

⁴ It is assumed that the connected demand is at unity or lagging power factor and the demand reduction is greater than the expected increase in losses.

Fast Reserve (FR) provides rapid and reliable delivery of active power through an increased output from generation or a reduction in consumption from demand sources, following receipt of an electronic despatch instruction from the TSO. Delivery must be within two minutes of instruction and sustain output for 15 minutes.	Stage 2
or instruction and sustain output for 15 minutes.	

4.3 Trial Objective

To test that the installed CLASS technology and existing network assets can deliver Primary and Secondary timescale Static Frequency Response, and ascertain whether customers observe any adverse effects. The parameters of each test (ie trigger, response time and duration) are based upon the delivery benchmarks of current commercial services procured by NGET.

Table 8: Summary of Trial objectives

Use of ENWL Assets	Test	Objective
Stage 1: Trip of Primary transformer	Trigger – automatic on site de Response time – maximum o LF signal and tripping of a Pri Duration - 30 minutes	etection of LF signal (49.7Hz)⁵ f 2 seconds between receiving imary Transformer circuit breaker
Stage 2: Tap Changer Operation	Type 1: Trigger – automatic on site detection of frequency signal at 49.8Hz ⁵ . Response time – <30 seconds Duration - >10 minutes	Type 2: Trigger – response to despatch instruction from NGET Response time – <2 minutes Duration - 15 minutes

The scale of the response will be noted during each test but is not a specific objective of the Trial. Compliance with NGET response size will be evaluated post trial.

4.4 Testing Approach

The frequency response and reserve services outlined could be required and activated at any point throughout the year. However, it is projected that customers would be most likely to observe any adverse effects to the Trial at times of highest demand on the network, for example the tripping of a Primary transformer in a period of peak demand, would cause a larger instantaneous change in voltage than at a lighter loaded period (off peak period).

With a dual objective in this Trial of proving the technical capability and assessing customers' perceptions, a progressive method to testing is to be applied. The Trial period will be split into two seasons (peak and off-peak), the first of which will allow the technology to be robustly tested. With confidence in the technology, implementation in the second season aims to assess customer observation of the tests by repeating all of the tests in the winter peak demand period.

⁵ The frequency thresholds to be used in the Trial are based on historic NGET frequency excursion data. The value of 49.7Hz for Stage 1 equates to approximately 1 excursion beyond this threshold per month. The frequency excursion beyond the Stage 2 values of 49.8Hz typically occurs 3 times per month.

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April 2015

It is deemed sufficient that only a technology test for Stage 2 Type 1 will take place in the off peak season, any collective effects from the co-ordinated tapping at multiple primaries will be captured in the peak season Stage 2 Type 2 test and subsequent survey.

4.5 Involvement of NGET in testing

In order to replicate the Fast Response service, the Stage 2 Type 2 tests will be initiated by a despatch signal from NGET in order to test the communication and control technology required to automatically request these services. The scheduling and resource of each of these tests has been agreed between both parties.

4.6 Summary of Trial 3

The key attributes of Trial 3 are summarised in the table below.

Table 9: Summary of Trial 3 – Frequency Response

Frequency Response <i>Objective</i>	Where	When	Technique	Parameters of test
Detection and sustained response to a low frequency event or electronic despatch signal.	Stage 1 -10 Primary Substations Stage 2 – 60 Primary substations	Across annual cycle - see test schedule	Stage 1 – Trip Primary transformer Stage 2 – lowering tap positions	See requirements for each type of test

5 TRIAL 4 – REACTIVE POWER ABSORPTION

5.1 Why we are carrying out this Trial

A new challenge that is faced by all network operators is managing the unacceptably high voltages that can occur on networks during periods when high Distributed Generation (DG) output coincides with low local demand. This problem of high voltages will progressively worsen as system power factor is further eroded by non-linear loads and by high volumes of non-synchronous DG. The CLASS Solution has the potential to deliver a low cost and quickly deployable alternative to traditional expensive asset solutions for mitigating excessive voltages. If proven to be applicable, the CLASS Solution would have the benefit of being both less expensive and less carbon-intensive.

5.2 Implementing the CLASS Solution for Reactive Power Absorption Capability

If a pair of Primary transformers are operated at different tap positions (ie with staggered taps), a circulating current is introduced around the pair. The circulating current decreases the network power factor and effectively absorbs reactive power from the upstream network. The consequential increase in reactive demand reduces network voltages higher up in the network, but leaves customers voltages unaffected. The method can deliver reactive power absorption capabilities quickly in real time so as to meet the needs of both a DNO and TSO.

5.3 Trial Objective

To test the installed CLASS technology and the existing network assets have the capability to deliver three levels of reactive power absorption at the required times. A successful test will quantify the change in power factor on the 33kV network to demonstrate reactive power absorption.

The data collected during this Trial will be used by the University of Manchester to determine the impact on the distribution network, in terms of losses and network loading, as well as the aggregate effect on the transmission network for voltage control.

5.4 Trial Approach

Simulations indicate that for a typical 4 tap stagger (2 tap up and 2 tap down) that an average reactive power consumption of 0.24MVAr/substation can be seen from the transmission network. Therefore, it is recognised that a co-ordinated aggregated response across a number of substations will be needed to deliver the necessary reactive power requirements. For both DNO and TSO purposes, the service will need to be enabled over a large number of substations. Therefore, the the response areas for testing are as follows; per Grid Supply Point (GSP), per region (north, central and south) and the whole ENWL Trial area.

The service would typically be required during times of lowest load; overnight, weekends and public holidays during the summer months have historically been times of lowest load. The GSP level tests will therefore be conducted between 22:00 - 07:00 throughout the week and sustained for a minimum of 1 hour duration. NGET define the peak high voltage period as 02:00 - 06:00 and the regional and whole area tests will be scheduled and sustained for the duration of this time period.

The level of reactive power absorption is proportional to the number of positions the taps are staggered. Theoretically most tap changers could achieve a maximum of 12 staggered tap positions but the operating voltage may not be at nominal, therefore a realistic figure of four or six staggered taps is considered appropriate. Additionally, across the general population of Primary transformers the reverse power capability may be limited and become a constraint to a higher order of tap stagger.

Again a progressive approach to testing is to be employed by starting with GSP level tests at the minimum tap stagger level of 2 before sequentially increasing the level of tap stagger and the response area. This approach is summarised in the table below.

Response Area	Level of tap stagger	Initiated by
No. 1-15 GSPs	2,4&6	ENWL
3 Regions	2,4&6	ENWL and replicated by NGET
ENWL area	2,4&6	NGET

5.5 Involvement of NGET

The provision of reactive power absorption across a region or whole network area may be a powerful method of mitigating overly high voltages on the transmission network. In order to test the communication and control technology required for the TSO to automatically request these services, a test will be initiated by NGET for each of the regional response areas and whole ENWL area for various levels of reactive power absorption. The scheduling and resource of each of these tests has been agreed between both parties.

5.6 Parallel Provision of Reactive Power and Demand Response Services

The concurrent provision of reactive power and demand response may in the future be required; for example in instances where there are high volts on the transmission network and an abundance of generation on the distribution network. Therefore it is important to test the limits of the tap changer operation and therefore determine the subsequent availability of the two services in parallel.

This will be achieved by replicating all the GSP level tests during the NGET peak high voltage period of 02:00 - 06:00 with 1.5% and 3% increase in nominal voltage and recording whether this can firstly be achieved and subsequently sustained for the four hour period.

5.7 Summary of Trial 4

The key attributes of Trial 4 are summarised in the table below.

Table 10: Summary of Trial 4 –	Reactive power absorption
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Objective	Where	When	Technique	Parameters of test
To test the installed technology can deliver reactive power absorption capability across a number of Primary substations within a defined response area at a selected level of tap stagger.	GSP, regional and ENWL area	Low demand periods – see schedule	Staggering of tap positions	Tap stagger 2, 4 or 6. GSP: 22:00- 07:00. 1 hour duration. Region/ ENWL area: 02:00-06:00. 4 hour duration.

