Innovation

Responding to the needs of customers

Dan Randles

Network Performance & Innovation Manager

3 October 2014

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Connecting the North West

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5 million

2.4 million

23.5 terawatt hours

£12.3 billion assets

UK energy challenges

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2014
1/3 gas
1/3 electricity
1/3 oil

2020
34% CO_2 reduction
40% from wind / PV and new nuclear
5% transport 120,000 electric vehicles
26 million smart meters fitted

2050
80% CO_2 reduction
Significant increase in electricity demand

RIIO-ED1
Traditional reinforcement unaffordable
DG represents the most immediate challenge

Uncertainty in future demand and generation ● Difficult to predict demand ● More pressure to meet customers' needs at minimum cost

Our innovation strategy

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Built around stakeholder priorities

Affordable reliability	Adoption rates for LCTs driving Network loads beyond existing capacity coupled with ageing infrastructure and a need to improve reliability of supply.
	Continued unpredictability in economic growth in the region
	High levels of DG necessitating optimisation of output or alternative methods for the storage of excess energy and greater flexibility in network loading and capacity
Customers	Customers demanding greater transparency over the way in which they are charged for electricity and more control over their own electricity consumption
	Demands for improved quality of service
	Extensive smart meter roll-out
Sustainability	Greater demands for electricity as more customers switch from gas
	Domestic use increasing by up to 20% through the connection of Low Carbon Technology (LCT) to the network
	Continued upward pressure on energy prices

Our smart grid programme

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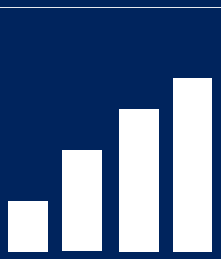
Leading work on developing smart solutions

	Deliver value from existing assets		Customer choice

LCN Fund Low Carbon Networks	Three flagship products	£30 million
LCN Fund Low Carbon Networks	Seven smaller scale demonstrators	£6 million

C2C Capacity to Customers

LVNS

FCAM

SMART FUSE

LV VOLTAGE

COLM

CLASS Customer Load Active System Services

LV PAC

SMART STREET

LoVIA

Capacity to Customers

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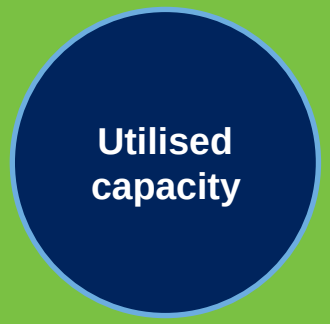
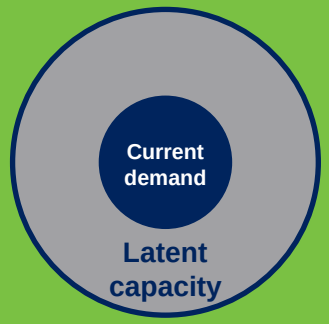
Capacity to Customers



Technical innovation



New commercial contracts

Capacity to Customers	Technical innovation	New commercial contracts
Combines proven technology and new commercial contracts	Remote control equipment on HV circuit and close the NOP	Innovative demand side response contracts
Releases significant network capacity	Enhanced network management software	Allow us to control customer's consumption on a circuit at the time of fault
Facilitates connection of new demand and generation without reinforcement	Effectively doubles the available capacity of the circuit	

