



Influencing customer profiles and new interactions

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The nature of customer interactions is changing all the time

Already business as usual

- Automatic fuse restoration after transient fault/ 'smart fuse'
- Chromatic analysis of insulating oil
- Condition Based Risk Management
- Enhanced automatic voltage control/ voltage regulators
- Generator constraint management
- Partial discharge monitoring
- Time domain reflectometry approach to LV fault finding
- Transformer oil regeneration
- Voltage gradient approach to LV fault finding
- Wood pole condition monitoring

New smart solutions

- Demand side response – losses and reinforcement
- Dynamic line ratings
- Dynamic network automation and associated advanced load modelling
- Dynamic transformer ratings
- Fault current limiter
- Smart meter data informing better investment
- Smart meter power cut response and duration
- Smart meter voltage alerts
- Switched capacitors

Trials

- Automatic fault restoration using LV autorecloser
- Energy efficiency
- Intelligent control devices (EVs)
- Network meshing
- OLTC acoustic monitoring

More information is being made available...

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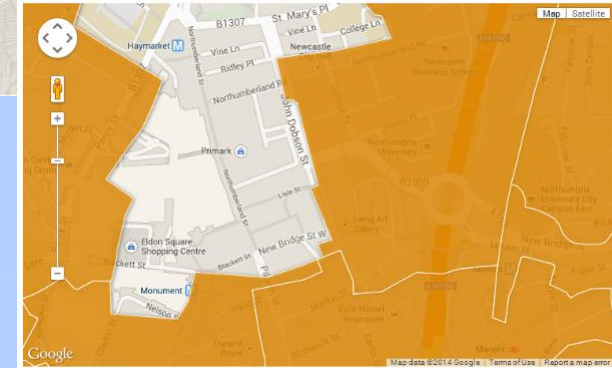
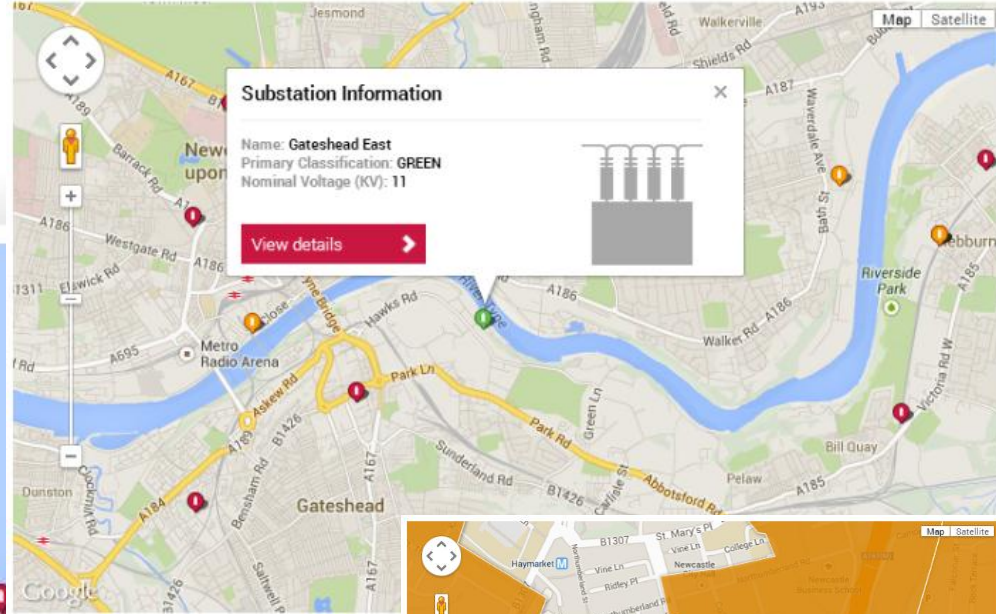
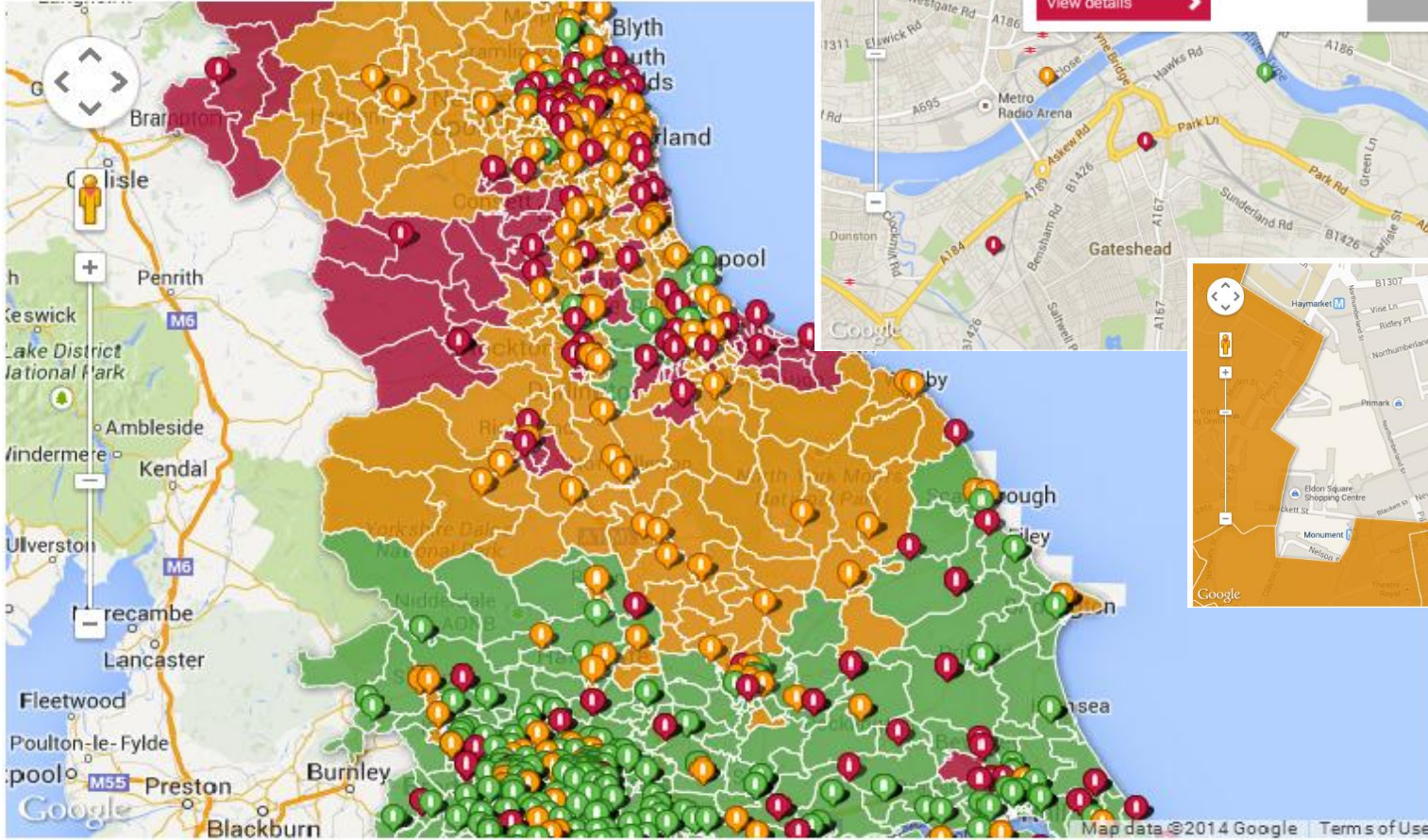
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Show Capacity:



High



...and more 'self serve' options are on the way

YOUR CONNECTION

We estimate your connection will cost **£1856** and will take **12 weeks**

We've calculated you'll need around **20** metres of cable

We've calculated we'll need to cross **1** major road + **2** minor roads

Did you know...? You can change the above values if you know they are not accurate.



