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Bringing energy to your door



## **Breakout Session 1.4 Low Carbon Technology - Distributed Generation**

LCNI Conference

Wednesday 6 December 2017

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**electricity  
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**SMART STREET**

**Ben Ingham**

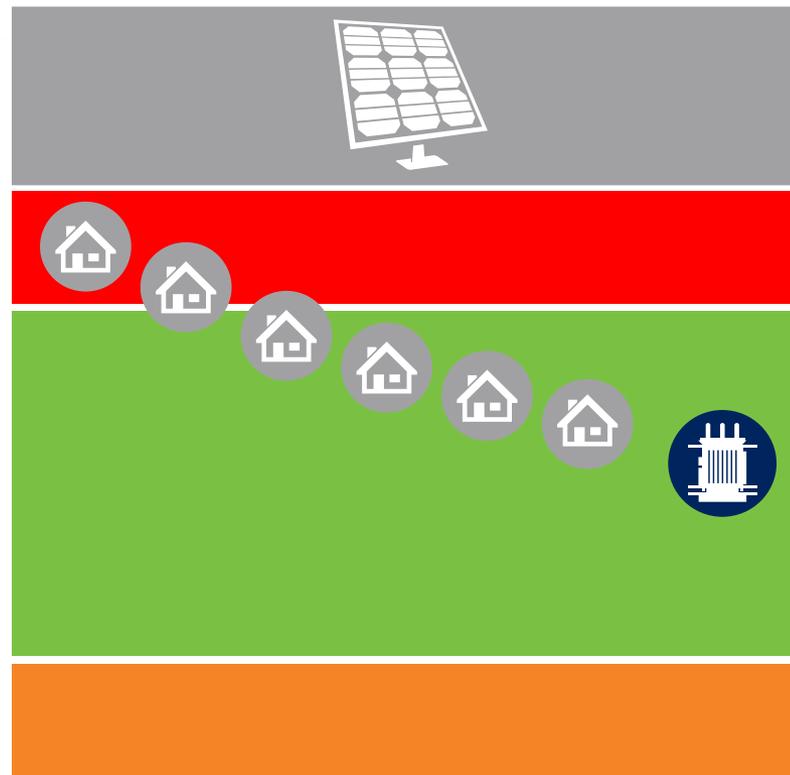
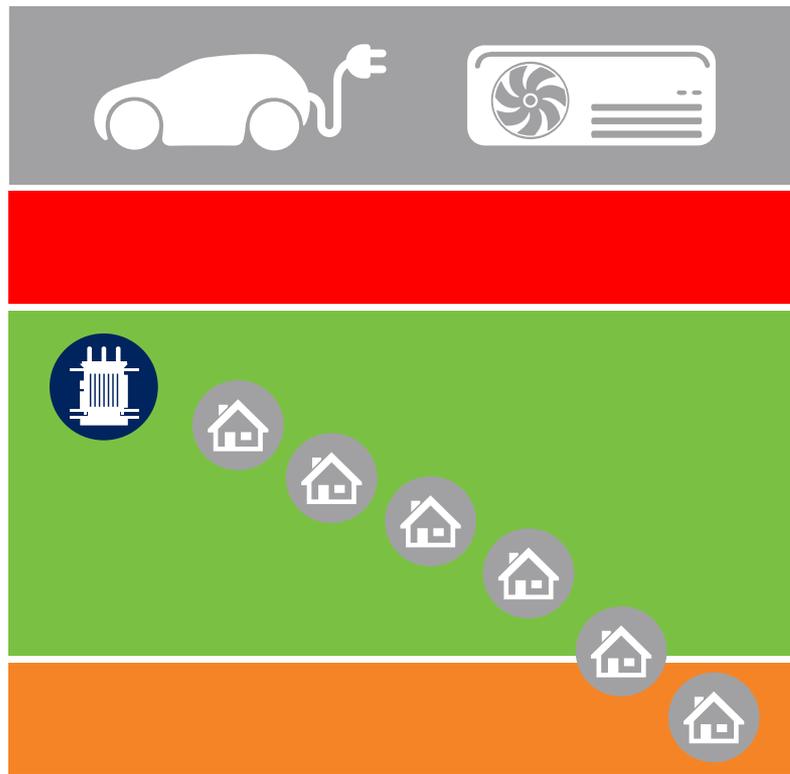
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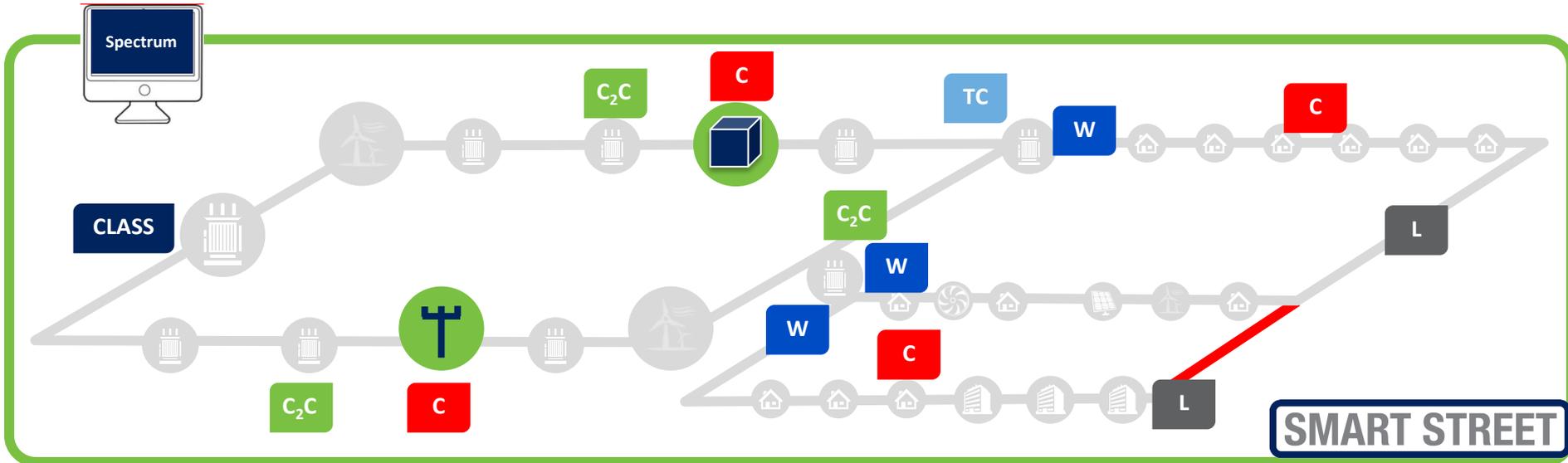
# Problem - LCTs create network issues