6 CONCLUDING COMMENTS

The Trial Design methodology and associated test schedule presented in this document will be re-evaluated after every quarter period of the Trial to ensure the data collected is appropriate for assessment of the capability of the CLASS Solution. This document should therefore be considered as a 'living document', as it will be updated with any lessons learnt as the series of trials progress.

Throughout the Trial findings will be collated in more detail and communicated to all interested stakeholders via a range of knowledge dissemination routes including conferences, close-down reports and additional white papers. Further information on the CLASS Project can be found on our website at <u>www.enwl.co.uk/CLASS</u>.

7 APPENDIX A - TEST SCHEDULE

7.1 Summary

Undertaking			Season 1				Season 2			Season 3			Season 4	
ondonaling	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15
Baseline Customer Survey	Baseline Customer Survey													
Trial 1								Trial 1				_		
Trial 2						ASC Testing 5 LI5 Primaries				Peak Demand Tests 14 LI5 Primaries 3, 4, 5 and 6% sequential Reductions per site				
Trial 3		Stage 2 ENWL: G NGT: Rej	? Type 2 roup 1-15 gion, Area	Stag Enabled 10	ge 1) Primaries	Stage 2 Type 1 Enabled 60 Primaries			Stag Enabled 10	le 1 I Primaries	Stage 2 ENWL: G NGT: Re	: Type 2 roup 1-15 gion, Area		
Trial 4		Level 2 ENWL: Groups 1-15 NGT: Region, Area	Level 4 ENWL: Groups 1-15 NGT: Region, Area	Level 6 ENWL: Groups 1-15 NGT: Region, Area										

