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RESPOND

Innovative Active Fault Management

Webinar

Thursday 28th September 2017

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Paul Marshall

Project Manager

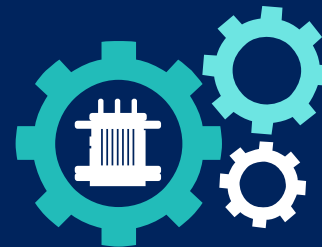
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RESPOND



Introduction

Project overview

Respond techniques



Trials & analysis

Customer

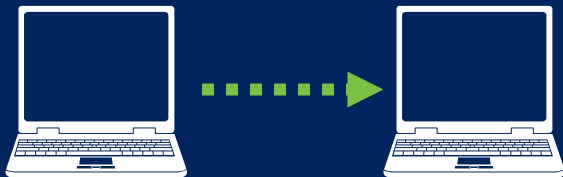
Next steps



30 minutes presentation



20 minutes
questions & answers



Submit written questions
online during the webinar



**Paul
Marshall**
Respond
Project
Manager



Paul Turner
Innovation
Manager



Steve Stott
Innovation
Engineer



Kieran Bailey
Trials &
Analysis Lead



**Tracey
Kennelly**
Innovation
Customer
Delivery Lead



Competitive competition

Funded by GB customers

Learning, dissemination & governance

Fourth of our five successful Tier 2 / NIC projects



Investment

£5.5
million

Project
Starts
Jan 2015

Site
selection
May 2015

Design
Nov 2015

System
installation
& Go Live
May 2016

Post fault
analysis
Apr 2018

Purchase
FCL
customer
Apr 2018

Safety
case
Sep 2018

Closedown
Oct 2018



Financial
benefits

Up to £2.3bn
to GB by
2050

Project partners

KELVATEK





Faster and cheaper to apply than traditional reinforcement



Will deliver a buy order of fault level mitigation solutions based on a cost benefit analysis



Facilitates active management of fault current, using retrofit technologies and commercial services



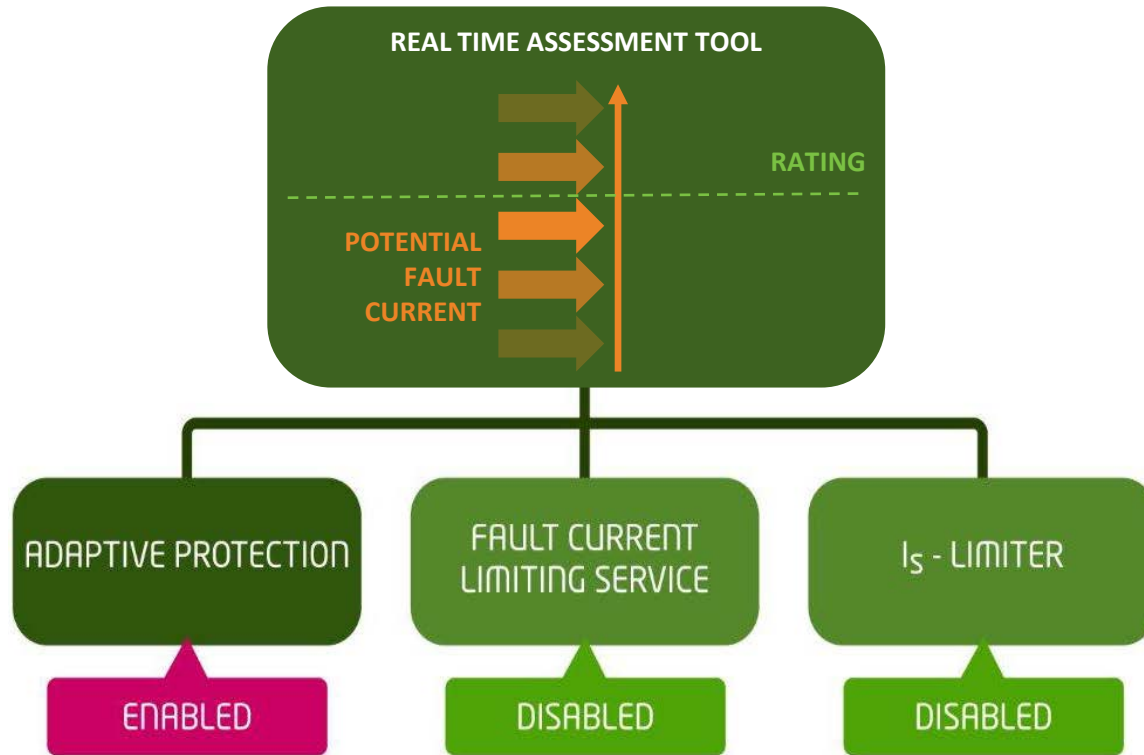
Enables a market for the provision of a FCL service