↑  
Drift  
range  
↓

LCTs rapidly surpass voltage and thermal network capacity

# Network reliability improvement



- C<sub>2</sub>C** Capacity to Customers
- C** Capacitor
- W** WEEZAP
- L** LYNX
- TC** On-load tap changer

Builds on C<sub>2</sub>C and CLASS ● Storage compatible ● Transferable solutions

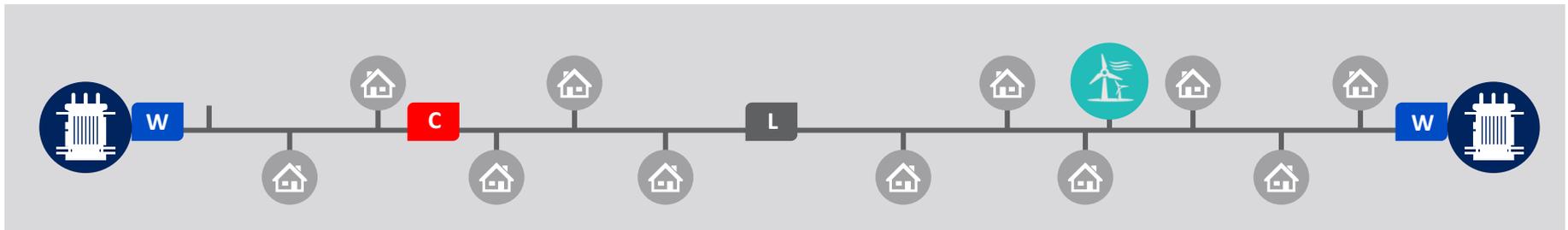
# Conservation voltage reduction



New devices allow safe meshed operation

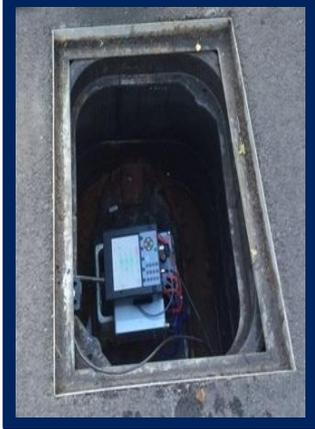
Integrated capacitors and OLTCs allow dynamic voltage control

Enables networks and appliances to work in harmony across load range



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

# The Smart Street system



Spectrum 5 (NMS)





Smart Street trial	Test regime
<b>LV voltage control</b>	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
<b>LV network management &amp; interconnection</b>	1. LV radial circuits
	2. LV interconnected circuits
<b>HV voltage control</b>	1. Voltage controllers at primary substation only
	2. Voltage controllers at primary substation and capacitor(s) on HV circuits
<b>HV network management &amp; interconnection</b>	1. HV radial circuits
	2. HV interconnected circuits
<b>Network configuration &amp; voltage optimisation</b>	1. Losses reduction
	2. Energy consumption reduction