Capacity to Customers and beyond

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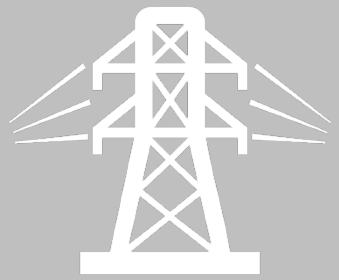
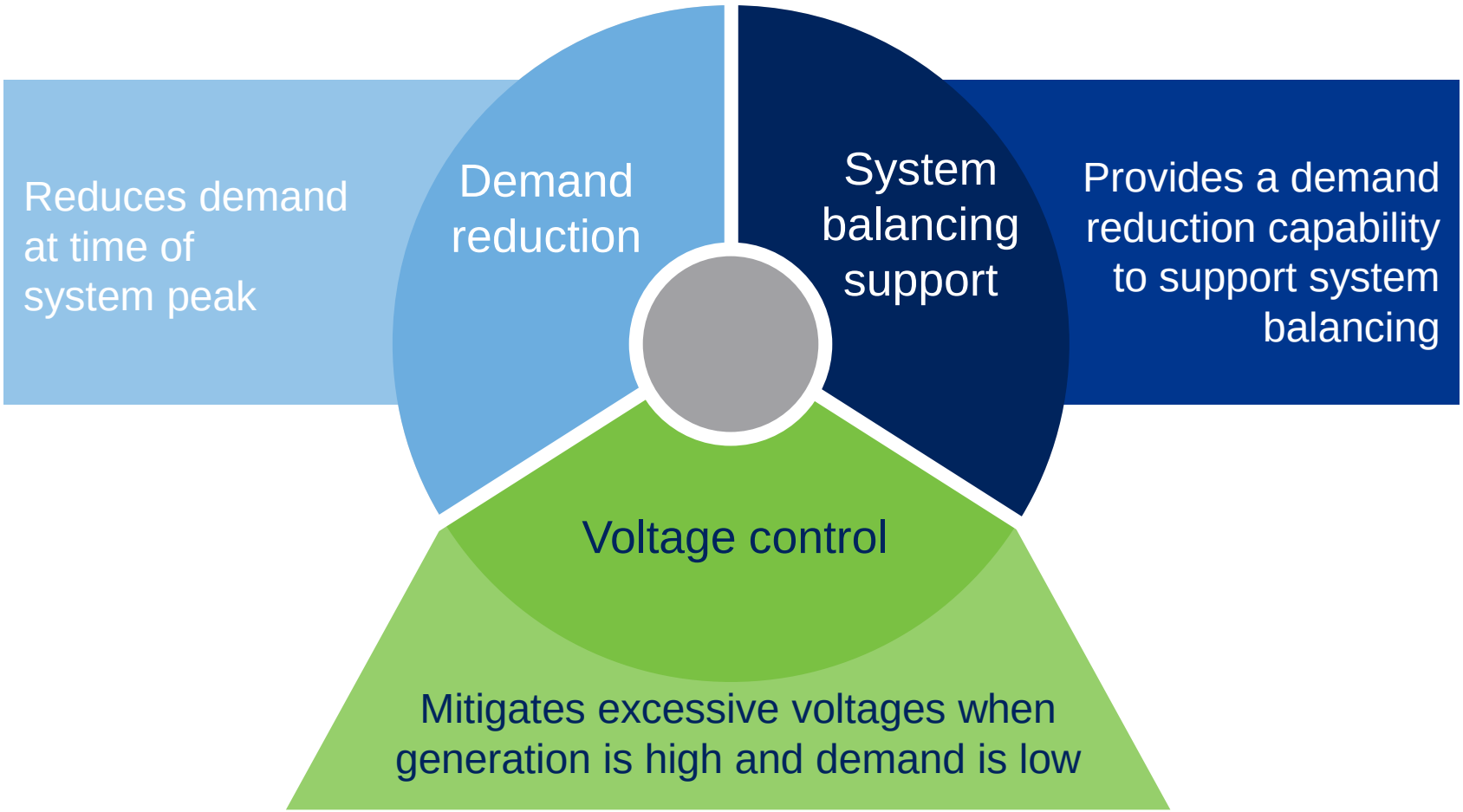
	
When is C_2C cost effective ...?	... or when should we reinforce?