Uses existing assets with no detriment to asset health

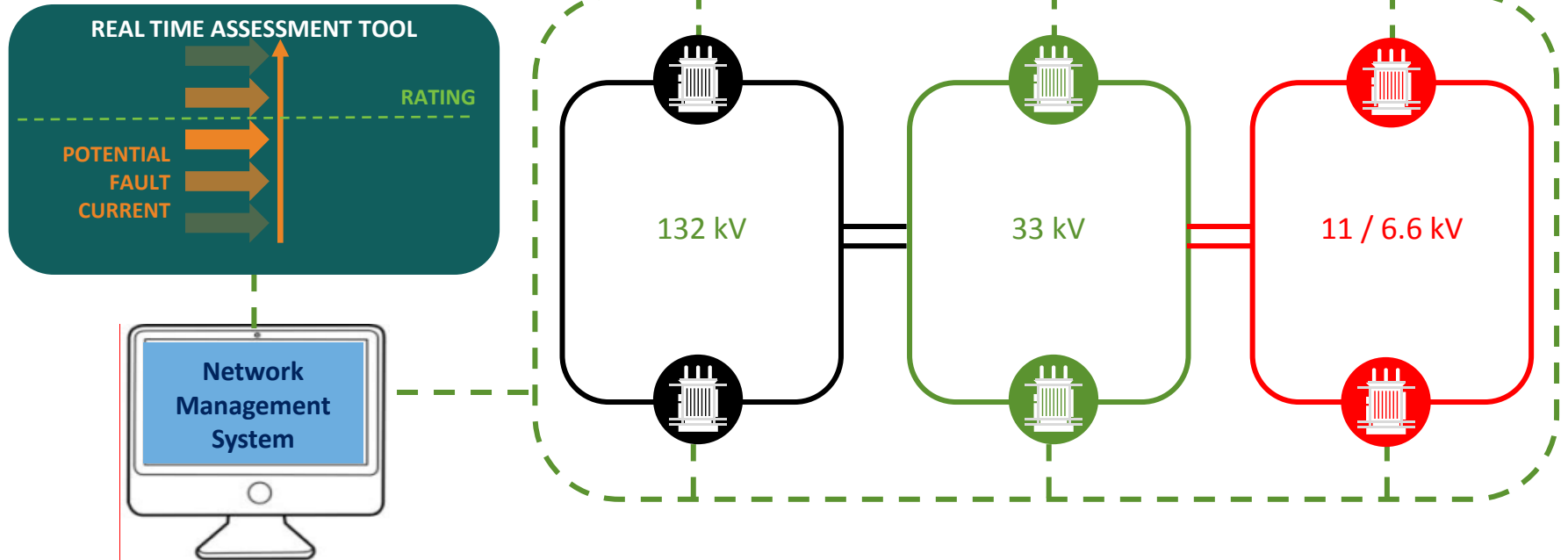


Reduces bills to customers through reduced network reinforcement costs



- Real time fault current assessment
- Safe network operation
-

Respond network model



Real Time ● FL Calculation ● Comparison ● Action



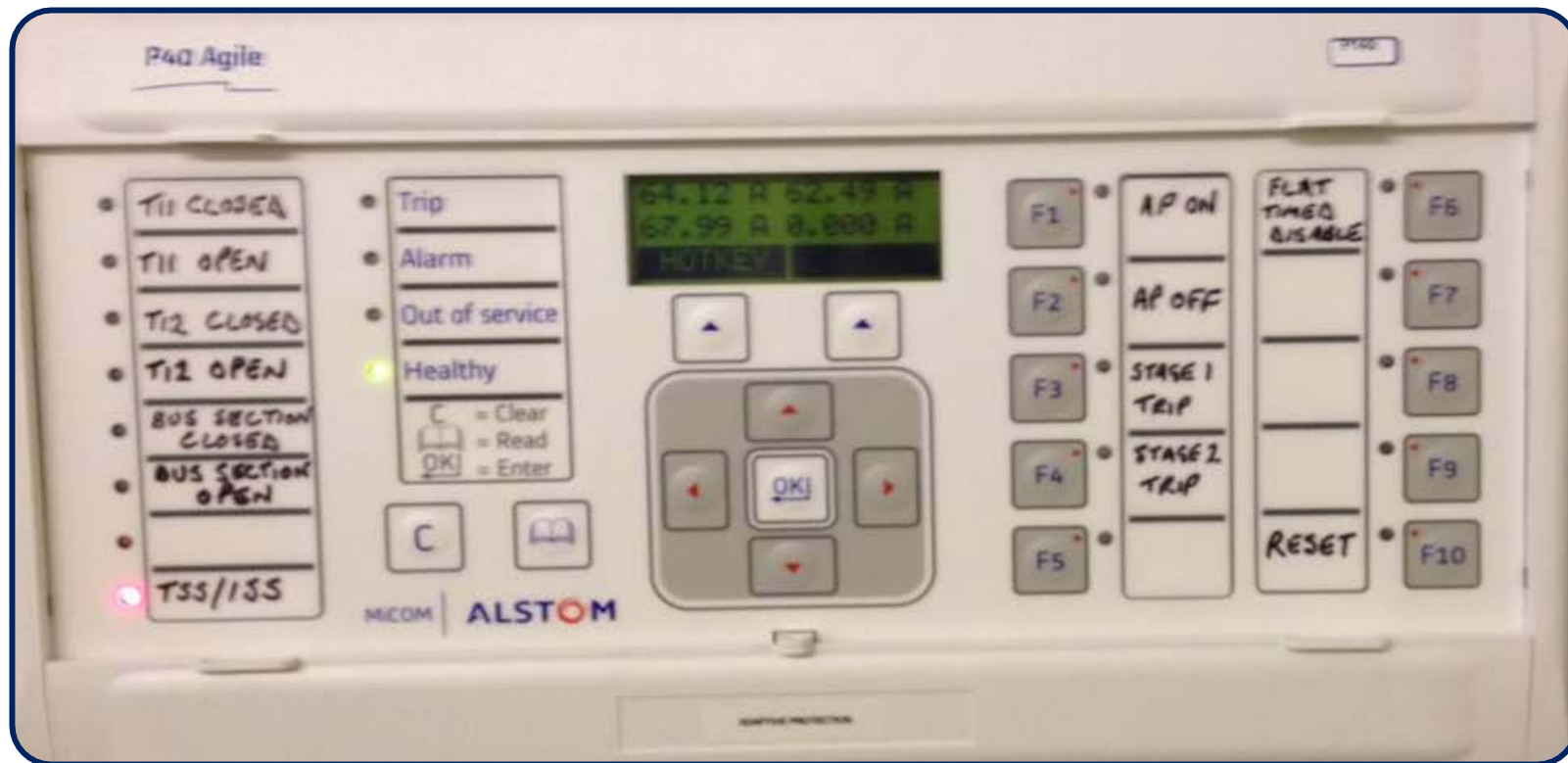
Network already designed to break fault current