Customer surveys required Involves both Technology Testing

GSP Group	Trial Primaries	0704/2014 14/04/2014 21/04/2014 20/04/	2014	05/05/2014	tind a second	In Inc.	12/05/2014	Triald a	1902	2014	Triada	25852044	-	62/06/201	Ted to 1		COM D	06/2014	200.00	Total 1	16/06/2014			236620	leeks beginning		2001	254	Trease and	er 3	7672014	Tours	tool to tool	14/07/2014	As Torres	27	1/07/2014	14
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Group 4 Harker / Hutton	KIRKEY STEPHEN	Baseline customer surveys		- i	evel 2 INVL) (EN	12 ,2% NL)	Stage 2 Type 2 Central dispatch								Level 4 (ENVIL)	nal4 5,25 NIIL)			┞				+	State 2	2			Level 6 (ENML)	Level 6 1.2%, 2% (ENRL)			$\left \right $			++	+		
	ANNE PIT			+	, i		(ENVIL)			_		(ENNLNGT)		-				-	+	-		+	+ +	Tgps 2 Caretal dispatch (DNILLN)	Level 4 (DNINLINGT)	-	H		-	+ +	-		_	\vdash	++	++	Lavel 6 (ENMLINGT)	
	BURROW BECK				eel2 Lee	12				Stage 2 7/pe 2 Central					Level 4	nel4								,			\square	Level 6	Level 6									
Group 5 Heysham	WESTGATE	assesse customer saveys		a a a a a a a a a a a a a a a a a a a	INWL) 1.5%, (ENII	(2% NL)				dispatch xd (ENWL)					(ENNL) 1.5 (E	S, 25 NHL)												(ENIIL)	1.5%, 2% (ENHL)									
	BAMBER BRIDGE		ModEl		_	Manufit		M	nal i		MeaDi	<u> </u>	Salar	Stage 2	┝─┼	Sec. Sec.		_					Sector			Manali				24		_	and it	\square			_	-
Group 9 Perswortham Ea Rochdale SGT 1	a/	Baseline customer surveys	05:00-09:00	+ +	_	09:30-16:30	+-1	Level 2 (ENVIL) (ENVIL) (ENVIL) (ENVIL)	10-21:00	_	21:00-05:30	┿┥╽	09:00-10:30	Tipe 2 Central dispatch x2	\vdash	10:30-16:00		Level 4 (ENML)	Lavel 4 1.5%, 2% (ENML)	00-17:00	\vdash		17:00-09:00	_		05:30-093			09:30-	16:30	(ENVL)	Level 6 1.5%, 2% (ENML)	10-21:00		21:00-0	630	-	02:00-1
	DOUGLAS ST				+		+ 1					+		(9.0002)	H			-				+	+ +	-			H			+ +	-					ŤŤ		
	BUCKSHAW		Mon-Fit 0100-07:00 07:00-09:00			Man-Fil 09:00-19:00 19:00-01:00		20 20 20	ab-Sun 12-00 19-00		Sat-Sun 1500 21100		Mon-Fit 01:00-07:00 07:00-09:00			Man-Fis 09:00-19:00 19:00-01:00				lar-Sun 22:00 28:00			Sar-Sun 1500 2100			Man-Fit 01:00-07:0 07:00-09:0			Max 09:00- 19:00-	45 19:00 21:00		300	at-San 12:00 18:00		3005 137 25	un 10 20		
Group 19 Penwortham	TARLETON				_			Level 2		_		+		Stage 2 Type 2 Central	\vdash			Level 4	Level 4	_		_	+	_			\vdash			+	Leals	Level G		\vdash	++	++	4 /	
West/Stanah	BLACKPOOL	assesse clatorier saveys		+ +	-		+	(ENVIL) 1.5%, 2% (ENVIL)				+-1		dispatch x2 (ENML)	\vdash			(ENIIL)	1.5%, 2% (ENUL)	-	\vdash	+	+			-	+			+	(ENVL)	(ENVL)		\vdash	++	++	-	
	CECIL ST				+		+					+		-	H			-				+	+ +				++			+ +	-					++	-	
	HINDBLEN RD		Mon-Fit 00:00-06:00 06:00-10:00			Mar-Fit 10:00-16:00 16:00-02:00		Sar 00:00 08:00	10-Sun 10-08:00 10-11:00		5at-Sun 11:00-19:00 19:00-00:00																		Mon 00:00- 06:00-	-Fr 35:00	Stage 1 to-enable	500 560	lan-Fis 30-16:00 30-00:00	Stage 1 Auto-enable	5ax	11:00 A	Dage 1 Jacenable	Sm-5 11:00-1 19:00-0
Group 11 Rochdale / Padiham	KNGGWAY	Baseline customer surveys					+			Level 2 (ENNL)	Level 2 1.5%, 2%	<u> </u>			\downarrow		8 10 4	tage 2 (ge 2 Jentral Ispatch	\downarrow		å	Level 4 DNHL) (DNH	25	_			Ц							Level (ENV)	6 Level 6 1.5%, 2%	++		
	HEADYHEL			+			+ +			_		Level 2 (ENVL/NGT		-	+		a)	xd XWIL)	╞╴╞	-	$\left \right $			Stage 2 Tige 2 Central	Level 4 (DNIIL/NGT	_	+			+	-		-	\vdash		++	Lavel 6 (ENWLINGT)	
	TRINEY																							(DNM_N)	GT)											++		
	HARWOOD		İ	11						Stage 2				İ	1 1					1		İ	11							11								
Group & Keansley	CHANGERHALL	Baseline customer surveys						Lavel 2 (EN/NL) (EN/NL)		Central depatch x0 (ENWL)								Level 4 (EN/AL)	Level 4 1.5%, 2% (ENML)												Level 6 (ENVIL)	Level 6 1.5%, 2% (ENV/L)			+			
	BLACKFRARS		Man-Sun 62:00-09:00			Mon-Gan 09:00-02:00				_		+	62:00-09:00	-	+	Man-Sun 09:00-02:00		_		-		_	+	_		_	$\left \right $		62:00-1	540 3930	Stage 1 to-enable	090	or-San 30-02:00	Stage 1 Auto-enable	++	2	Jage 1 Jo-erable	
	CAMPBELL ST							Level 2				Stage 2 Type 2 Cantral						Instit	Level 4								\mathbf{H}				Inth	Level 6						
Group 7 Keansley Loca	CARR ST	Baseline customer surveys						(ENVL) 1.5%, 2% (ENVL) (ENVL)				dapatch x2 (ENVIL)						(ENML)	1.5%, 2% (ENML)												(ENVL)	1.5%,2% (ENML)						
Group 1 Bold (Manweb	ASHTON-Goborne	Baseline customer surveys	Mon-Sun 00:00-06:00 06:00-09:00	Stage 2 Type 2 Central L dispatch (6	evel 2 ISNAL) (ENI	Mon-Sun 09:00-15:00 15:00-18:00 NL)	+	Ma 18:00 19:00	an-Sun 10-19:00 10-00:00	_		+	Mon-Sun 00:00-08:00 08:00-08:00	_	Level 4 (ENNL) (E	Mon-Sun 09:00-15:00 15:00-18:00 NINU)		_	10 10	lan-Sun 00-12:00 00-00:00		_	+ $+$	_			\vdash	Level 6 (ENML)	Lavel 6 1.5%, 2% (ENRL)	Sun X6:00 X6:00	Same 1	Ma 09:0 15:0	on-Sun 30-15:00 30-18:00	Same	Man3 18:00-1 19:00-1	kan 8:00 10:00	Sam 1	
	SKELMERSDALE			(ENINL)								┿┥╽												_			$\left \right $				to-enable			Advenable			to-enable	