[← START AGAIN](#)

[MAKE THIS A FORMAL QUOTATION](#)



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Smart meters could be a game changer in many ways

- Roll-out in 25m homes from 2015 to 2020
- Operational and network planning benefits
- Through time we are seeing more ‘peak congestion charging’ in electricity bills
 - Red/amber/green periods in place for half-hourly metered customers
 - From 2016, larger non-half hourly metered customers could see time of use tariffs
 - Smart meters will enable time of use tariffs for domestic and small business



*‘Controlling your energy’ –
Gaz and Leccy marketing campaign*

Customer-Led Network Revolution (CLNR)

DEMAND SIDE SOLUTIONS

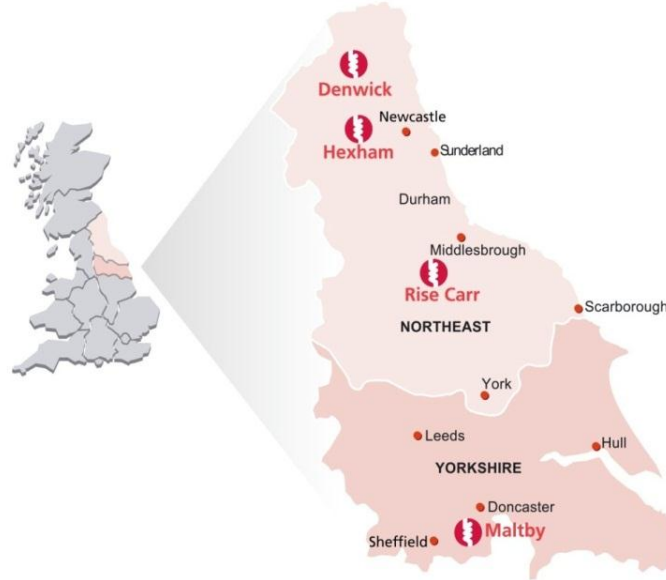


National smart meter data



Active customer participation

TRIAL AREAS



DISRUPTIVE CUSTOMER TECHNOLOGY



Heat pumps



Photovoltaic panels



Electric vehicles

INTEGRATED TECHNOLOGY SOLUTIONS



Electrical energy storage

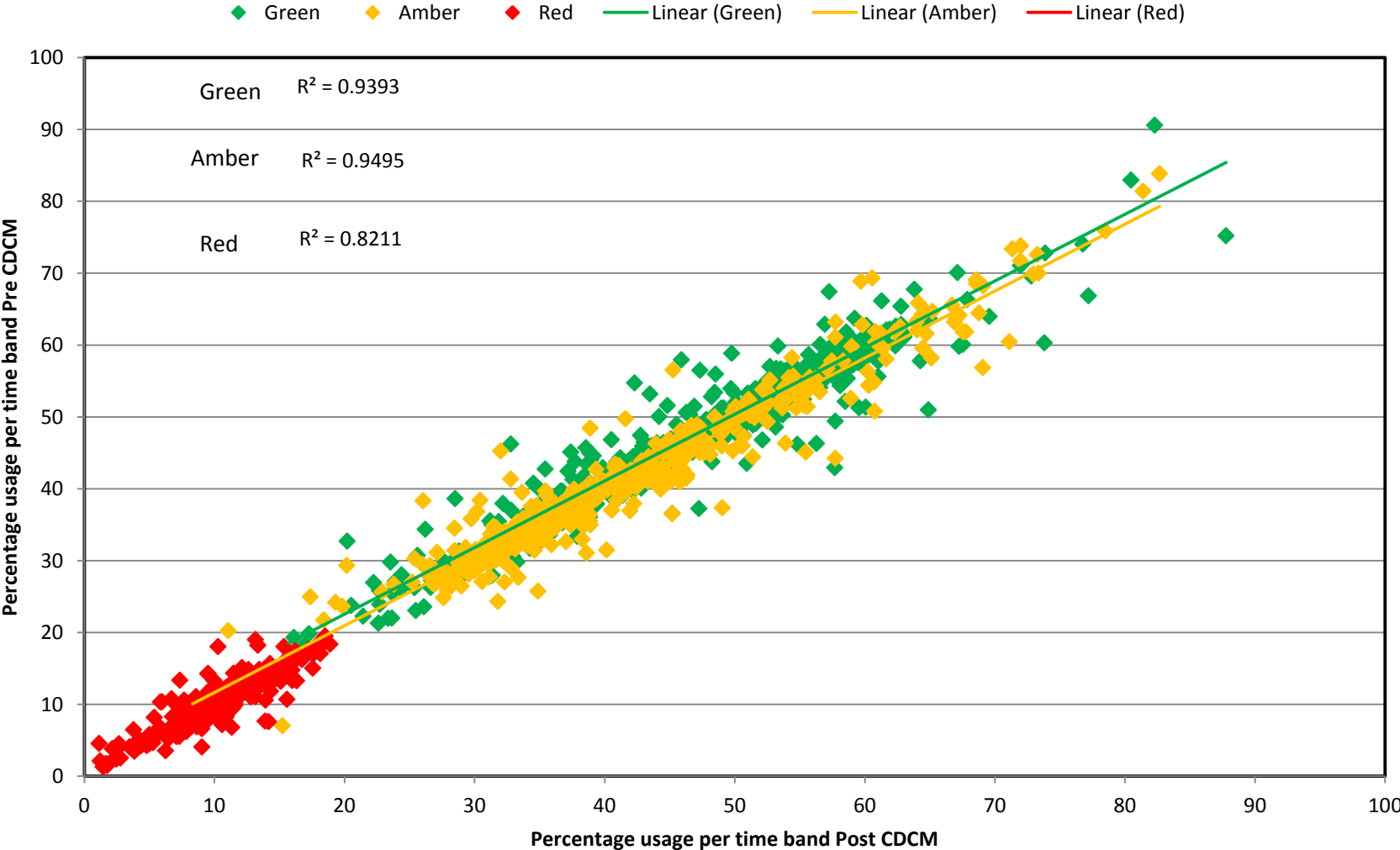


Enhanced automatic voltage control



Real-time thermal rating

Business customers have not followed price signals...



...although some have engaged in I&C demand-side response



Mining (1)

- Contracted DSR: 2 MW
- DSR Type: **CHP Generation**



Web-Hosting (1)

- Contracted DSR: 0.8 MW
- DSR Type: **Diesel generation**



Water treatment (3 sites)

- Contracted DSR: 3MW total
- DSR type: **Diesel generation**



ICE production (1)

- Contracted DSR: 0.6MW
- DSR type: **Load reduction**



Supermarkets (2 chains)

- Contracted DSR: 0.36 and 3.6 MW
- DSR type: **Diesel generation**



Hospital (1)

- Contracted DSR: 0.5MW
- DSR type: **Diesel generation**



Telecoms (5 sites)

- Contracted DSR: 3MW total
- DSR type: **Diesel generation**



Gas production (1)

- Contracted DSR: 5MW
- DSR type: **Load shifting**

Conclusions from I&C demand side response

- Customers are willing to sign contracts with DNOs and can deliver
- Localised customer identification and recruitment is a challenge but it is possible
- Existing STOR participants are easier to recruit...
...and sharing arrangements needed to transition from trial to business-as-usual
- New balancing services to manage the supply margin make sharing more relevant
- Pricing will be driven by supply and demand:
 - Customers are looking for bankable business cases
 - DNOs need to consider the deferred / avoided reinforcement costs, probabilistic response and benefit sharing
- We intend to run I&C capacity auctions for DSR provision during RIIO-ED1 in areas of forecast reinforcement need