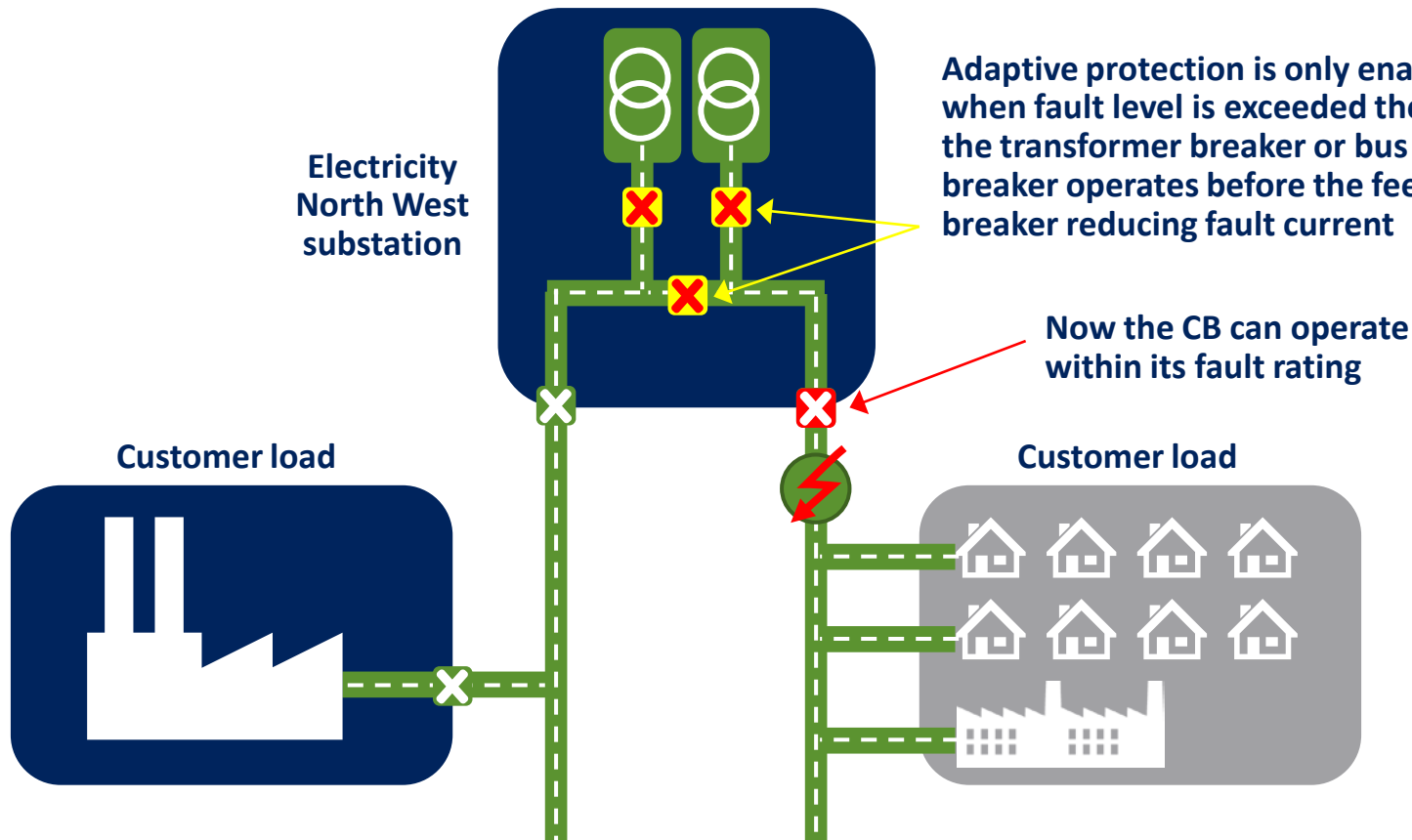
Adaptive protection changes the order in which circuit breakers operate to safely disconnect the fault



Using redundancy in the network ensures no other customers go off supply



Adaptive protection



I_s-limiters – two sites and five sensing sites



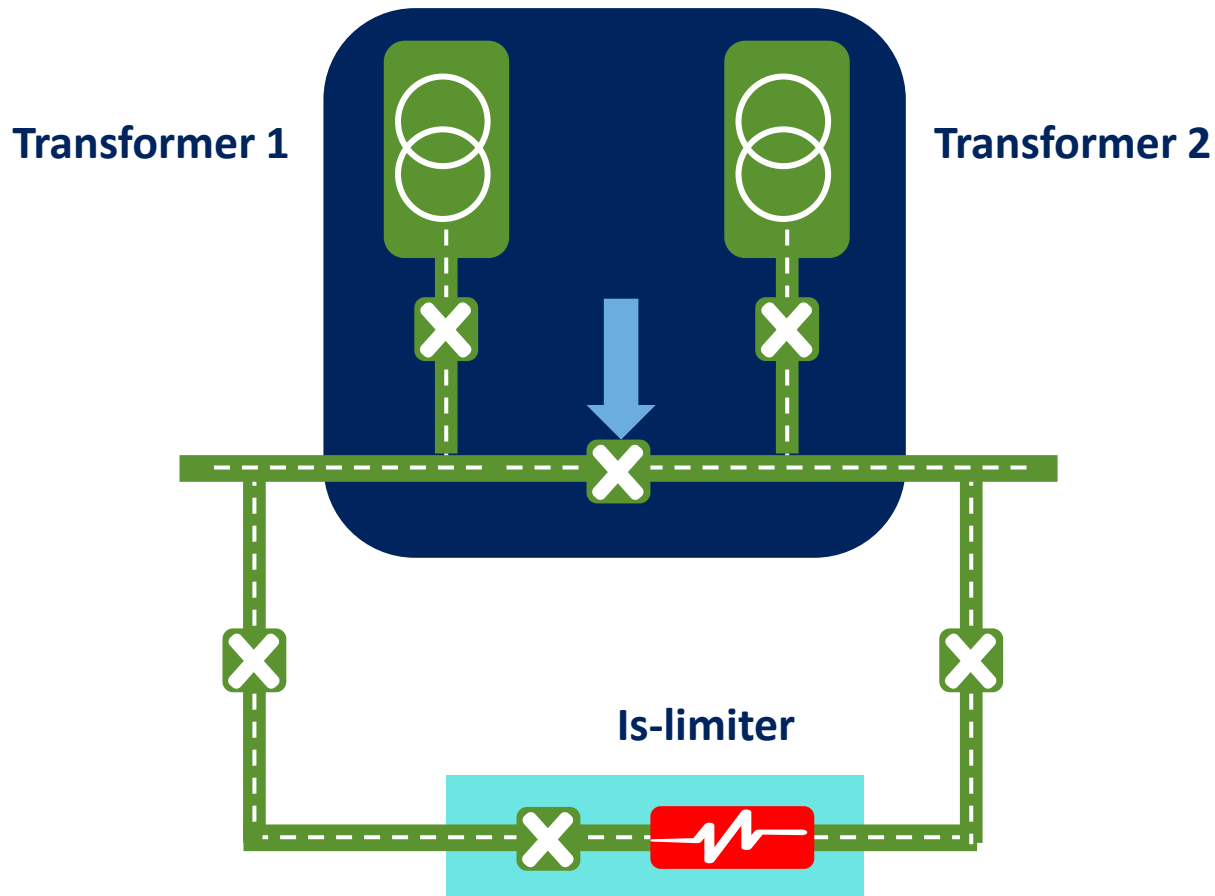
Operates within
5 milliseconds or 1/200th of a
second

