SMART STREET

electricity north west

Bringing energy to your door

Active Optimisation of LV Networks

MEEPS Workshop
4th November 2016

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Ben Ingham

Innovation Engineer

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Smart Street project overview

£11.5m, four-year innovation project

Started in Jan 2014 and finishes in Apr 2018

Quicker connection of LCTs

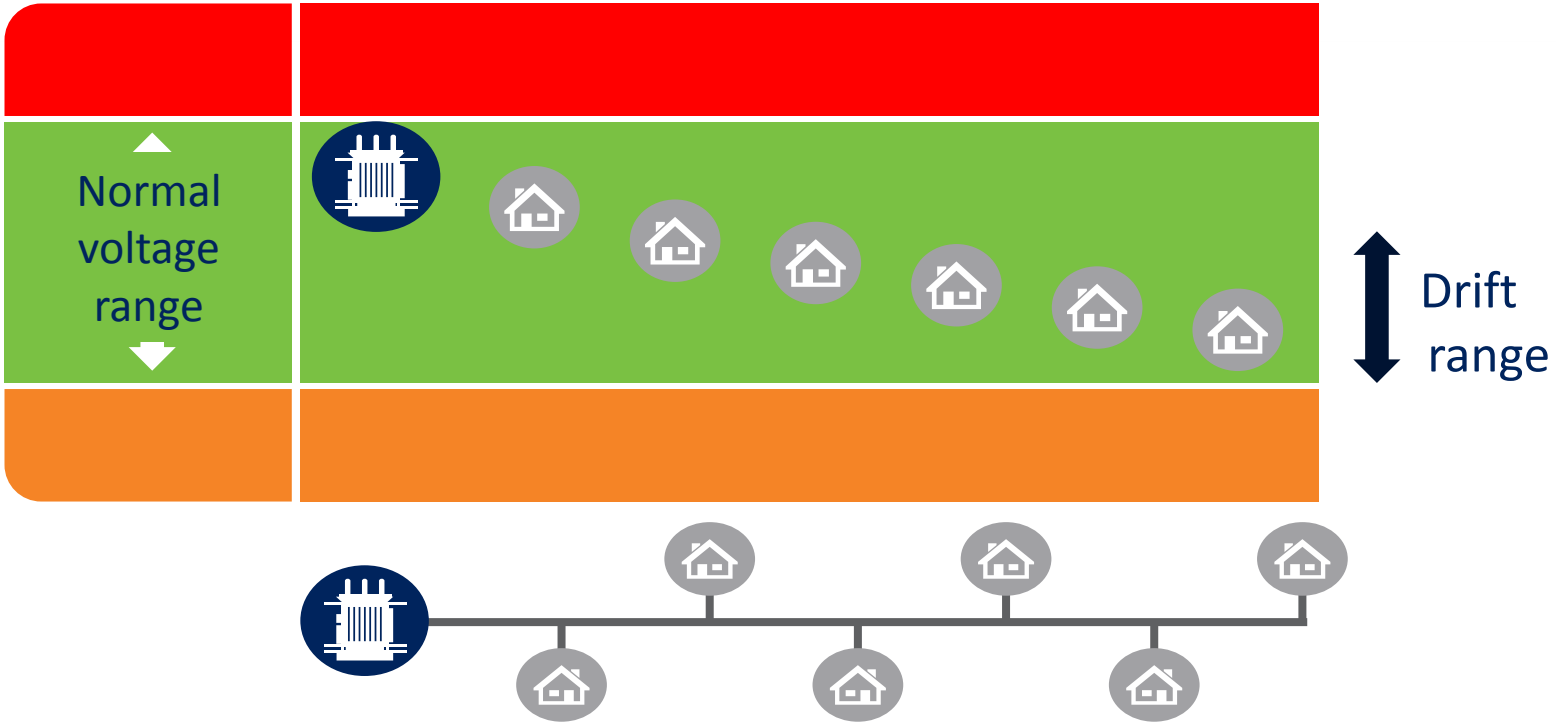
Lower energy bills

Improved supply reliability

Trials period Jan 2016 – Dec 2017

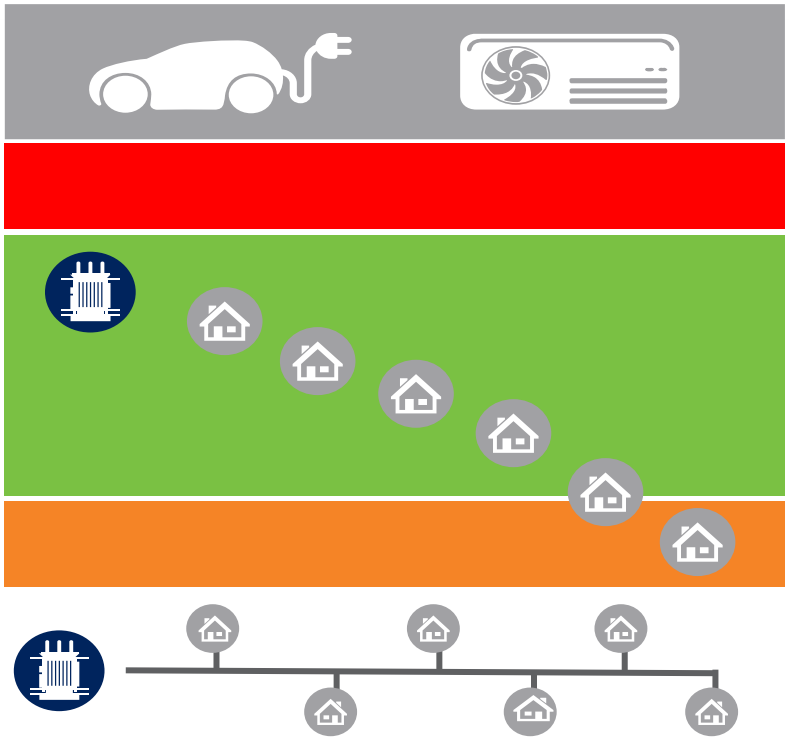
Extensive customer engagement programme throughout project