£

Working with University of Manchester to develop economic methodology

Customer Load Active System Services

CLASS is seeking to demonstrate that electricity demand can be managed by controlling voltage…without any discernible impacts on customers



Smart Street

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New controllable switching devices stabilise voltage

Allows us to lower voltage levels

Enables networks and appliances to work in harmony

Low cost ● Quick fit ● Minimal disruption ● Low carbon ● Low loss ● Invisible to customers ● Faster connection of low carbon technologies

Fault Level Active Response (FLARE)

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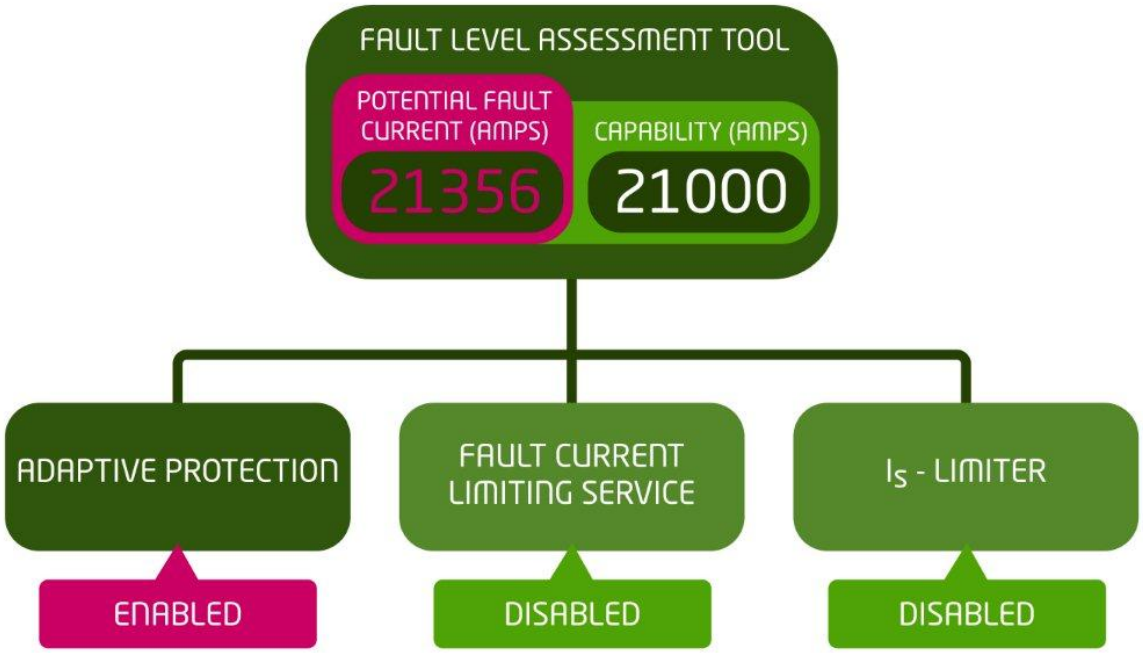
FLARE is the first UK demonstration of an active fault level management solution that avoids traditional network reinforcement



Faster LCT adoption ● Less disruption ● Lower bills

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	**dan.randles@enwl.co.uk**

Thank you for your time and attention

Low Voltage Network Solutions

Overview of project (non-academic focus)

Dr Rita Shaw

3 October 2014

LCN Fund
Low Carbon Networks

MANCHESTER 1824
The University of Manchester

ofgem

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LV Network Solutions

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LCN Fund
Low Carbon Networks

Our largest Tier 1 LCNF Fund

2011 - 2014

£1.5 million

www.enwl.co.uk/lvns and your USBs

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Modelling and analysis

But there was more to the project….

Aim of the project

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To understand our LV networks now and in future scenarios

LV monitoring – identify technique and deploy

Challenge

Develop installation procedures	
Site selection / surveys	
Determine monitoring requirements	Train installation crews
Prepare functional specifications	Prepare for data capture
Tender and procure equipment	Roll out to site - 28 pole mounted and 172 ground

Monitoring equipment

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GridKey monitoring equipment at 100 substations

2012 UK Energy Innovation award for the ‘Best Smart Grid Technology’

Monitoring equipment

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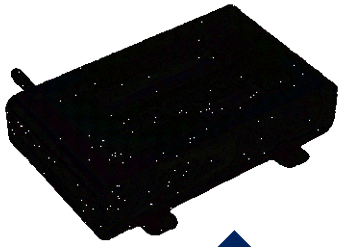
Nortech monitoring equipment at 100 substations