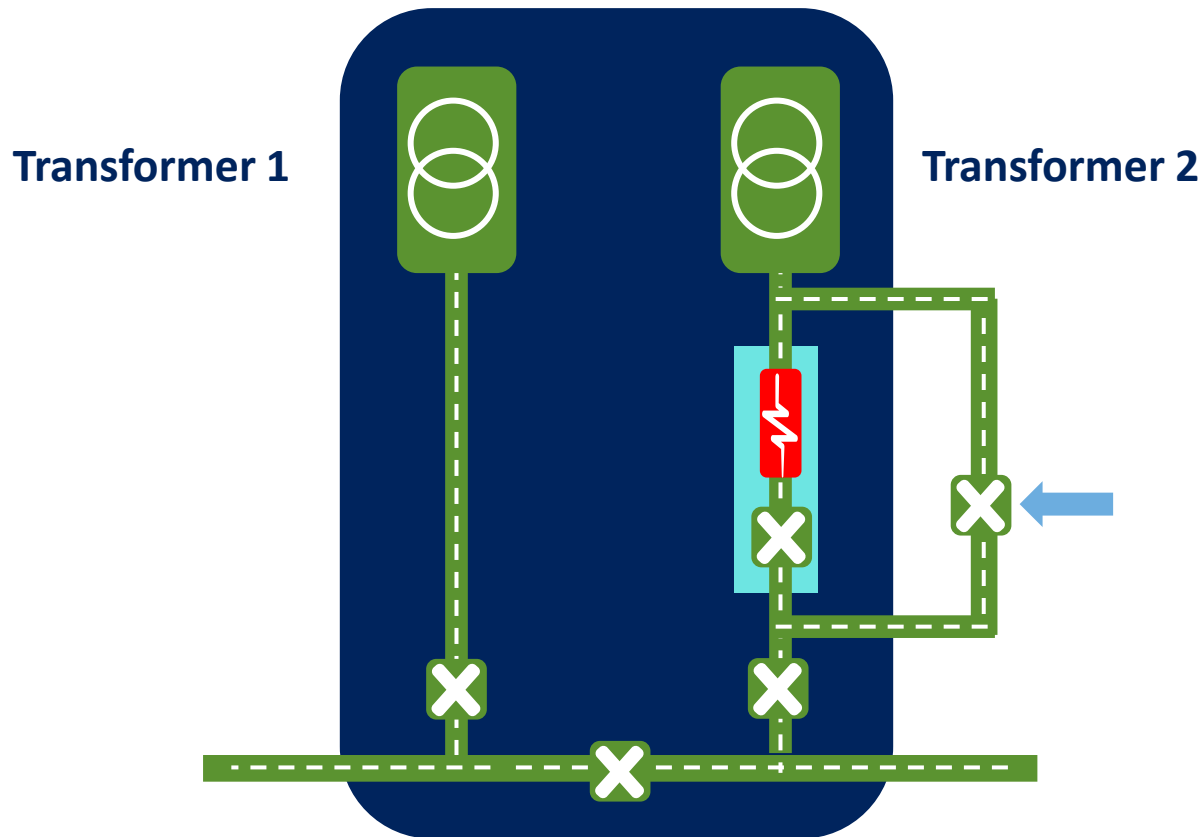


Detects rapid rise in current
when a fault occurs and
responds to break the
current