Voltage profile

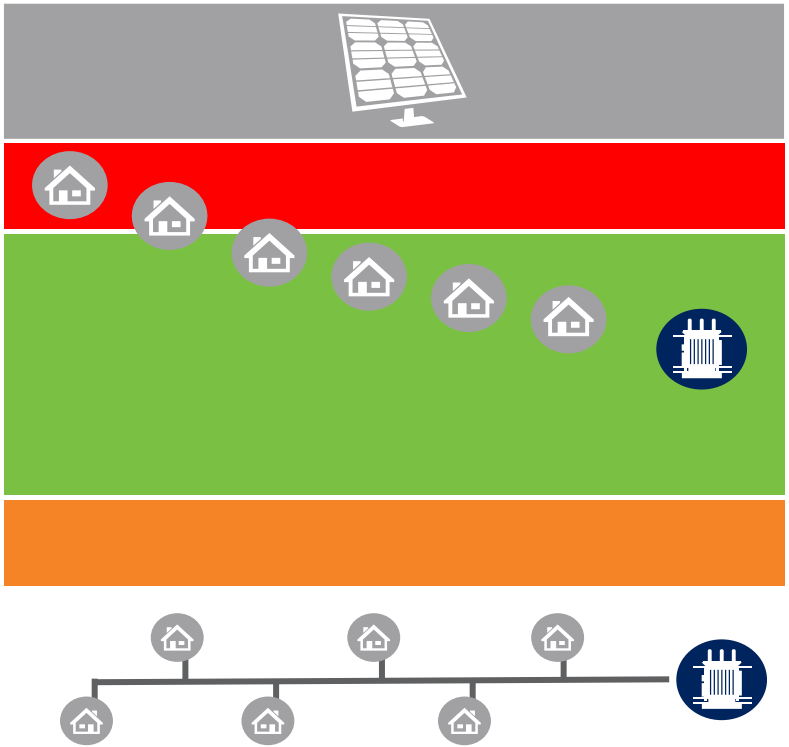


Historic networks have no active voltage regulation

Problem - LCTs create network issues

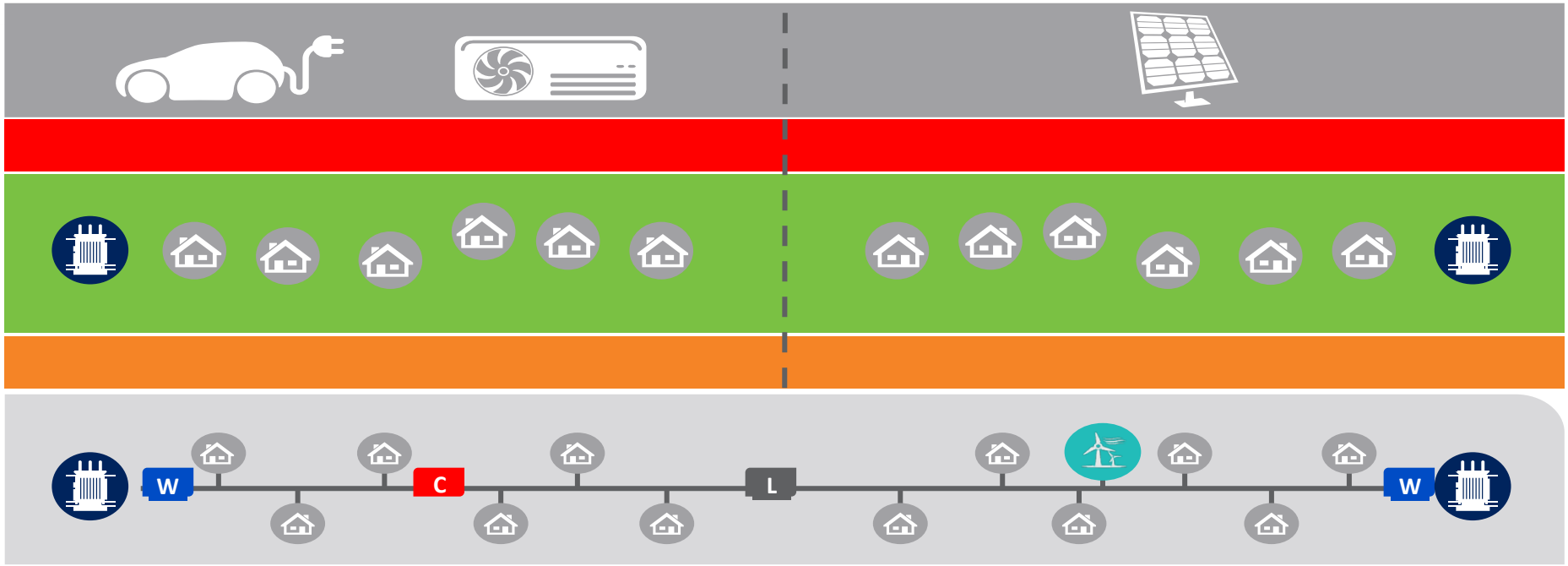


Drift range



LCTs rapidly surpass voltage and thermal network capacity

Smart Street – the first intervention



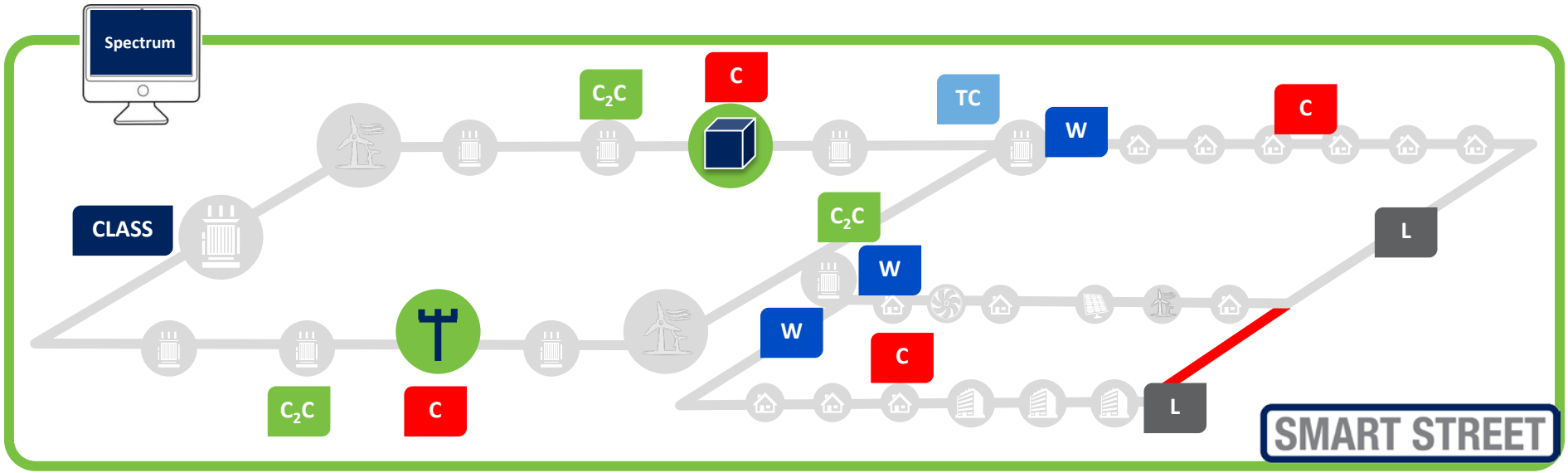
Low cost ● Quick fit ● Minimal disruption ● Low carbon ● Low loss ● Invisible to customers

Voltage stabilised across the load range ● Power flows optimised

The Smart Street System

Spectrum Power 5 (NMS)

Network reliability improvement



C2C Capacity to Customers

C Capacitor

W WEEZAP

L LYNX

TC On-load tap changer

Builds on C2C and CLASS ● Storage compatible ● Transferable solutions

Aims

Quantification of CVR benefits

Validation of optimisation techniques

Identify potential power quality and customer side impacts

Trials – test regimes

Smart Street trial	Test regime
LV voltage control	1. On-load tap changing distribution transformer only