Group 14 Washway Far	NITT GREEN	Baselow customer surveys	Mon-Fis 00:00-06:30 06:30-08:00	+ +	-	Mar-Fit 08:00-19:00 19:00-00:00	+ +	5a 00:00	10-Sun 10-06:30 10-08:00	Level 2 (ENINL)	Level 2 1.5%, 2% (ENML) 1800-0000		Man-Fit 0000-06:30 06:30-08:00		 	Man-Fil 08:00-19:00 19:00-00:00		<u> </u>		lar-Gun 00-06:30 00-08:00	Tipe 2 Central L depatch (F	Level 4 DNHL) (DNH	14 Sal-Sun 02:00-19:00 5) 19:00-00:00	-		Lauri 4	924 75 04	12 2 2	Mar- 08:00- 19:00-	4s 19:00 10:00	<u> </u>	Sa 000 063	#-San 00-08:30 10-08:00	Level	6 Level 5 500 1.5%, 2% (8:00 (ENVL) 19:00	kan 12:00 00:00		Level 6 00:00-0
	UPHOLIAND)								(ENIIL))	dap (ENH	ngt)
Group 8 Maccinefield	BOLLINGTON	Baseline customer surveys		+	_		+	Level 2 (ENVIL) (ENVIL)				Stage 2 Type 2 Central dispatch			\vdash			Level 4 (ENML)	Lavel 4 1.5%, 2% (ENUL)	_			+	_			\vdash			+	Level 6 (ENVL)	Level 6 1.5%, 2% (ENNL)		\vdash	4-+-	++	_	
	S.W. MACCLESFIELD		Mon Sun		-	Mon-Gan		Ma	an-Sun	_	Man-Sun	(ENNL)	Mon-Gue			Man-Gun						-		_		-			Man	San 1	Stage 1	Ster Control	on-Sun	Stage 1	Man	5-m	Stage 1	Man-5
	LONGSIGHT						+ +			_																	H				Stage 1 At-enable			Stape 1 Auto-enable			Stage 1 ito-erable	
	MOSS SIDE (Longright)			Stage 2 Type 2																																		
Group 2 Bredbury	WNFRED RD	Baseline customer saveys	Mon-Fri	Central L dispatch (S XI (ENINL)	avel 2 ISNAL) (ENI	(2% Mar-Fit		Se	e Sun			┿┥╽	Man-Fri		(ENNL) (E	Ni, 2% NINL) Man-Fil		_	<u> </u>	a-Sun		_		_		Man-Fr		(ENML)	1.5%, 2% (ENIIL) Mar	F6	_	51	s-5a	\vdash	++	++	4 !	Mar
	LEVENSHULME		0000-000	-		14:00-17:00 17:00-00:00	+ +	1	7:00	_		+	00:00-14:00		1	17:00-00:00		-		17:00		+	+ +	_		05:00-140			17:00-	10:00	-	1	17:00			++	-	06:00-1
	ROMLEY		Mon-Sun 00:00-06:00 06:00-08:00	-		Mon-Sun 08:00-16:30 16:30-18:00	+	Mo 18:00 19:00	an-Sun 10-12:30 10-03:00		Mbn-Sun 02:03-06:50 06:03-08:50		Mon-Sun 08:00-16:30 16:30-18:00			Mon-Gun 18:00-19:30 19:30-00:00						+		-		Mon-Gu 00:00-001 00:00-001			Man- 08:00- 16:30-	Sun 16:30 18:30	Stage 1 to-enable			Stage 1 Auto-enable		1	Stage 1 ato-erable	Man-3 18:00-1 19:00-0
	GREEN LANE-Altrincham																																		++	\downarrow		
Group 3 Carrientee	CHASSEN RD	Baralina customer annan	MonSun	<u> </u>	evel 2	Mon-Gun	Stage 2 Type 2 Central					+	Modu	_	Louid L	Mar-Gun		_	\vdash	_		_	+ +	_			\vdash	Level 6	Lawid Man	Sun	_	Mar (199	on Sun	\vdash	++	++	4 /	
	RLAM		06:00-12:00	+ I	(ENI	NL) 18:00-02:00	dispatch xCl (ENWL)					+	0600-1200		(6.000.) (6	NINL) 18:00-00:00		+	┼┼			+	+				++	(LANKE)	(ENINL) 06:00-	2:00	Stage 1 to-enable	180	00-00-00	Stage 1 Auto-enable	++		Stage 1 do embie	
	BAGULEY																							Stage 2	1						Stage 1 zo-erable	ΪÌ		Stage 1 Auto-enable	Τİ	1	Rage 1 Jouenable	
	BRIDGEWATER		Mon-Fri 00:00-06:00 06:00-11:00			Man-Fis 11:00-16:00 16:00-00:00		Sar 00:00 04:00	0-04:00 00-11:00		5ar-San 11:03-00:00	(ENVLNGT)	Man-Pri 00:00-06:00 06:00-11:00			Max-Fis 11:00-16:00 16:00-00:00		-	00	ar-sun 30-0e:00 30-11:00			5a-Sun 11:00-00:00	Central dispatch (ENVIL_N)	(ENNILINGT GT)	-			Max- 00:00- 06:00-	*** \$2:00 11:00	_	11:0 16:0	10-16:00 00-00:00		5ar-5 00:00-4 04:00-	4:00 11:00	(ENWLINGT)	Sar-5 11:00-0
Group 12 South	DICKINSON ST WEMSLOW	Baseline customer surveys	Man-Sun		_	Mon-Sun		OR:00	a-sa 10-17:00 ar-Sun	Level 2	Level 2 15%, 2%	+	02:00-07:00	_		07:00-11:00 Mon-Sun	8 70 6	lage 2 (ps 2 Antral	tt.	20-005 20-17:00 tanSun		Level 4	17:00-02:00	_		01:00-060 Mon-Sur			0120-	26-30 26-30	_	090	8-08 8-1700	Levi	1230-0 1730-0 15 Level 6 1.5%, 2%	1.00	-	02:00-0 Man-0
	DIDSBURY		2000-0710			0/10-0/00		CG-CC		(and RC)	(ENVL) TEUD-DEDD					0000-0730	(2	X3 NINL)				(Den	L) 000-100			100-001									(ENINL)			0000-0
	WITHINGTON																																					
	DENTON EAST											+												_			\square					++		\vdash		44		
	OPENSHAW					++				_		+							+				\vdash	-			++					++		\vdash		++		
Group 13 Stalybridge	HIDE	Baseline customer surveys			-		+ +		+ 1	Level 2 (ENINL)	Level 2 1.5%, 2% (ENRL)	+			+ +			-	t t		Stage 2 Tige 2 Central L depatch (Level 4 DNHL) (DNH	14 25 5.)	-			H			+ +	-	1		Level	6 1.5%, 2% (ENVL)	++	\dashv	
	GOWHOLE																				(ENML)																	
	STUART ST		MorFri	+	_	Marilli	+		ko-f ti		Maria	+	545a		$\left \right $	Mar 24		_		ko-F6			Walk	_		-	\square			in l	Stage 1		lan-Fri	State (-Te	Stage 1	
	CENTRAL MANCHESTER		2100-07:00			07:00-10:00		10:00	10-18:00		1805-21:00		00:00-00:00			21:00-07:00			67	00-10-00			10:00-18:00	_		18:00-211			00:00-	x:20	to-enable Stage 1	210	00-07-00	Auto-enable Stage 1	0.00	شد مد ر	Stage 1	10:00-1
Group 15 Whitegate	BELGRAVE	Baseline customer surveys								Lavel 2 (ENINL)	Level 2 1.5%, 2% (\$NML)										Tige 2 Central L depatch (F	Level 4 DNHL) (DNH	14 25 51									<u>i</u> i		Level (CNN)	6 Level 6 1.5%, 2% (ENML)	<u>i</u> i		
	WELOWBANK																				(ENML)																	
Trial 1 Trial 9 Trial 3	Foat Modelion Deal Voltage Detation Concern Decores	KEY 1 top increases followed by decreases in next half 5 as of voltage reduction, number of texts, time a 5 more, automatic enable or depended controlly	tour, time of day Indow ENING or NGTI																																			
Trial 4.b	Reactive Power Absorption and Demand Boost	Level of tap stagger with votage increase applie	d																																			