Respond will prove the
technology, review safety
case and deploy at two sites



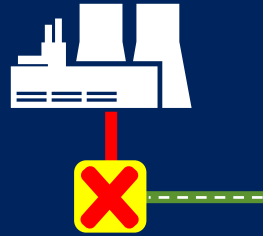






Fault Current Limiting (FCL) service

Two UU sites & three external sites



Fault current generated by customers can be disconnected using new technology



Financial benefits to customers taking part and long term to all customers



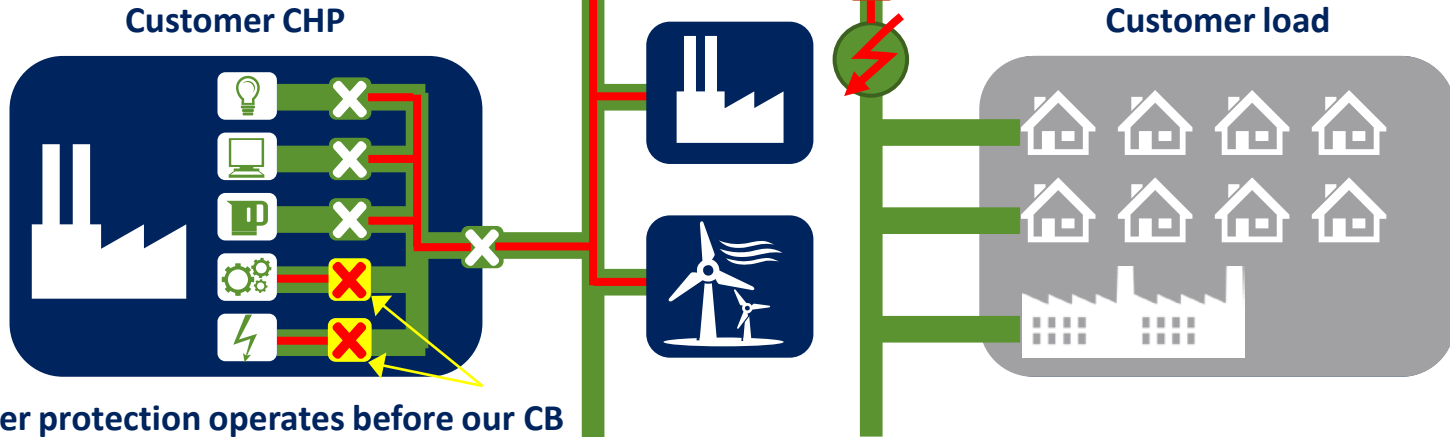
Challenge is to identify customers to take part in a trial of the FCL service

Fault Current Limiting service



FCL service is only enabled when fault level is exceeded then the customer's breaker operates before the feeder breaker reducing fault current

Electricity North West substation





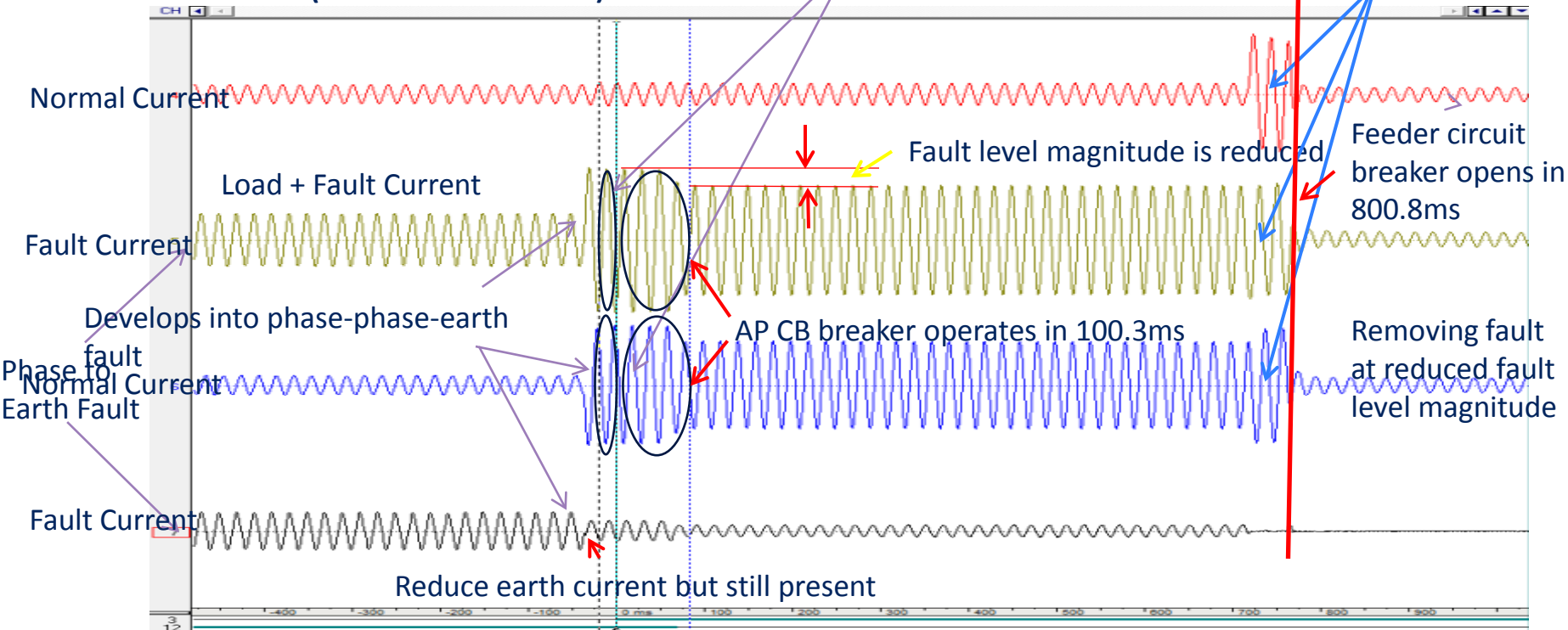
Substation	FLM technique	No of Network faults out of Substation	No of primary substation trips	No of successful operations	No of failures
Bamber Bridge	HV Is Limiter bus section	8	4	2	0
Broadheath	HV Is Limiter Incomer	9	3	0	0
Atherton Town Centre	HV Adaptive Protection	15	5	3	0
Denton West	HV Adaptive Protection	0	0	0	0
Blackbull	HV Adaptive Protection	10	1	1	0
Irlam	HV Adaptive Protection	1	1	1	0
Littleborough	HV Adaptive Protection	6	2	2	0
Monton	EHV 33kV AP	0	0	0	0
Offerton	EHV 33kV AP	0	0	0	0
Athletic St	EHV Is sensing	0	0	0	0
Wigan	EHV Is sensing	0	0	0	0
Longridge	HV Is sensing	29	5	0	0
Nelson	HV Is sensing	8	3	0	0
Hareholme	HV Is sensing	15	3	0	0
	Totals	100	26	9	0



Adaptive Protection sees the Fault and operates in 35.5ms

Develops into a 3 phase fault

Disturbance Record (T11 and T12 currents)