CLNR trialled four types of DSR with domestic customers

- **Static**

- Time of use tariff with smart meter
- Restricted hours tariff with home automation

- **Dynamic**

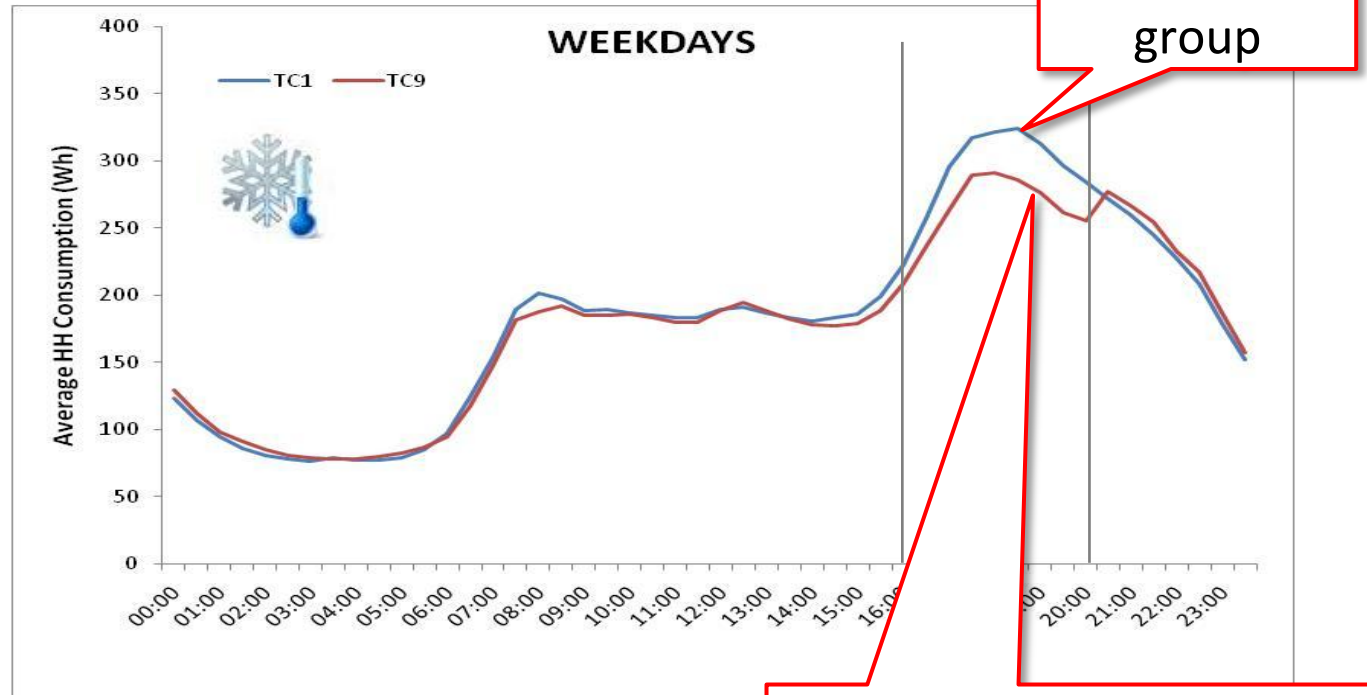
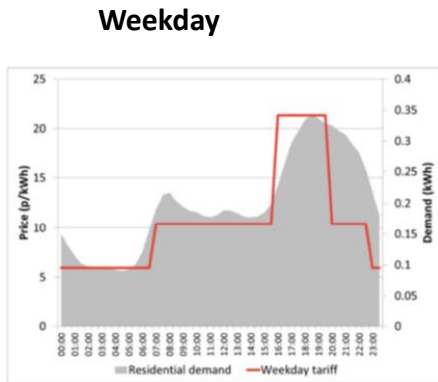
- Direct load control of appliances and heat pumps
- Within premises balancing with solar PV customers