Timeline for Trials - by season (r1.0) site

GSP Group	Trial Primaries	0 Trial 1 Trial 2	1/09/2014 Trial 3	Trial 4 Trial 1	CE/0	9/2014 Trial 3 Tri	tal 4 Trial 1 Ti	15/09/2014	4 Trial 3 Trial 4	Trial 1	22/09/2014	3 Trial 4	Trial 1 Trial	29/09/2014 2 Trial 3	Trial 4	Trial 1 Trial	06/10/2014	Trial 4 Trial 1	13/10/2 Trial 2	2014 Trial 3 Trial 4	Trial 1 Tria	20'10/2014	Trial 1	27/10/2014	3 Trial 4	0 Trial 1 Trial 2	3/11/2014 Trial 3 Trial 4	10/1 Trial 1 Trial 2
	EGREMONT	Mon-Sun 01:00-05:00		Mon-Su 08:30-15:	n 30		Mon-Sun 17:00-18:30						Mon-Sun 01:00-05:00			Mon-Sun 08:30-15:30		Mon-Sun 17:00-18:3	30				Mon-Sun 01:00-05:00					Mon-Sun 08:30-15:30
		05:00-08:30	┥┝	15:30-17:	00	┥┝	18:30-01:00	_	-		-		05:00-08:30	-		15:30-17:00		18:30-01:0	00				05:00-08:30		—			15:30-17:00
Group 4 Harker / Hutton	KINNDI STEPHEN		┥┝	_		{		_			_			-				_	+ +						<u> </u>			
	ANNIE PIT		_			ļ								_														
	CHATSWORTH ST																											
	BURROW BECK																											
Group 5 Heysnam	WESTGATE		7 [1 [1 1									
	BAMBER BRIDGE	Auto reductio			Auto reduction		A redi	Auto Auction	-	As redu	to ction		Auto	on					1 1									
	A1/7 MILANA	Mon-Fri		Mon-Fr	enabled		Sat-Sun	abled		Sat-Sun	bled		enable	d				Mon-Fri			Mon-Fri		Sat-Sun		+	Sat-Sun		
roup 9 Penwortham East / Rochdale SGT 1	/	09:30-16:30	╡┝	21:00-05:	30		10:30-16:00	_		17:00-09:00	_			-				09:30-16:3	30		21:00-05:30		10:30-16:00		<u> </u>	17:00-09:00		
	GRIFFIN		4			_								_				_	4				+					
	DOUGLAS ST																											
	BUCKSHAW	Sat-Sun 03:00 09:00		Sat-Sur 15:00 21:00									Mon-Fri 01:00-07:00 07:00-09:00			Mon-Fri 09:00-19:00 19:00-01:00		Sat-Sun 03:00 09:00			Sat-Sun 15:00 21:00		Mon-Fri 01:00-07:00 07:00-09:00			Mon-Fri 09:00-19:00 19:00-01:00		Sat-Sun 03:00 09:00
	TARLETON		1																									
Group 10 Penwortham	CLEVELEYS				1				-					1					+ +									
West / Otanian	PLACE/2000		┥┝	_		┥┝		-	-		-			-	\vdash		+	_	+				+		+			+ +
	BLACKPOOL		┥┝	_		{		_			_			-			+ +	_	+ +			+ +	+		<u> </u>			
	CECIL ST		4			↓ ∟					_			_								<u> </u>			<u> </u>			
	HYNDBURN RD	M00-En 00:00-06:00 06:00-10:00		10:00-00: 16:00-00:	00		00:00-08:00 08:00-11:00			11:00-19:00 19:00-00:00																00:00-06:00 06:00-10:00		10:00-16:00 16:00-00:00
Group 11 Rochdale /	KINGSWAY		7 F																									
Padiham	LITTLEBOROUGH		1			1													1 1									
	HEADY HILL							-			-			1					+ +									
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	TRINITY		4 -	_		↓ ⊨		_			4			4	\vdash		+	_				+ $+$	+					
	HARWOOD																											
Group 6 Kearsley	CHAMBERHALL																											
	BLACKFRIARS	Mon-Sun 02:00-09:00	7 F	Mon-Su 09:00-02:	n 00											Mon-Sun 02:00-09:00		Mon-Sun 09:00-02:0	00							Mon-Sun 02:00-09:00		Mon-Sun 09:00-02:00
	LOSTOCK		1																1 1									
	CAMPRELL ST					1 -		_			-			-					1 1						1			
Group 7 Kearsley Local	COMIN DECE OF		┥┝			┨ ┣━		_			-			-	\vdash		+ +	_	+ +			+ +	+		—			
	CARR ST	Max Cox	╡┝	March		↓ ⊨	Marca				_	<u> </u>	No. Co.	_		May Car		Han Car								Max Con		No for
Group 1 Bold (Manweb)	ASHTON-Golborne	00:00-06:00	JL	09:00-15: 15:00-18:	00		18:00-19:00 19:00-00:00						00:00-06:00 06:00-09:00			09:00-15:00 15:00-18:00		18:00-19:0	00							00:00-06:00		09:00-15:00 15:00-18:00
	GOLBORNE	Auto reductio enablec			Auto reduction enabled		A bar en	Auto Auction abled		As redu ena	to ction bled		atuA ittuben sidane	on id														
	SKELMERSDALE													T														
oup 14 Washway Farm	KITT GREEN	Mon-Fri 08:00-19:00	┥╴┝	Sat-Sur 00:00-06:	30	1. –	Sat-Sun 08:00-19:00			Mon-Fri 00:00-06:30			Mon-Fri 08:00-19:00	٦		Sat-Sun 00:00-06:30		Sat-Sun 08:00-19:0			Mon-Fri 00:00-06:30		Mon-Fri 08:00-19:00		1	Sat-Sun 00:00-06:30		Sat-Sun 08:00-19:00
		19:00-00:00	Stage 2 Type 1 Auto-enable	06:30-08:	00	Stage 2 Type 1 Auto-enable	19:00-00:00	Ty Auto	tage 2 Type 1 o-enable	06:30-08:00	Stage Type Auto-en	able	19:00-00:00	Stage 2 Type 1 Auto-enable		06:30-08:00	+ +	19:00-00:0	00		06:30-08:00		19:00-00:00	_	—	06:30-08:00		19:00-00:00
	UPHOLLAND		┥┝	_		↓					_	-		-				_	+				+ +		—			
Group 8 Macclesfield	BOLLINGTON		4			_								_					4 4									
	S.W. MACCLESFIELD																											
	FALLOWFIELD	Mon-Sun 06:00-11:00		Mon-Su 11:00-23	n 00		Mon-Sun 23:00-06:00			Mon-Sun 06:00-11:00			Mon-Sun 11:00-23:00			Mon-Sun 23:00-06:00		Mon-Sun 06:00-11:0	00		Mon-Sun 11:00-23:00		Mon-Sun 23:00-06:00					
	LONGSIGHT		1			1								1					1									
	MOSS SIDE (Longsight)				+						-			-					1 1									
Group 2 Brodhury	MANIFOCD DD		┥┝		-	┥┝		_			-	-		-				_	+ +				+	_	—			
Group 2 Breabury	WINIFRED RD	Mon-Fri	┥┝	Mon-Fr		↓ ⊢	Sat-Sun	_			_	-		-		Mon-Fil	+ +	Mon-Fri			Sat-Sun		+ +		<u> </u>	Mon-Fri		Mon-Eti
	VICTORIA PARK	00:00-06:00 06:00-14:00		14:00-17: 17:00-00:	00	ļ	05:00 17:00									00:00-06:00 06:00-14:00		14:00-17:0 17:00-00:0	00		05:00 17:00					00:00-06:00 06:00-14:00		14:00-17:00 17:00-00:00
	LEVENSHULME	Auto reductio enabled			Auto reduction enabled		A red en	Auto Auction abled		As redu ena	to ction bled		Auto reducti enable	on id														
	ROMILEY	Mon-Sun 00:00-06:00 05:00-08:00		Mon-Su 08:00-16: 16:30-18:	n 30		Mon-Sun 18:00-19:30 19:30-00:00						Mon-Sun 00:00-06:00 05:00-08:00			Mon-Sun 08:00-16:30 16:30-18:00		Mon-Sun 18:00-19:3	30				Mon-Sun 00:00-06:00 06:00-08:00			Mon-Sun 08:00-16:30 16:30-18:00		Mon-Sun 18:00-19:30 19:30-00:00
	GREEN LANE-Altrincham		1			1																						
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	CHABBEN RD	Mon-Sun		Mon-Su	enabled		es	abled		ena	bled	-	enable	d		Mon-Sun	+ +	Mon-Sun				+ $+$	+		—	Mon-Sun		Mon-Sun
Group 3 Carrington	TRAFFORD PARK NORTH	00:00-06:00 06:00-12:00	4 -	12:00-18: 18:00-00:	00	↓ ⊨					_			4		00:00-06:00 06:00-12:00		12:00-18:0 18:00-00:0	00							00:00-06:00 06:00-12:00		12:00-18:00 18:00-00:00
	IRLAM																											
	BAGULEY																											
	BRIDGEWATER		Л Г			1 [
	DICKINSON ST	Sun-Mon Auto reductio		Sun-Mo	n Auto reduction		Sun-Mon A	Auto		Sun-Mon Au	to ction		Auto	20		Sun-Mon	+ +	Sun-Mon			Sun-Mon		Sun-Mon		+			
and the first Management		0200-07:00 enabled		07:00-11:	enabled		11:00-17:00 en	bied		17:00-02:00 ena	bled	-	enable			Mon-Sun		Mon-Sun			Mon-Sun		Mon-Sun		+	Mon-Sun		Mon-Sun
oop 12 ooun wanchesta	WILMSLOW		┥┝	_		↓ ⊨		_			_	<u> </u>		-		06:00-09:00		14:00-17:0	00		17:00-01:00		06:00-09:00			14:00-17:00		17:00-01:00
	DIDSBURY		╡┟																									
	WITHINGTON																											
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	OPENSHAW		4 -	_	-	-		_									+ +	_					+				+	
Group 13 Stalybridge	HYDE																											
	GOWHOLE																											
	STUART ST		1																									
	CENTRAL MANCHESTER	Mon-Fri 21:00-07:00		Mon-Fr	00		Mon-Fri 1P-00-18-00			Mon-Fri 18:00-21:00			Sat-Sun 00:00-00:00			Mon-Fri 21:00-07:00		Mon-Fri	00		Mon-Fri 10:00-18:00		Mon-Fri 18:00-21:00			Sat-Sun 00:00-00-00		Mon-Eri 21:00-07:00
				UV-00-10										-				0.00-1010							+			
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Group 15 Whitegate	BELGRAVE		4 6																									
	WILLOWBANK																											