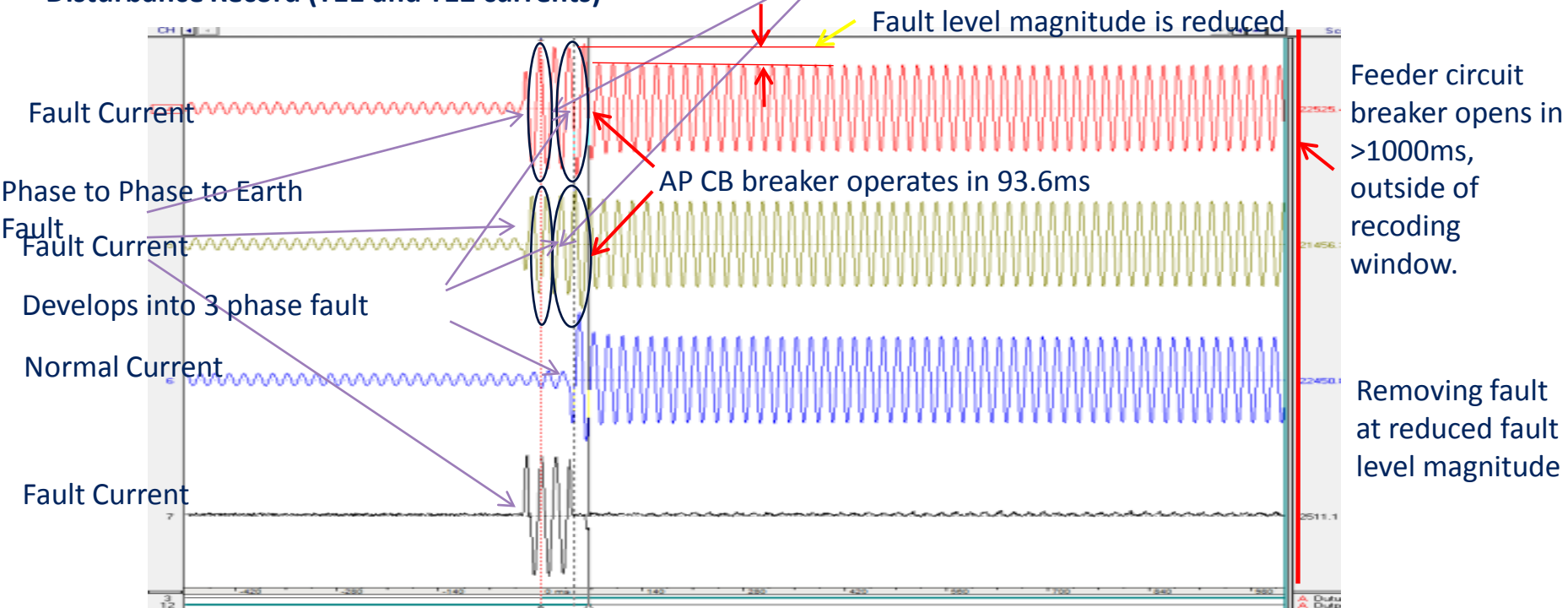
Atherton Town Centre – Thomas St/Holland St 11kV cct

28 August 2016



Adaptive Protection sees the Fault and operates in 23.7ms

Disturbance Record (T11 and T12 currents)

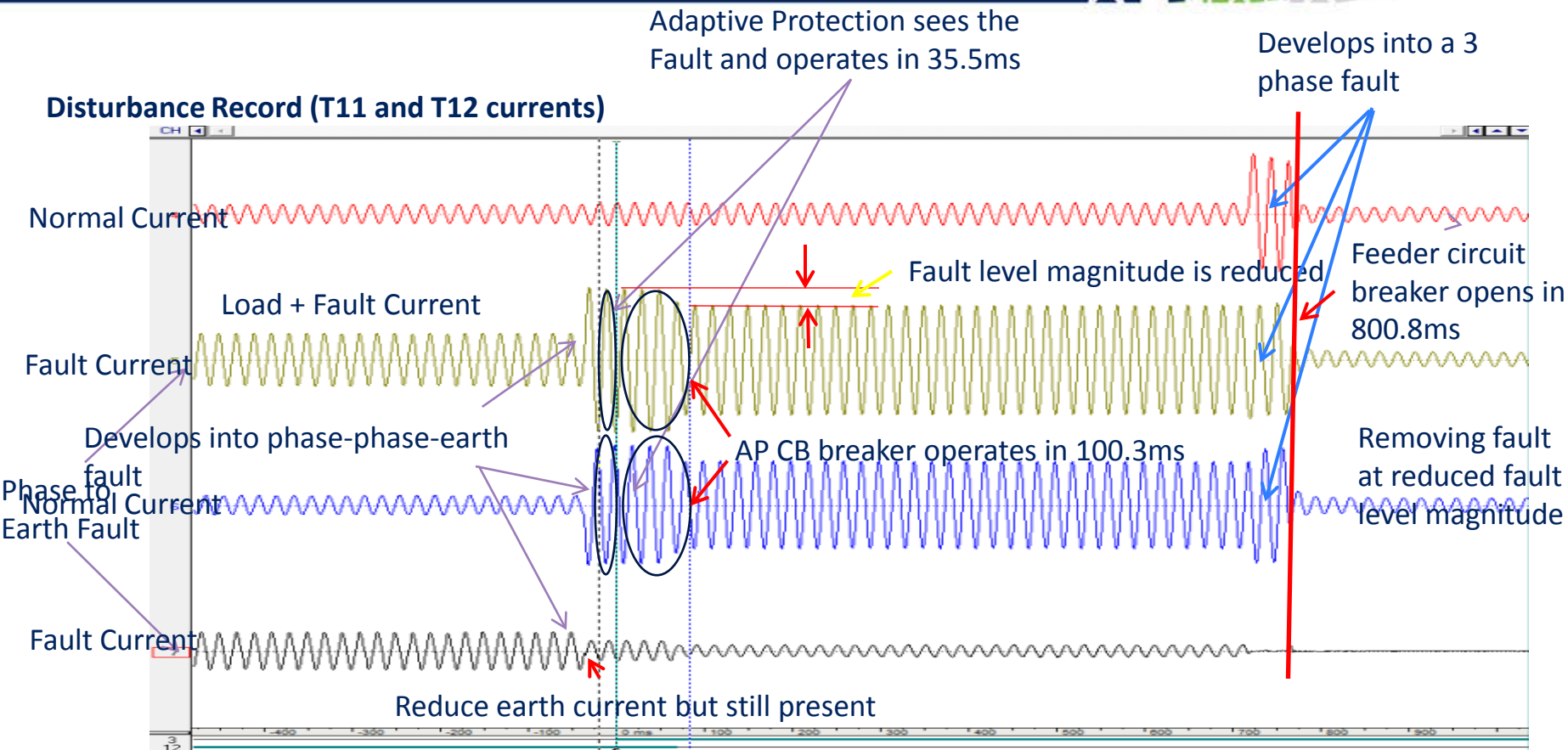


Atherton Town Centre – Collier Brook 11kV cct

19 September 2016



Disturbance Record (T11 and T12 currents)