	2. On-load tap changing distribution transformer and capacitor(s) on LV circuits
	3. Capacitors at distribution substation only
	4. Capacitors at distribution substation and on LV circuits
	5. Capacitor(s) on LV circuits only
LV network management & interconnection	1. LV radial circuits
	2. LV interconnected circuits
HV voltage control	1. Voltage controllers at primary substation only
	2. Voltage controllers at primary substation and capacitor(s) on HV circuits
HV network management & interconnection	1. HV radial circuits
	2. HV interconnected circuits
Network configuration & voltage optimisation	1. Losses reduction
	2. Energy consumption reduction

Trials

W/C 14/3/2016	14/06/2016 – 24/06/2016	19/07/2016 – 01/08/2016	09/08/2016 – 22/08/2016	W/C 22/08/2016
Successful operation of OLTC and LV capacitor banks	OLTCs only	Use of LV meshing & OLTCs	HV and LV meshing	HV meshed circuits only

Smart Street summary

Combine into one end-to-end system

Optimisation

Challenge

Learning

First example of centrally controlled LV network

Range of intervention solutions

SMART STREET

Faster LCT adoption

Less embedded carbon

Re-usable technology

Optimise energy and losses

Carbon Footprint

Benefit

Lower energy bills

More reliable supply

Reinforcement savings

Outcomes to date

~25GB of data recorded so far	Trial area networks modelled	Predicted CVR factor of 1.10 for LV and 1.01 for HV networks	Analysis techniques indicate optimisation algorithm is close to optimal	Ring operation modelled and compared to radial

Still to come

Effects of voltage reduction on lighting and domestic appliances under investigation

Carbon impact being studied

Analysis of trials data ongoing

For more information

	**www.enwl.co.uk/thefuture**
	**futurenetworks@enwl.co.uk**
	**0800 195 4141**
	**@ElecNW_News**
	**linkedin.com/company/electricity-north-west**
	**facebook.com/ElectricityNorthWest**
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Please contact us if you have any questions or would like to arrange a one-to-one briefing about our innovation projects