Communications approach

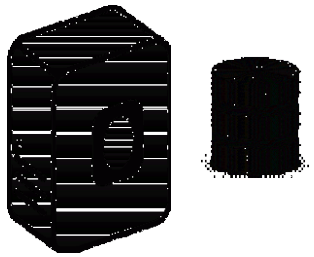
Monitoring unit fitted with SIM card
Assigned private, static IP address
Time stamped data logs created every 1 – 10 minutes



1 set of Rogowski coils fitted per LV way 3 phases and neutral measured

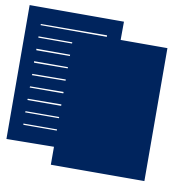
DPN3 Protocol between iHost and monitor

Unsolicited event reporting transfers data logs in near real time



iHost server at Electricity North West consists of communication modules, databases and web user interface

Export produces CSV files to be used by the University of Manchester



LV monitoring – outcomes

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Challenging but achieved!

- 10,000 days of good 10-minute data
- At transformer and head of each feeder, per phase + neutral
- Value of monitoring within LVNS
- Performance evaluation of monitored LV networks'
- Review / improve load estimates for whole network
- Validation of network models
- Monitoring used in other innovation projects and BAU

Apart from the monitoring…

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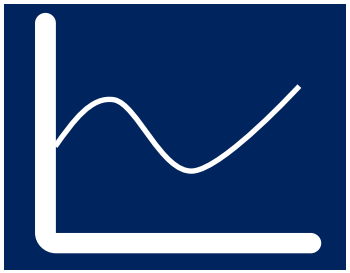
Extract and transfer monitoring, network and customer data to UoM



Engage with UoM analysis and outputs

Leverage learning to support business

What we have learnt

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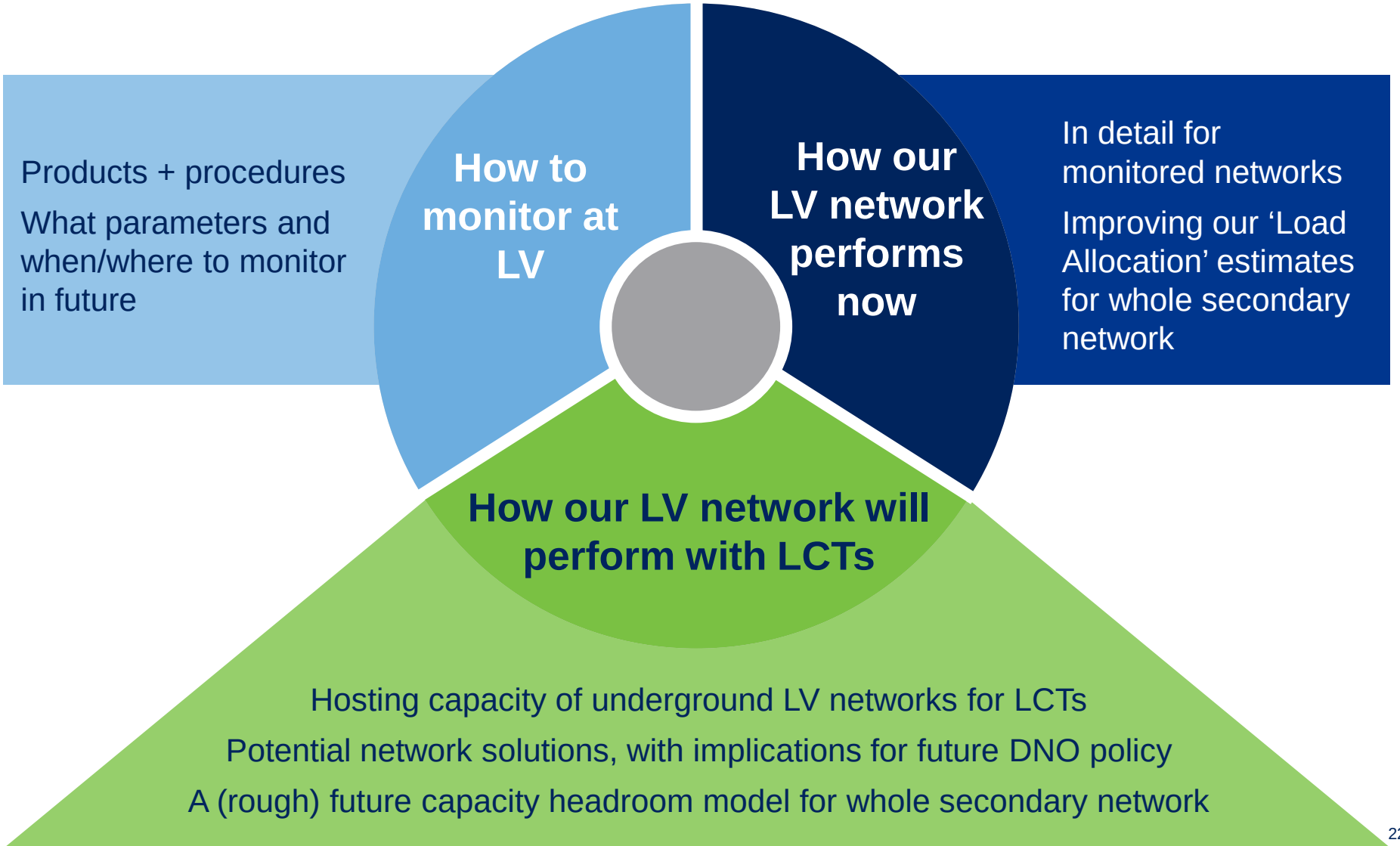