1

Incident started as phase to phase fault on Lansdown Hill South 6.6 kV feeder

2

Adaptive Protection Stage 1 operated which tripped the 6.6. kV bus section circuit breaker

3

Lansdown Hill South feeder protection relay detected the fault, but did not operate as the fault was cleared by a mid-point circuit breaker at Lansdown Hill

4

Mismatch between disturbance recorder settings and the programmable scheme logic within the AP relay mean that disturbance recordings were not triggered

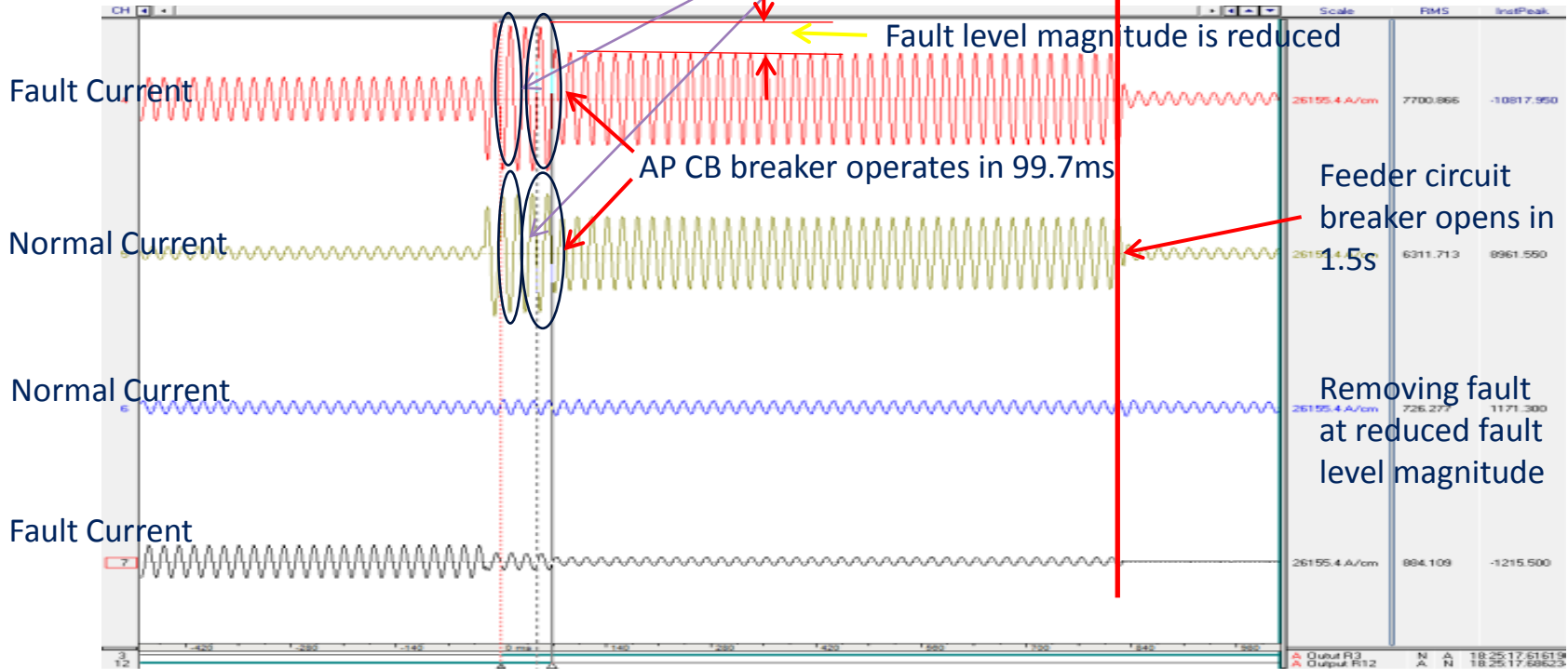
5

Analysis shows that AP operated correctly to trip the bus section circuit breaker which reduced the fault current but the extent of the reduction cannot be quantified without a disturbance record



Adaptive Protection sees the Fault and operates in 18.5ms

Disturbance Record (T11 and T12 currents)





1

The red phase I_S -limiter responded to a fault and operated to interrupt the fault

2

The time interval between the Bamber Bridge local feeder earth fault alarm and the tripping of the I_S -limiter was 10 ms

3

The series circuit breaker opened 51 ms after the tripping of the I_S -limiter

4

The event-log indicates that the Bamber Bridge local 11 kV protection relay operated 1.371 secs after the I_S -limiter series CB opened