 Tract
 LOad Modeling
 If up non-set followed by divortation in reach fail frour, time of day

 Trial 2
 Piew Voltage Reduction
 Size of voltage reduction, number of tests, time window

 Trial 3
 Pieware Networks
 Size of voltage reduction, number of tests, time window

 Trial 4
 Pieware Networks
 Size of voltage reduction, number of tests, time window

/2014			17/11	/2014			24/11	/2014	
Trial 3	Trial 4	Trial 1 Mon-Sun	Trial 2	Trial 3	Trial 4	Trial 1	Trial 2	Trial 3	Trial 4
		17:00-18:30 18:30-01:00							
		Sat-Sun 15:00				Mon-Fri			
		21:00				07:00-09:00			
		Sat-Sun 00:00-08:00				Sat-Sun 11:00-19:00			
		08:00-11:00				19:00-00:00			
		Mon-Sun 18:00-19:00							
		19:00-00:00							
		Mon-Fri 00:00-06:30 06:30-08:00				Mon-Fri 08:00-19:00 19:00-00:00			
		Sat-Sun							
		17:00							
		Mon-Sun 01:00-05:00				Mon-Sun 09:00-14:00			
		06:00-09:00				14:00-17:00			
		Mon-Fri 07:00-10:00				Mon-Fri 10:00-18:00			