Also ... LV feeder midpoint monitoring

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100 midpoints and 100 endpoints outside LVNS project

Smart joint technique developed by us

Why are we doing this?

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Drive value for our customers

QUESTIONS & ANSWERS

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Thank you for your time and attention

Voltage Management on Low Voltage Busbars

Dr Geraldine Bryson
Future Networks Technical Manager

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Aims and objectives

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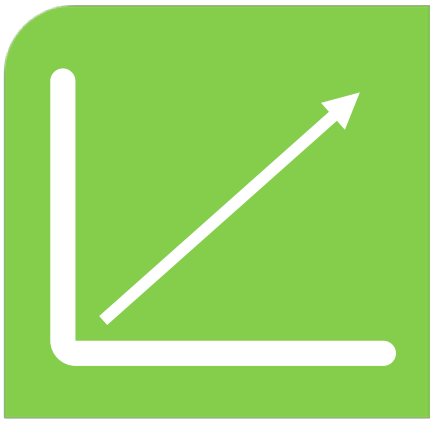

Trial solutions to help manage LV networks and cope with changing demand

Assess ability to manage voltages in real time

Assess effectiveness of devices to correct power factor

Assess phase imbalance and power quality

30 month project started in April 2011 costing £0.5 million

MANCHESTER 1824
The University of Manchester

ABB

power Perfector
energy saving like no other

MR

FUNDAMENTALS

Trials

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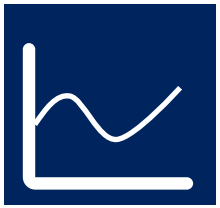
Four techniques explored through field trials

Voltage regulation using a distribution transformer with OLTC



Voltage regulation using a Power Perfector on an individual LV feeder

Voltage regulation using a shunt capacitor installed part way along an LV feeder

Harmonic filtering, power factor correction and phase balancing via active filter

Distribution transformer with OLTC

Commissioned June 2013 with Fundamentals and set to existing LV busbar voltage

Training for TapCon230 relay

Operational procedures designed to reduce impact on customers and reduce training needs

Site trials use LV monitoring for results

Power Perfector

Commissioned August 2012

Training for changing settings

Operational procedures designed to reduce impact on customers and reduce training needs

Site trials use LV monitoring for results and change voltage settings

LV capacitors

Set to control volts NOT VArs

Operational procedures designed to reduce impact on customers and reduce training needs

Commissioned October 2013

Site trials use LV monitoring for results and change voltage settings

Active harmonic filters

Commissioned August 2012

Operational procedures designed to reduce impact on customers and reduce training needs

Site trials switch filter ON/OFF

Installed full PQ monitors for results

University of Manchester - Modelling

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Modelling complete → Monitoring data used to verify → Alternative solutions modelled