Quantification  
of benefits

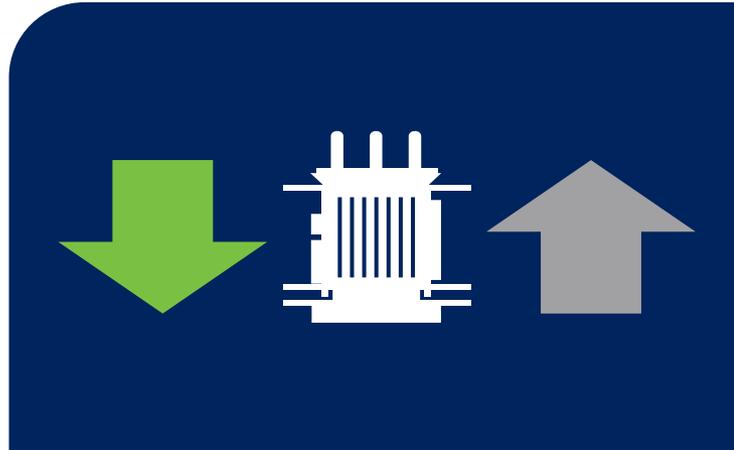


Validation of  
optimisation  
techniques

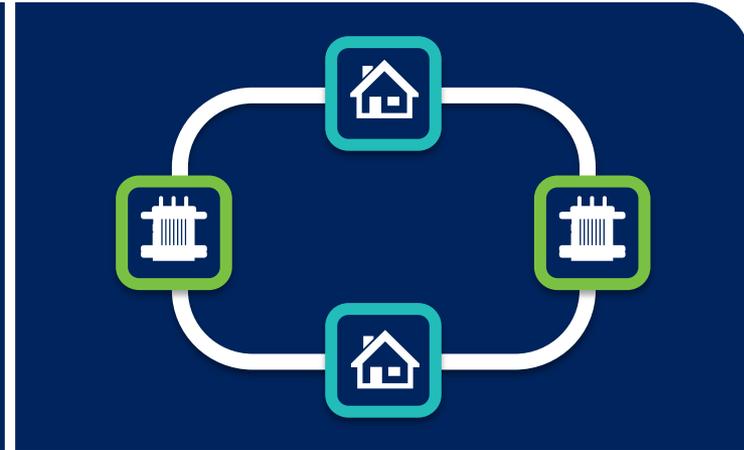


Identify potential  
power quality  
and customer  
side impacts





Some hunting issues with  
Volt-VAr compensation  
operations



Operation of meshing and  
capacitors proven



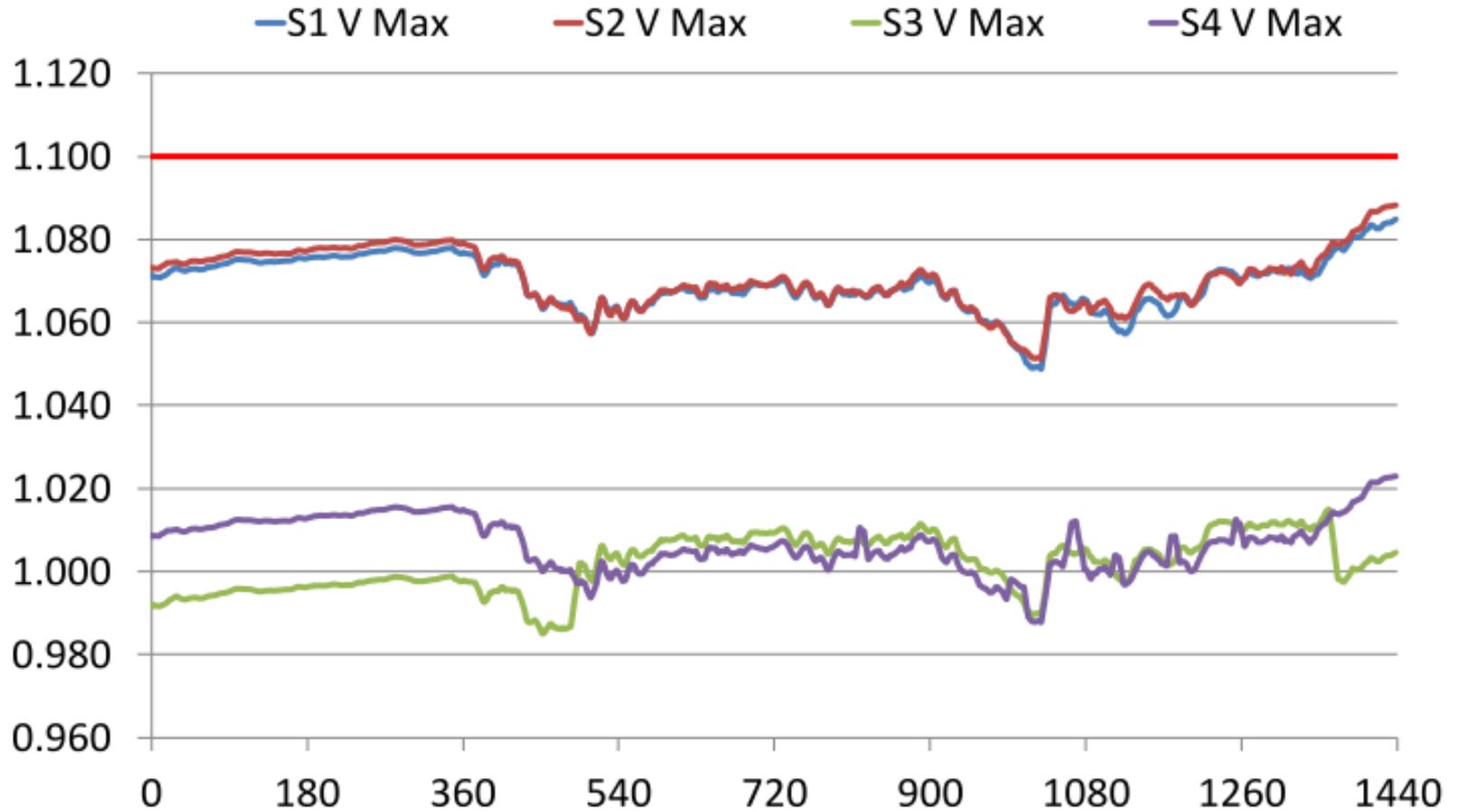
IET led-consultation on  
the impact on customer  
installations