GSP Group	P Group Truel Muscus EVENDE14 Total Muscus Total Muscus														22/12/	2014	-		29/12/20	14			05/01/2015			Weeks beginni 12/01/2015	ing	1	19/01/	2015	1		26/01/201	5	1	02/0	2/2015	- 1	09/0
		Trial 1 Mon-Sun	Trial 2	Trial 3	Trial 4	Trial 1 Mon-Sun	Trial 2	Trial 3	Trial 4	Trial 1 Mon-Sun	Trial 2	Trial 3	Trial 4	Trial 1	Trial 2	Trial 3	Trial 4	Trial 1	Trial 2	Trial 3	Trial 4 Tr Mor	n Sun	al 2 Trial 3	Trial 4	Trial 1 Mon-Sub	Trial 2 Tr	ial 3 Trial 4	Trial 1 Mon-Sun	Trial 2	Trial 3	Trial 4	Trial 1	Trial 2 1	Trial 3 Tr	rial 4 Trial 1 Mon-Su	Trial 2	Trial 3	Trial 4	Trial 1 Trial 2 Mon-Sun
	EGREMONT	01:00-05:00 1	17:00-19:00			08:30-15:30 15:30-17:00			<u> </u>	17:00-18:30 18:30-01:00					17:00-19:00						01:00	0-05:00 0-08:30		1	8:30-15:30 5:30-17:00			17:00-18:30 18:30-01:00	17:00-19:00		_				01:00-05: 05:00-08:	30		0	8:30-15:30 5:30-17:00
Group 4 Harker / Hutton	KIRKBY STEPHEN																																						
	ANNIE PIT						3% x3 11:00-13:00															4.59 11:00-	6 x3 13:00									11:	6% x3 :00-13:00						
	CHATSWORTH ST															1																							
	BURROW BECK	1							1						3% x3	T			1						1				4.5% x3	1						1	t t		
Group 5 Heysham	WEATONTE														17.00-10.00			-			-				-	_	_	-	17.00-18.00		-			_		-		-	
	WESIGATE																-	_	_	_	_	_		-	_						-		_				$\left \right $	_	
	BAMBER BRIDGE						17:00-18:00																						11:00-15:00										
Group 9 Penwortham East	AVENHAM	05:30-09:30 09:30-16:30				16:30-21:00 21:00-05:30				09:00-10:30 10:30-16:00				16:00-17:00 17:00-09:00										0	Monen 5:30-09:30 9:30-16:30			Monien 16:30-21:00 21:00-05:30			0	9:00-10:30 0:30-16:00			16:00-17: 17:00-09:	00			
Rochdale SGT 1	GRIFFIN															1																							
	DOUGLAS ST																																						
	BUCKSHAW	Mon-Fri (Re-00-19-00				Sat-Sun				Sat-Sun				Mon-Fri		-		Mon-Fri	-		Sat	¢-Sun			Sat-Su			Mon-Fri				Mon-Fr			Sat-Sur				Sat-Sun
	bookarber	19:00-01:00				09:00			<u> </u>	21:00				07:00-09:00			15	00-01:00		-	05	9:00			21:00	_		07:00-09:00			1	9:00-01:00	_	_	09:00		$\left \right $	-	21:00
	TARLETON																																						
Group 10 Penwortham West / Stanah	CLEVELEYS																																						
	BLACKPOOL																																						
	CECIL ST	1 1													1	1		1	1						- 1					-		-	-			1	1		
	HYNDBURN RD	Mon-Fri 00:00-06:00		Stage 1		Mon-Fri 10:00-16:00		Stage 1		Sat-Sun		Stage 1		Sat-Sun 11:00.19:00		Stage 1		<u> </u>		Stage 1			Stage 1		- 	Sta	ge 1			Stage 1			s	itage 1	Mon-Fri	00			Mon-Fri
		06:00-10:00		Auto-enable	_	16:00-00:00		Auto-enable		08:00-11:00		Auto-enable		19:00-00:00		Auto-enable			^	to-enable			Auto-enable			Auto	enable	-		Auto-enable			Auto	o-enable	06:00-10:	00	+	1	:00-00:00
Group 11 Rochdale / Padiham	KINGSWAY								<u> </u>																										_	<u> </u>	<u> </u>		
	LITTLEBOROUGH																																						
	HEADY HILL																																						
	TRINITY															Í																							
	HARWOOD											\vdash										-																	
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Group 6 Kearsley	CHAMBERHALL																																				\vdash		
	BLACKFRIARS	Mon-Sun 02:00-09:00		Stage 1 Auto-enable		Mon-Sun 09:00-02:00		Stage 1 Auto-enable				Stage 1 Auto-enable				Stage 1 Auto-enable			A	stage 1 to-enable	Mor 02:00	n-Sun 0-09:00	Stage 1 Auto-enable	d	1100-Sun 9:00-02:00	Sta Auto-	ge 1 enable			Stage 1 Auto-enable			S Auto	rage 1 io-enable	Mon-Su (2:00-09:	00		o	won-Sun 2:00-02:00
	LOSTOCK																																						
	CAMPBELL ST																																						
Group 7 Kearsley Local	CARR ST															-		-	-					-	-					-						1			
	ACUTON Cohome	Mon-Sun			_	Mon-Sun				Mon-Sun					-		-	-	-		Mor	n-Sun			Mon-Su	-		Mon-Sun		-	-	-	-	-	Mon-Su	1	Stage 2		Mon-Sun
Group 1 Bold (Manweb)	ASH1 ON-Goborne	06:00-09:00				15:00-18:00				19:00-00:00								_			06:00	0-09:00		1	5:00-18:00			19:00-00:00					_		06:00-09:	00	Type 2 Central dispatch	1	5:00-18:00
	GOLBORNE			Auto-enable			3% X3 17:00-18:00	Auto-enable				Auto-enable				Auto-enable			A	to-enable			Auto-enable		17.	3% X3 Sta 100-18:00 Auto-	ge 1 enable			Auto-enable			Auto	tage 1		_	x3 (ENWL)		3% X3 17:00-18:00
	SKELMERSDALE																																						
Group 14 Washway Farm	KITT GREEN	Sat-Sun 00:00-06:30 05:30-08:00				Sat-Sun 08:00-19:00 19:00-00:00				Mon-Fri 00:00-06:30 06:30-08:00				Mon-Fri 08:00-19:00			0	Sat-Sun 100-06:30			Sat 08:00	8-Sun 0-19:00		0	Mon-Fri 0:00-06:30 6:30-08:00			Mon-Fri 08:00-19:00 19:00-00:00			0	Sat-Sun 0:00-06:30 6:30-08:00			Sat-Sur 08:00-19: 19:00-001	00		0	Mon-Fri 0:00-06:30
	UPHOLLAND	0.000.00				12.00 00.00								13.000.00			Ĩ		-																	~			
	DOLL INCTON		_		_												-	-	-		_	_		-			_	-			-		-	_			\vdash	-	
Group 8 Macclesfield	BOLLINGTON	╞																									_				_		_		_		\vdash		
	S.W. MACCLESFIELD										3% X3 17:00-19:00											4.59	19:00						6% X3 17:00-19:00							_			
	FALLOWFIELD	Mon-Sun 06:00-11:00		Stage 1 Auto-enable		Mon-Sun 11:00-23:00		Stage 1 Auto-enable		Mon-Sun 23:00-06:00		Stage 1 Auto-enable		Mon-Sun 06:00-11:00		Stage 1 Auto-enable	1	10n-Sun :00-23:00	A	Stage 1 to-enable	Mor 23:00	n-Sun 0-06:00	Stage 1 Auto-enable	0	Mon-Su 6:00-11:00	Sta Auto-	ge 1 enable	Mon-Sun 11:00-23:00		Stage 1 Auto-enable	2	Mon-Sun 3:00-06:00	S Auto	itage 1 Io-enable					
	LONGSIGHT		3% x3 16:30-20:00	Stage 1 Auto-enable				Stage 1 Auto-enable			4.5% x3 16:30-20:00	Stage 1 Auto-enable				Stage 1 Auto-enable		16	6% x3 30-20:00 A	Stage 1 to-enable			Stage 1 Auto-enable			Sta Auto-	ge 1 enable			Stage 1 Auto-enable			S	itage 1 Io-enable] [
	MOSS SIDE (Longsight)				j								i			Ì	Í			Ì	i		ii	i	Ì	Ì	1	Ì.		Ì	Ì		Ì	1					
Group 2 Bredhury	MINIERED RD	+ +	_		-												-		-+								_	-			-				-		Stage 2 Type 2 Central	-	
,		Mon-Fri				Mon-Fri				Sat-Sun										_	Mo	on-Fil			Mon-Fr	_	_	Sat-Sun			-	_	_	_	Mon-Fri		dispatch x3 (ENWL)	_	Mon-Fri
	VICTORIA PARK	00:00-06:00 06:00-14:00				14:00-17:00 17:00-00:00			<u> </u>	05:00 17:00											00:00	0-06:00 0-14:00		5	4:00-17:00 7:00-00:00			05:00 17:00							00:00-06: 06:00-14:	00		1	1:00-17:00 7:00-00:00
	LEVENSHULME						3% x3 16:30-20:00								4.5% x3 16:30-20:00							6% 16:30-	x3 20:00																
	ROMILEY	Mon-Sun 00:00-06:00 06:00-08:00		Stage 1 Auto-enable		Mon-Sun 08:00-16:30 16:30-18:00		Stage 1 Auto-enable		Mon-Sun 18:00-19:30 19:30-00:00		Stage 1 Auto-enable				Stage 1 Auto-enable		17	3% x3 1:30-18:30 A	Stage 1 do-enable	Mor 00:00 06:00	n-Sun 0-06:00 0-08:00	Stage 1 Auto-enable	0	Mon-Su 8:00-16:30 6:30-18:00	1.5% x3 Sta 30-18:30 Auto-	ge 1 enable	Mon-Sun 18:00-19:30 19:30-00:00		Stage 1 Auto-enable		17:	6% x3 S :30-18:30 Aut	itage 1 Io-enable	Mon-Su 00:00-06: 06:00-08:	00		0	Mon-Sun 8:00-16:30 8:30-18:00
	GREEN LANE-Altrincham								1		3% x3 16:30-18:00					1									4	1.5% x3 30-18:00		1				16	6% x3 :30-18:00	1					
	CHASSEN RD		3% x3						İ – –							1	-	-	-	-		4.59	13	-	-					-	-					6% x3		-	
0	70477077	Mon-Sun				Mon-Sun												-			Mor	n-Sun			Mon-Sun		_				-		-		Mon-Su	17.30-19:00	\vdash		Mon-Sun
or cop 5 carringión	INAPPORD PARK NORTH	06:00-12:00		~		18:00-00:00	~ ~	~				-				-					06:00	0-12:00		1	8:00-00:00					-	_				06:00-12:	00	+ +	1	3:00-00:00
	IRLAM	$ \downarrow \downarrow$		Auto-enable			16:30-18:00	Auto-enable				Auto-enable				Auto-enable			A	do-enable			Auto-enable		16	30-18:00 Auto-	enable			Auto-enable			Auto	o-enable			\square		16:30-18:00
	BAGULEY			Stage 1 Auto-enable				Stage 1 Auto-enable			3% x3 17:00-18:30	Stage 1 Auto-enable				Stage 1 Auto-enable			A	Stage 1 to-enable			Stage 1 Auto-enable			Sta Auto-	ge 1 enable		4.5% x3 17:00-18:30	Stage 1 Auto-enable			S	itage 1 Io-enable					
	BRIDGEWATER																																				I		
	DICKINSON ST	Mon-Thu 00:00-06:00				Mon-Thu 06:00-09:30				Mon-Thu 09:30-17:30				Mon-Thu 17:30-00:00	3% x3	İ		Sat-Sun 100-07:00			Sat	#-Sun 0-10:00			Sat-Sun 4	1.5% x3 00-18:00		Sat-Sun 18:00-01:00		İ		Mon-Thu 0:00-06:00	6% x3		Mon-Th	30			Mon-Thu 1:30-17:30
Group 12 South Manchester	WILMSLOW	Mon-Sun				Mon-Sun 01:00-06:00				Mon-Sun 09:00-14:00				Mon-Sun			0				Mor	n-Sun 0-06:00			Mon-Su 9:00-14:00			Mon-Sun							Mon-Su 01:00.00	00	\vdash		Mon-Sun
		1/:00-01:00				06:00-09:00				14:00-17:00				17:00-01:00			_	_			06:00	0-09:00	+	1	4:00-17:00			1/:00-01:00			-				06:00-09:	00	\vdash	1	100-17:00
	DIDSBURY																		_												_	_					\vdash		
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Group 13 Stalybridge	HYDE																						+													-	$ \downarrow \downarrow$		
	GOWHOLE																																						
	STUART ST																T		T						T	I											I		
	CENTRAL MANCHESTER	Mon-Fri 18:00-21:00		Stage 1 Auto-enable		Sat-Sun 00:00-00:00		Stage 1 Auto-enable		Mon-Fri 21:00-07:00		Stage 1 Auto-enable		Mon-Fri 07:00-10:00		Stage 1 Auto-enable	10	Mon-Fri 100-18:00		Stage 1 to-enable	Mo 18:00	on-Fri 0-21:00	Stage 1 Auto-enable		Sat-Sun 0:00-00:00	Sta	ge 1 enable	Mon-Fri 21:00-07:00		Stage 1 Auto-enable		Mon-Fri 7:00-10:00	S	itage 1 o-enable	Mon-Fri 10:00-181	00			Mon-Fri 8:00-21:00
	MIDDLETON JUNCTION			Stage 1				Stage 1				Stage 1				Stage 1				Stage 1			Stage 1			Sta	ge 1			Stage 1			s	itage 1				-	
				Auto-enable				Auto-enable				Auto-enable				Auto-enable			A	do-enable			Auto-enable			Auto	enable			Auto-enable			Auto	o-enable					
Group 15 Whitegate	BELGRAVE																_																			-			
	WILLOWBANK																																						
Trial1	Load Modeling		KEY	ap increase to a	wed by decisi	use in next has	nou, and of	cary		1																													
Trial 2 Trial 3	Peak Voltage Reduction Frequency Response Reactive Prover ansomers		3u	oure of voitag age, accomance	erable of dispu	ander of 9555, alcheo centraly ap stagger	y (ENVIL OF N	61)		1																													