Time of use tariff with smart meter



- Smart meter and in-house display
- 2020 distribution cost profile
- -4% day rate
- +99% peak rate
- -31% off-peak rate

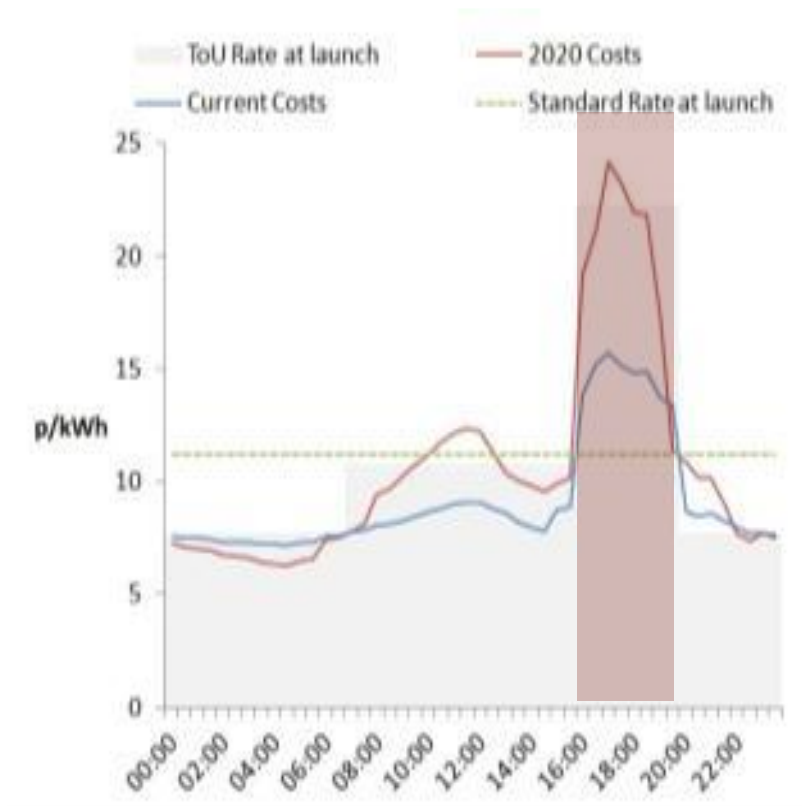
Domestic time of use behaviour persists over time, with greater load shifting and savings in the winter months



ca. 10% less electricity in peak and 3% reduction overall

Restricted hours tariff with home automation

- Smart appliance automation
- Time of use tariff
- Customer override



Direct load control of appliances and heat pumps

- Appliance automation
- Up to 15 interruptions
- Up to 4 hour events
- 1 interruption per day
- Up to 10 consecutive days
- Customer override
- DNO > supplier > appliance > customer control



Within premises balancing with solar PV customers



- Manual balancing – in-house display provides real time info on generation, consumption and export
- Automatic balancing - uses excess generation from solar panels to heat hot water
- Applies to weekends as well as weekdays