Workshop held in London  
on the 30 November 2017

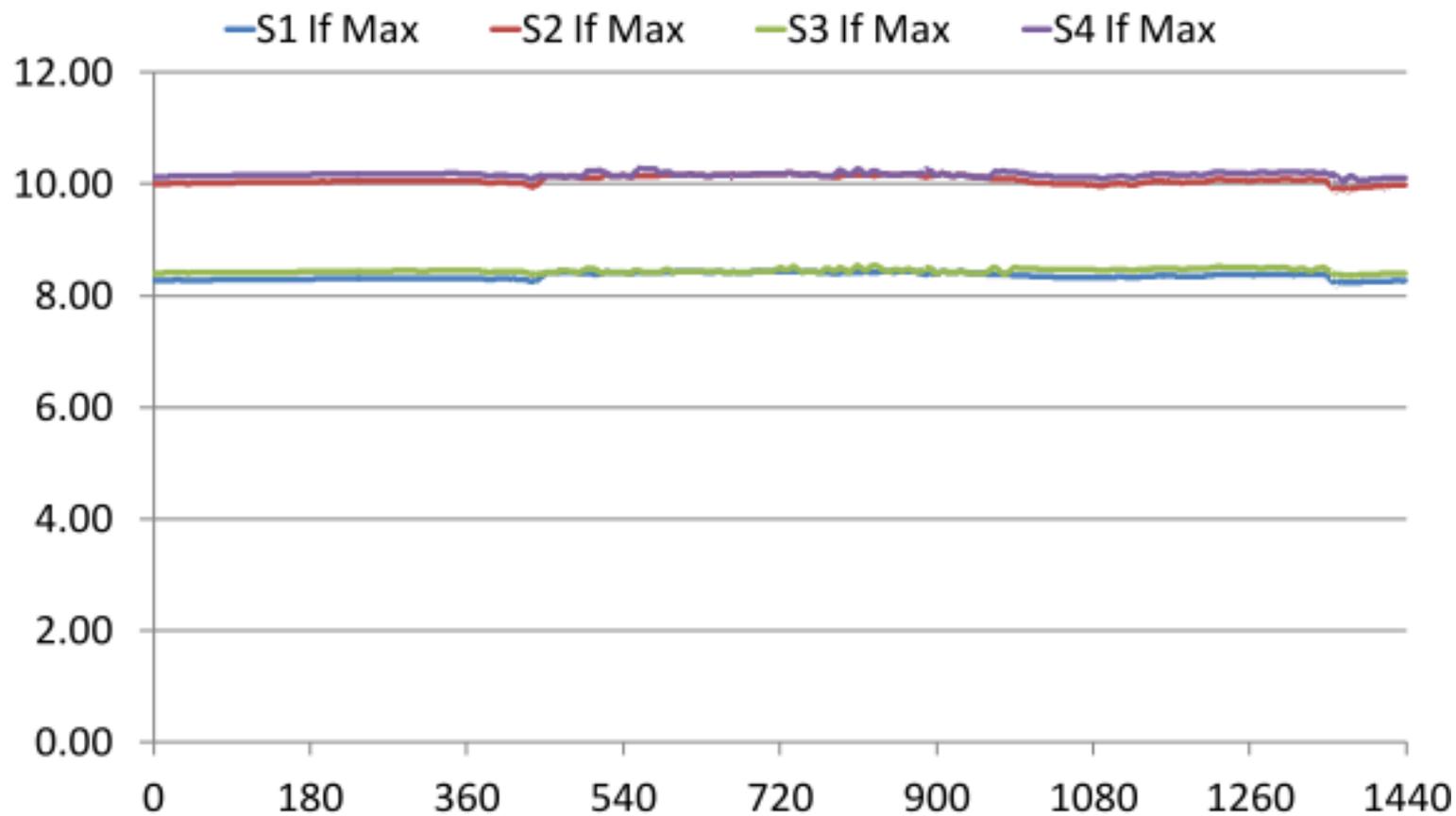


## Voltage at distribution substation





## Fault levels at Denton East





Real data used to validate modelled networks



Trade off between losses and energy savings quantified

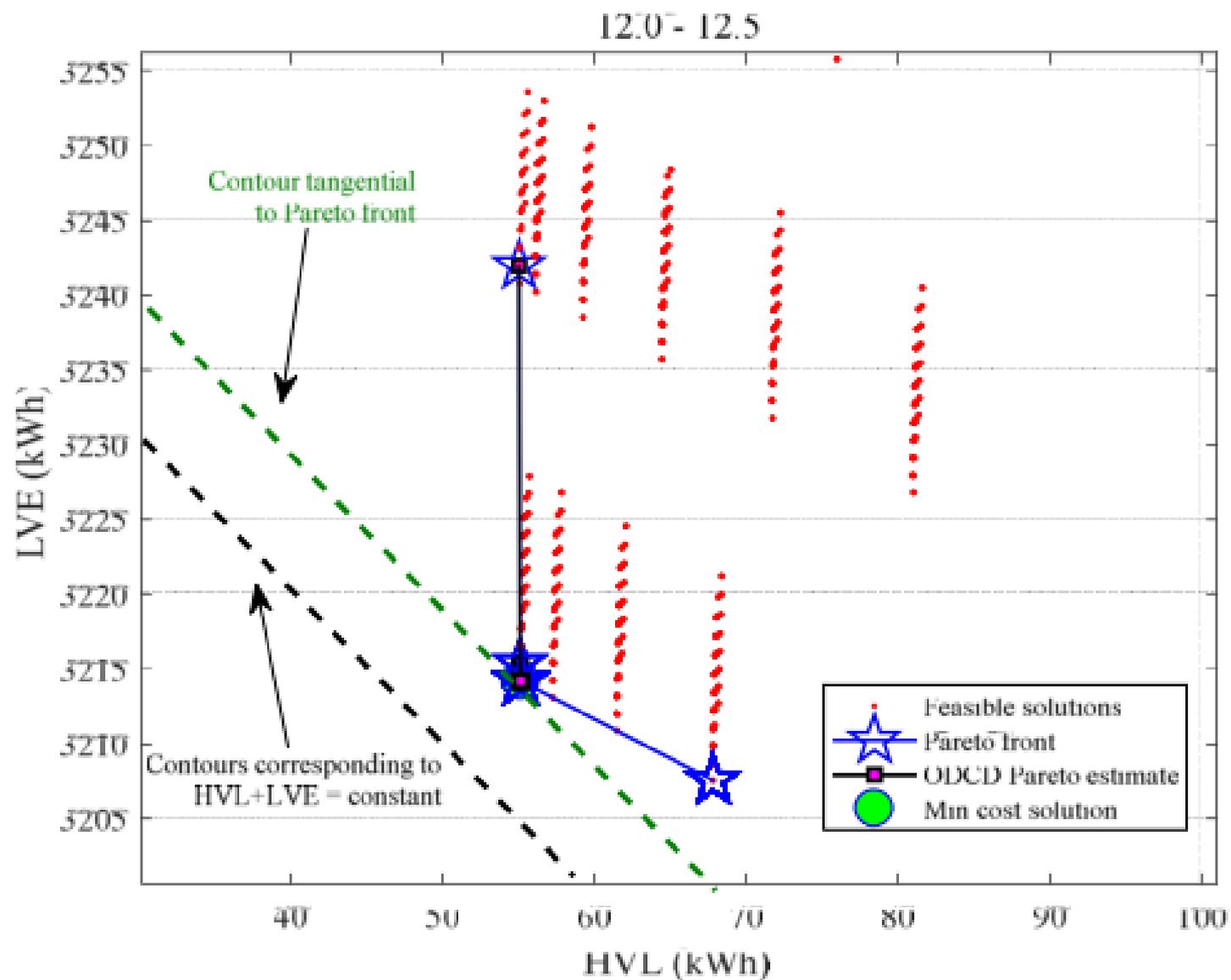


Final analysis of collected data due February 2018



Carbon benefit assessment and business case to be completed by January 2018

# Losses vs energy savings





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

Benefits



Lower energy bills  
More reliable supply  
Reinforcement  
savings



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