09/02	/2015			16/02	/2015			23/02	/2015	
ial 2	Trial 3	Trial 4	Trial 1 Mon-Sun	Trial 2	Trial 3	Trial 4	Trial 1	Trial 2	Trial 3	Trial 4
			17:00-18:30 18:30-01:00							
	Stage 2									
	Central dispatch									
	x3 (ENWL)									
_	ì í									
	6% x3				Stage 2 Type 2					
_	11.00-10.00				Central dispatch					
					x3 (ENWL)					
				6% x3						
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			Mon-Fri				Mon-Fri			
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			Mon-Sun 18:00-10:00							
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6 x3 -18:00										
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			Sat-Sun							
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	Stage 2 Type 2									
	dispatch x3									
6 x3 -18:00	(ENWL)									
				6% ×3						
				17:00-18:30						
			Mon-Thu				Sat-Sun			
			17:30-00:00				01:00-07:00			
			Mon-Sun 17:00-01:00							
			Sat-Sun 00:00-00:00				Mon-Fri 21:00-07:00			

GSP Group	Trial Primaries		2/03/2015		09/03/2011	5	1	6/03/2015		23/03/2015		30/03/2015	dal 2		06/04/2015		Weeks beginni 13/0	9 /2015	2	0/04/2015		27/04/2015		04/05/2015		11/05/20	015		18/05/2015		25/05/2015	
	EGREMONT	Mon-Sun 01:00-05:00	Trai 3	Mon-S 08:30-1 16:30-5	un (30	10213 10214	Mon-Sun 17:00-18:30 19:20-01:00	That's Th	Mon-Sun 01:00-05:00 05:00.09:30	2 11013	Mon-Sun 08:30-15:30 15:20.17:00	2		Mon-Sun 17:00-18:30 19:30-01:00	Inal 2 Inal 3	Ingl 4	Mon-Sun 01:00-05:00		4 Inal1 Inal2 Mon-Sun 08:30-15:30	111213	Mon-Sun 17:00-18:30 18:20-01:00	Inal 2 Inal 3	Indi 4 Indi 1	Inal 2 Inal 3	Inal4 Inal	I Inal 2	Inal3 Inal	4 1/1011	That 2 That 3	Indi 4		Trai4
	KIRKBY STEPHEN			10.00*1	~					1																						
Group 4 Harker / Hutton	ANNIE PIT									Stage 2 Type 2 Central			1																			
	CHATSWORTH ST									dispatch (ENWL/NGT)																						
Group 5 Hevsham	BURROW BECK																															
	WESTGATE																															
	BAMBER BRIDGE	Mon.Ed		Man			SatiSus		SatiSin	_ ⊢		_	╡┝	Man Ed			MacRi		Satistic		SatiSup					+				\square		
Group 9 Penwortham East / Rochdale SGT 1	AVENHAM	05:30-09:30 09:30-16:30	Type 2 Central dispatch	16:30-2 21:00-0	:00 :30		09:00-10:30 10:30-16:00		16:00-17:00 17:00-09:00	4 -				05:30-09:30 09:30-16:30			16:30-21:00 21:00-05:30		09:00-10:30 10:30-16:00		16:00-17:00 17:00-09:00											
	GRIFFIN		x3 (ENWL)							- -		_	╡┝												_	+				+		
	DOUGLAS ST	Mon-Fri		Mon-I	8		Sat-Sun	+ +	Sat-Sun	- -	Mon-Fri	_	┤┝	Mon-Fri			Sat-Sun		Sat-Sun							+				+		_
	BUCKSHAW	01:00-07:00 07:00-09:00	-	09:00-1: 19:00-0	:00 :00		03:00 09:00		15:00 21:00		01:00-07:00 07:00-09:00		┥┝	09:00-19:00 19:00-01:00			03:00 09:00		15:00 21:00													_
Group 10 Penwortham	CLEVELEYS		Stage 2 Type 2 Central		+ +	_		+ +					┥┝			$\left \right $				+						+	_	+		+		_
West / Stanah	BLACKPOOL		dispatch x3 (ENWL)			_				\dashv \vdash		_	┥┝													+				+		-
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	HYNDBURN RD	Mon-Fri 00:00-06:00		Mon-1 10:00-1	i 100		Sat-Sun 00:00-08:00		Sat-Sun 11:00-19:00				1													1 1						
Group 11 Rochdala /	KINGSWAY		1	14.000	S T	tage 2 ype 2				1			1							1						1 1						
Padiham	LITTLEBOROUGH				di (E	spatch x3 NWL)				Stage 2			1																			
	HEADY HILL									Type 2 Central dispatch (ENWL/NGT																						
	TRINITY																															
	HARWOOD																															
Group 6 Kearsley	CHAMBERHALL				_					_			-																			
	BLACKFRIARS	Mon-Sun 02:00-09:00		Mon-S 09:00-0	1:00					-			-	Mon-Sun 02:00-09:00			Mon-Sun 09:00-02:00															
	LOSTOCK				+ +								┥┝												_					+		
Group 7 Kearsley Local	CAMPBELL ST		+		+ +			+ +		- -		_	┥┝							+						+				+		
	ASHTON-Golborne	Mon-Sun 00:00-06:00		Mon-S 09:00-1	un 200	_	Mon-Sun 18:00-19:00		Mon-Sun 00:00-06:00	- -	Mon-Sun 09:00-15:00	-	┥┝	Mon-Sun 18:00-19:00			Mon-Sun 00:00-06:00		Mon-Sun 09:00-15:00		Mon-Sun 18:00-19:00				_	+				+		
Group 1 Bold (Manweb)	GOLBORNE	06:00-09:00		15:00-1	100		19:00-00:00		06:00-09:00		15:00-18:00	_	┥┝	19:00-00:00			06:00-09:00		15:00-18:00	+	19:00-00:00					+				+		-
	SKELMERSDALE																									+						
Group 14 Washway Farm	KITT GREEN	Sat-Sun 08:00-19:00		Mon-1 00:00-0	H 130		Mon-Fri 08:00-19:00	Type 2 Central dispatch	Sat-Sun 00:00-06:30		Sat-Sun 08:00-19:00		Stage 2 Type 2	Mon-Fri 00:00-06:30			Mon-Fri 08:00-19:00		Sat-Sun 00:00-06:30		Sat-Sun 08:00-19:00					+						
	UPHOLLAND	1.00000						x3 (ENWL)		1			dispatch (ENWL/NGT)																			
Course & Managhan Solid	BOLLINGTON																															
Group & Macciesheid	S.W. MACCLESFIELD																															
	FALLOWFIELD										Mon-Sun 06:00-11:00			Mon-Sun 11:00-23:00			Mon-Sun 23:00-06:00		Mon-Sun 06:00-11:00		Mon-Sun 11:00-23:00		Mon-Sun 23:00-06:00									
	LONGSIGHT																															
	MOSS SIDE (Longsight)											_												_		+				\square		
Group 2 Bredbury	WINIFRED RD	Mon-Fri	+ +	Mon-I	8	_	Sat-Sun	+ +		+ $+$		_	╞	Mon-Fri			Mon-Fri		Sat-Sun	+ +					_	+ +				+		
	VICTORIA PARK	00:00-06:00 06:00-14:00		14:00-1 17:00-0	1:00 1:00		05:00 17:00			+ $+$		_	-	00:00-06:00 06:00-14:00			14:00-17:00 17:00-00:00		05:00 17:00						_	+						
	ROMI EX	+ +			+			+	_	+ +	Mon-Sun	-	╞	Mon-Sun			Mon-Sun		Mon-Sun		Mon-Sun re-co. 46-20		Mon-Sun			+				+		_
	GREEN LANE-Altrincham										06:00-08:00	-		16:30-18:00			19:30-00:00		06:00-08:00		16:30-18:00		19:30-00:00		_					+		
	CHASSEN RD																															
Group 3 Carrington	TRAFFORD PARK NORTH	Mon-Sun 00:00-06:00		Mon-S 12:00-1	un 1:00							-		Mon-Sun 00:00-06:00			Mon-Sun 12:00-18:00													+		
	IRLAM			0-0031										06.00-1200																		
	BAGULEY											Stage 2																				
	BRIDGEWATER											Type 2 Central dispatch (ENWL/NGT																				
	DICKINSON ST	Sat-Sun 07:00-10:00		Sat-S 10:00-1	n 1:00 S	tage 2 Vpe 2	Sat-Sun 18:00-01:00		Mon-Thu 00:00-06:00		Mon-Thu 06:00-09:30)		Mon-Thu 09:30-17:30			Mon-Thu 17:30-00:00		Sat-Sun 01:00-07:00		Sat-Sun 07:00-10:00		Sat-Sun 10:00-18:00		Sat-Su 18:00-01	n 100						
Group 12 South Manchester	WILMSLOW	Mon-Sun 01:00-06:00 06:00-09:00		Mon-5 09:00-1 14:00-1	un C 1000 de 1000	Sentral spatch x3	Mon-Sun 17:00-01:00		Mon-Sun 01:00-06:00 06:00-09:00		Mon-Sun 09:00-14:00 14:00-17:00			Mon-Sun 17:00-01:00			Mon-Sun 01:00-06:00 06:00-09:00		Mon-Sun 09:00-14:00 14:00-17:00		Mon-Sun 17:00-01:00									\square		
	DIDSBURY				(E	(WIL)						_																		\square		
	WITHINGTON											_																		+		
	DENTON EAST											-														+				+		
	DROYLSDEN EAST		+		+							-								+						+				+		
Group 12 Stabbilder	OPENSHAW							Stage 2 Type 2 Central				-																		+		
- Sup is callyonige	GOWHOLE							dispatch x3 (ENWL)				-				$\left \right $														+		
	STUART ST							+																						++		
	CENTRAL MANCHESTER	Mon-Fri 07:00-10:00	+	Mon-1	H		Mon-Fri 18:00-21:00	- F	Sat-Sun 00:00-00:00		Man-Fri 21:00-07:00			Mon-Fri 07:00-10:00			Mon-Fri 10:00-18:00		Mon-Fri 18:00-21:00		Sat-Sun 00:00-00:00					+				+		
	MIDDLETON JUNCTION			1000				Stane 2																								
Group 15 Whitegate	BELGRAVE							Type 2 Central dispatch																								
	WILLOWBANK							X3 (ENWL)																								
Trial 1	oad Modeling	1 tap increase followed b	KEY ay decrease in next h	alf hour, time of day			3																									
Trial 2 Trial 3 Trial 4	- wak voltage Reduction Frequency Response Reactive Power Absorption	Size of voltage reduction Stage, automatic enable	or dispatched centra	me window ally (ENWL or NGT)			1																									