Recommendations for Future Networks

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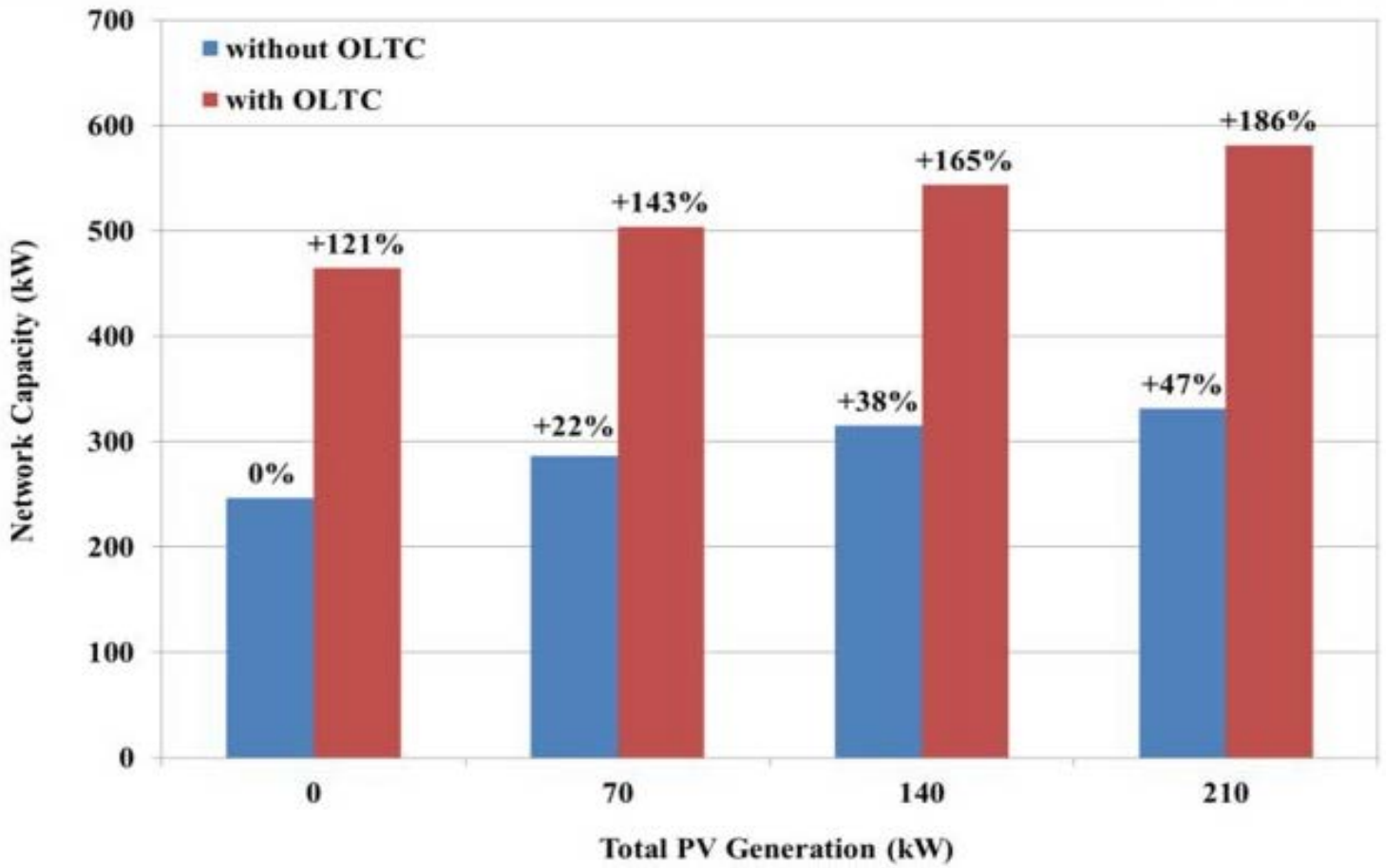
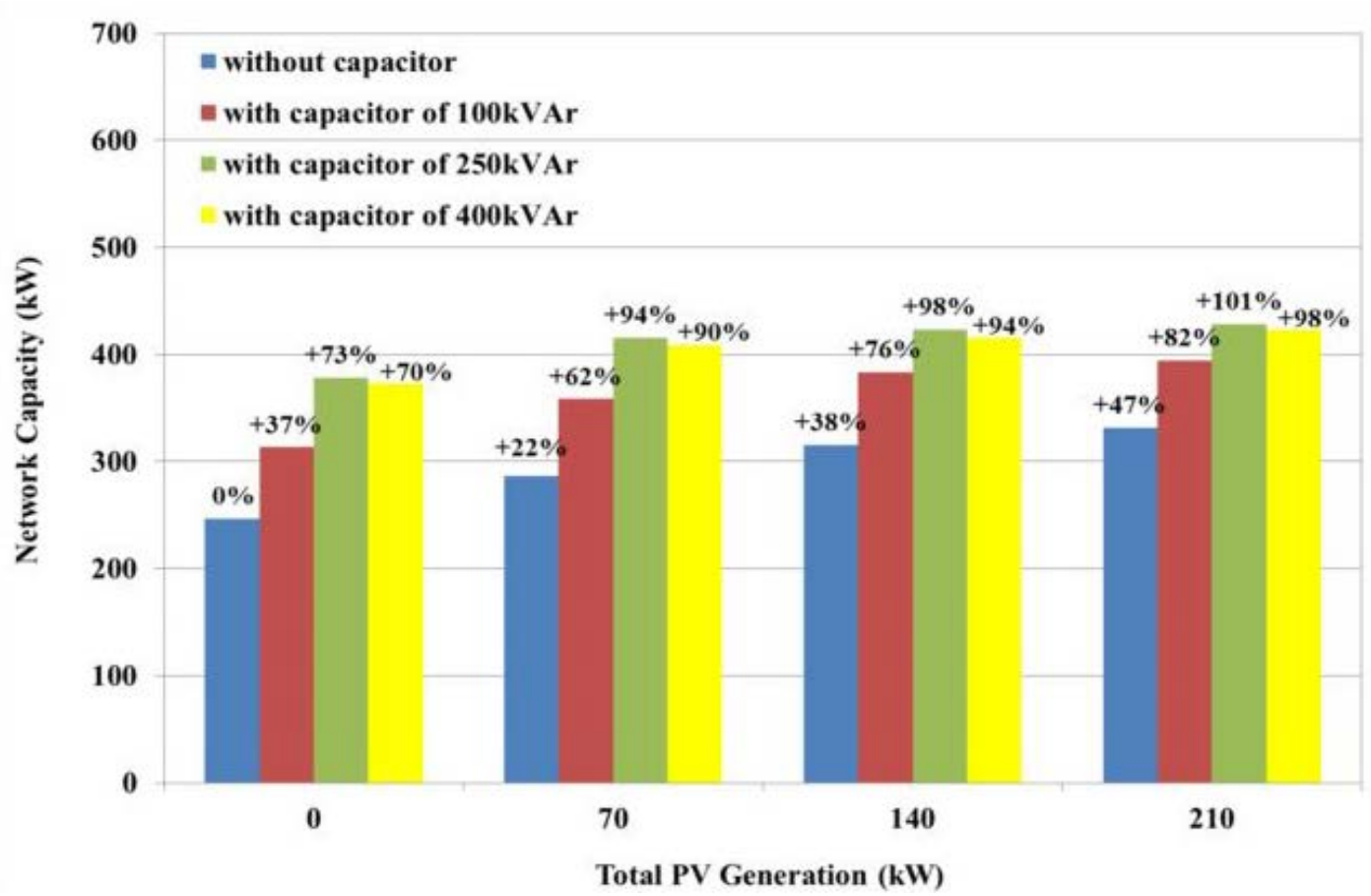
Capacity release with OLTC