5

No waveforms are available

Bamber Bridge red phase fuse



Bamber Bridge yellow phase fuse



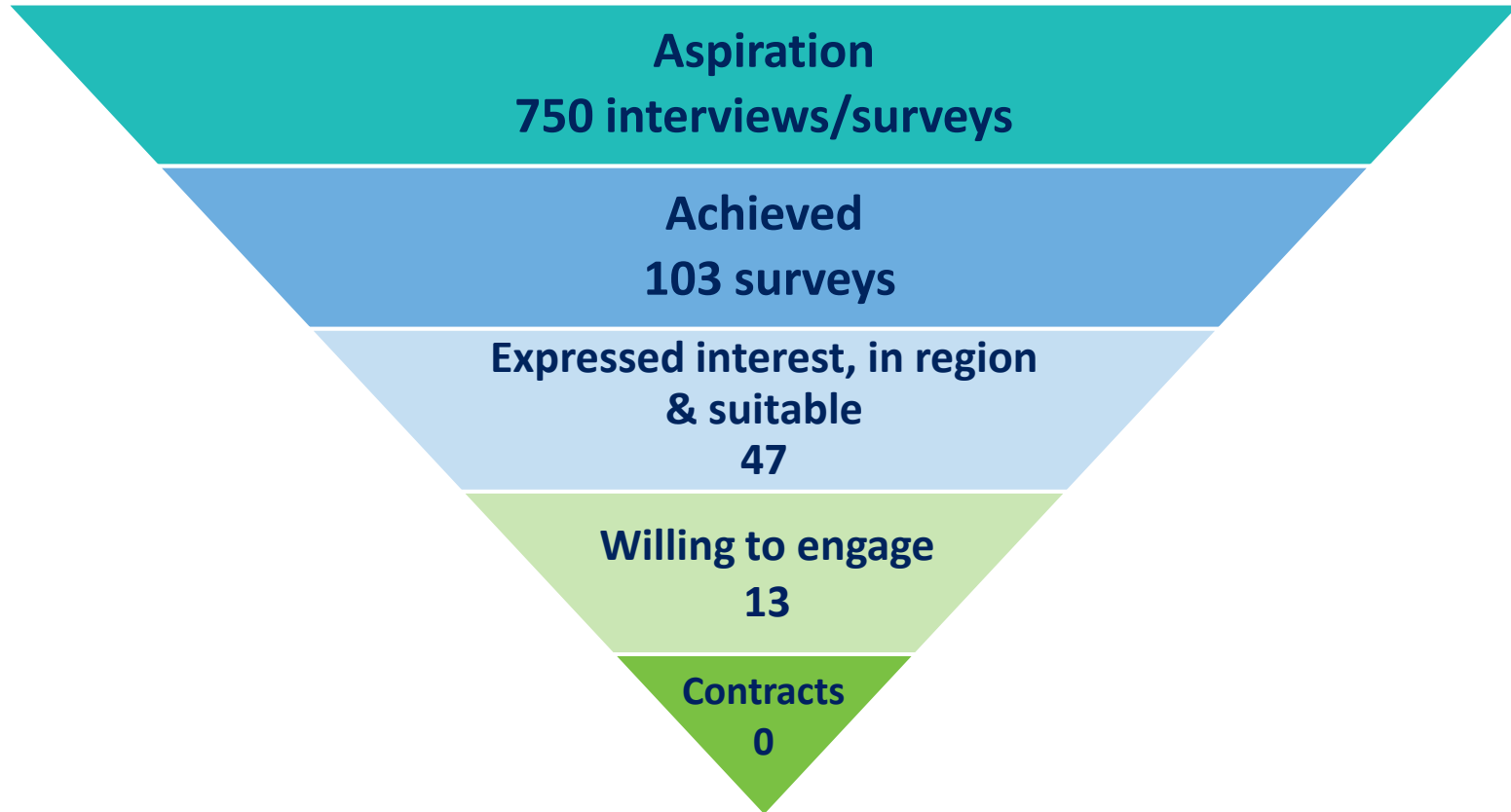


Survey analysis
'appeared to prove'
the hypothesis that the

**Respond method enables a
market for an FCL service**



A target market was
identified of customers from
**non-manufacturing
industries** and those
**'able to constrain their motor
or generator'**
for up to 10 minutes, without
significant impact



Risks - barriers to transitioning from interest to agreeing terms



Essential to have electricity available 24/7 or a 10 minute constraint would have significant impact
Connection not within project timescale or not connected in parallel



Nervousness about the number of constraints
Long and short term impact on equipment / increased maintenance



Impact on operation of their business & loss of export ability
Breach of service level agreements (Triad & capacity market) & reputation



Unease at relinquishing control of equipment
Arrangements for re-closure / having staff on standby



Financial incentive = key driver for target market
But only if sufficient to offset all risks AND the revenue from other commercial arrangements



DNO community must develop greater commercial understanding of its target market



Transition from expression of interest to active participation in FCL service identifies need for greater awareness



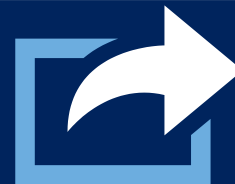
Loss of critical plant, even for a short duration, can have a significant impact



Assessment of risk verses the incentives and saving available is fundamental in an organisation's decision-making process



Conflicts with other services are a significant barrier
DNOs need to better understand services already available in expanding and competitive marketplace



While there are potential conflicts, equally there could be possible synergies which warrant further investigation



Continue to deploy the FLAT and the three techniques



Trial ongoing until May 2018



Examine the key questions and hypotheses



Customer recruitment phase for FCL service



Build safety cases for each of the techniques



Examine the relative benefits versus financials for the three techniques



Paul Marshall
Respond Project
Manager



Paul Turner
Innovation
Manager



Steve Stott
Innovation
Engineer



Kieran Bailey
Trials & Analysis
Lead



Tracey Kennelly
Innovation
Customer
Delivery Lead



Submit written questions online



	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
Today's webinar was successful in raising my understanding of the Respond project			8.3%	33.3%	58.3%
Webinars are suitable channels for communicating innovation project outcomes and are more convenient than attending an event in person.			8.3%	41.7%	50%
I will take part in other webinars organised by Electricity North West to discuss low carbon projects.				16.7%	83.3%
Do you have any comments or suggestions about how we could have improved today's webinar?	<ol style="list-style-type: none"> 1. Not sure what happened today but i lost the telephone audio with the synchronized slides on the web. Hence, i had to dial in separately to hear the webinar. Will the today's webinar be available on the public domain for us to go through separately? 2. perfect done - thank you 3. Maybe start at quarter past the hour. It can be tricky to get into a meeting room and be set up right away. 				



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