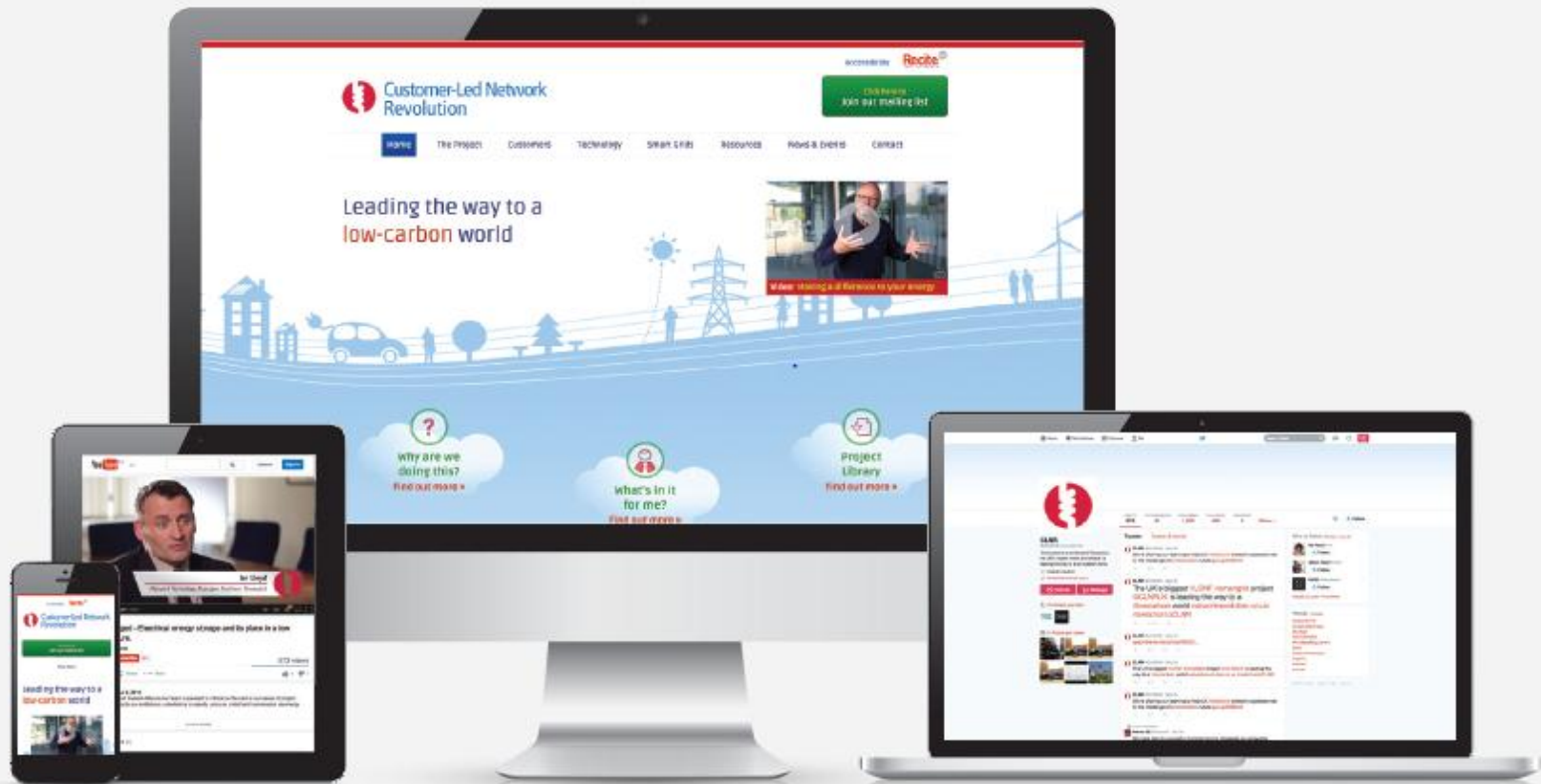


Conclusions emerging from domestic demand side response (1 of 2)

- **Customers are willing to participate in DSR**
 - Time of use for households – enabled by smart meter installation
 - Within premises balancing by households with PV
- **Customer appetite is high for time of use**
 - Smart meter users 90%+ satisfaction ratings...
 - ...although 40% would have been worse off without safety net
 - Solar PV customers keen to consume their generation

Conclusions emerging from domestic demand side response (2 of 2)

- **Restricted hours and direct control were a challenge and benefits not as clear**
 - Enabling communications and control is new technology
 - Simpler options exist with washing machines – in built time-delay functionality or time switches
 - Heat pumps offer meaningful 3kW peak reduction but retrofit is not straightforward for customers
- **Successful implementation in business-as-usual requires more consideration of regulatory and commercial barriers**
 - Particularly how those least able to pay may be protected



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'customer-led network revolution' group

www.networkrevolution.co.uk