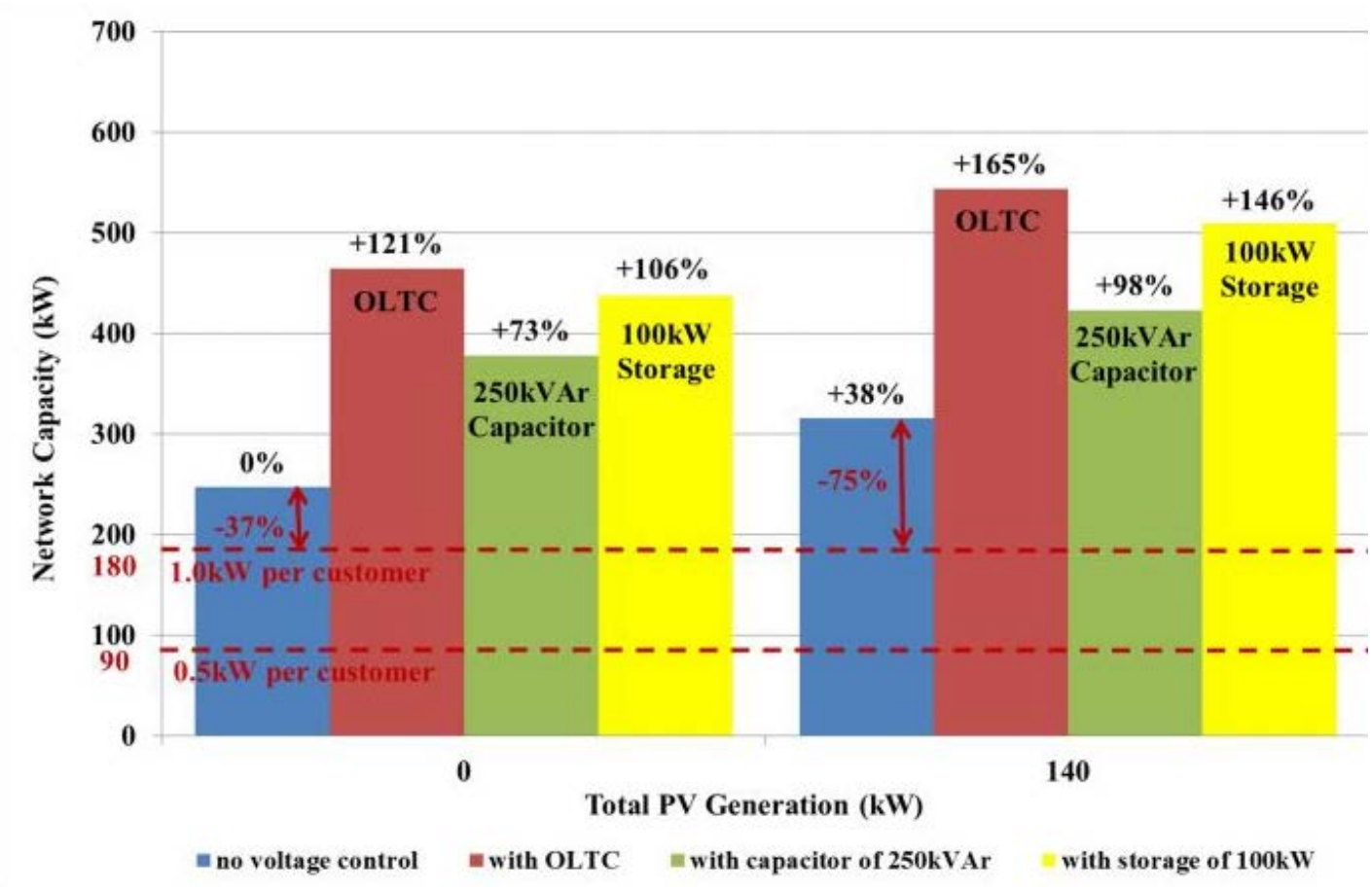
University of Manchester - Modelling

Capacity release with capacitor installation



University of Manchester - Modelling

Capacity release for different solutions



Lessons learnt

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- Site surveys to get right location
- Elimination of modifications on site
- Attention to security
- Impact on customers

Site / equipment specs

Approvals

- Produced in a timely manner
- Impact on customers

- Make sense of results
- Provide guidance on future networks

Academic support

Approach

- True partnering approach with all project stakeholders

Network monitoring key to understanding the outcomes

QUESTIONS & ANSWERS

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