Focus group Meeting 2	***11th July 2017***	***Overall objective - to optimise communication materials for use in the quant survey in order to evaluate customer perception of concept and test the hypothesis "Customers who are educated on the need for and benefits of Celsius are significantly more likely to find it acceptable".***

ECP 1 (4th July) Objective: To test the general Celsius proposition, its description, barriers, etc and how this might be best communicated to the customers in the trial areas as part of the survey.

ECP 2 (11th July) Objective: Evaluate and refine the customer information to be shared with those 'educated' about Celsius.

GROUP STRUCTURE (1½ HOURS):

AREA OF DISCUSSION	TIME ALLOCATION
(1) Introduction / Re-cap	10 minutes
(2) Low carbon technology show cards	15 minutes
(3) Project leaflet	35 minutes
(4) Technique show cards	15 minutes
(5) Summarise	10 minutes
(6) Thank and close	5 minutes

1 Moderator Introduction (10 minutes):

- Re-Introduce yourself
  - Reminder that the research is being conducted on behalf of Electricity North West (ENW) and reminder of purpose
  - Confidentiality is guaranteed, no right / wrong answers, interested in everybody's opinions, in as much detail as possible
- Explain your role and set out 'rules' (*speak loudly / clearly / not all together*)
- Explain audio and video recording, one-way mirror and presence of observers (if appropriate)
- Any questions?
- What were the **key things** you remember regarding the last session? (who ENW are? What Celsius is)

- Briefing: The aim for this session is to develop the materials that the ECP evaluated last week, and also look at a new communication material.

Remind the ECP that:

- The first stage of the Celsius project is to gather temperature related data from 520 substations
- Secondly, a range of cooling techniques will be trialled on 100 of these substations to demonstrate the benefits of each technique
- Through a customer survey the project seeks to demonstrate that these cooling techniques are as acceptable to customers as traditional reinforcement and could be rolled out across Great Britain.
- The communication materials being developed will be shown to some customers taking part in the survey to educate them about the need for Celsius, how it works and the expected benefits.

2 Low carbon technology show cards (15 minutes)

Moderator info: based upon your feedback we have changed the information provided relating to the low carbon challenge.

UNPROMPTED: Explore immediate reactions/thoughts/impressions

- How do they compare to the previous cards?
- Anything that they did not know before?
- Any questions on new material?

PROMPTED: These materials seek to convey at thermal constraints on the network are **PRIMARILY CAUSED** by an by **increased demand for electricity, which increases electrical current flowing on the network, which in turn raises the operating temperature of equipment.** This problem is exacerbated by environmental factors, especially the impact of sun glare and the substation's environment.

- **Is the difference between these aspects (electrical current / environment) clear?**

There is also further information about Celsius which explains how this is one of a myriad of solutions that can be utilised to address a range of network problems.

- If you used this information to describe the problem that Celsius is trying to solve, and how to a friend, what if anything, would you change and why?

3 Leaflet (35 minutes):

Moderator info: Imagine you have received this leaflet, explaining what Celsius is and why it is needed. The front cover is a brief summary, which is all that a lot of people will probably read, while the inside contains more information for those who would like further detail. We have taken your feedback from last week and attempted to answer your questions in an FAQ section.

- Spontaneous reaction to the leaflet?
- Do they like the look and feel of the leaflet?
    - Reaction to the images, graphics, colours used etc.

FRONT COVER

- Does the leaflet's design convey the importance of the information? It is perceived as important?
- Perception of the strapline? It is good news?
- Reaction to constituent parts:

  Who is Electricity North West?

  What are we doing?

  Why are we doing this?

  How will I benefit?
- Is it clear what Celsius is and how it may affect them?
- Do they want more or less information about anything on the front cover?
- How much information do they think customers need to see on the front of the leaflet?

INSIDE

- Establish the perceived credibility of 'changing the way we use electricity'
- Establish the general tone of voice adopted – is it: positive, explanatory, defensive, scaremongering?
- Check understanding of key terminology such as thermal capacity, thermal constraints and traditional reinforcement, does anything require adding or changing?
- We have given you quite a lot of information about Celsius, but would someone reading this for the first time understand – is it sufficiently explained or is it oversimplified?
- Does it sound like Celsius could meet the electricity needs of the future?
    - If so, why? If not, why not?
    - Does it explain that, as part of one of a number of measures, Celsius might help to meet future needs?

TRIALLING THE COOLING TECHNIQUES

- Test for understanding and acceptability of trialling the cooling techniques in order to quantify any associated capacity release benefits
- Do we need to better explain that certain solutions might be better suited to different substations - would that be confusing or too much information – do they care?

- Prompt regarding the statement, ‘how our customers feel about them’ – how does the ECP feel? How does it presume others may feel?
- How does the ECP feel about ‘replacing equipment the way we always have in the past’.
- Are there any unanswered questions about the techniques and/or trial?

BENEFITS

- How credible is this information?
- How does the ECP interpret and rank order these benefits?
- Does it clearly explain that these new cooling techniques could *prevent or delay* traditional reinforcement?
- How would they explain the benefits to someone in their family or a friend?

ENGAGING WITH CUSTOMERS

- Is this a good thing?
- What would they expect the survey to ask?
- Would they expect customers who have received a leaflet to have the same views as a customer taking part in the survey who did not receive a leaflet?

FAQ

- **Moderator** – we know from other research too much information can just confuse and raise further questions
- Is there any new information on the leaflet that you had not come across before?
- Is the information helpful and/or relevant? Does it alleviate any concerns held?
- Any further FAQ’s that they would add? Any that need further refinement required?
- We have stated that Celsius will not affect the quality of your supply but here we explain that power cuts do happen ordinarily, from time. Because of this we’ve included some useful information about who to call and what to do in a power cut - is this confusing or contradictory of do you think it’s helpful
- Likewise, ENW will be engaging with some of their more vulnerable customers – is the priority service information appropriate in this kind of leaflet?

ABRIDGED LEAFLET

- Would you be more inclined to read a shorter version of the leaflet and if so what key points would you want to be retained?

Present the shorter leaflet to gauge perception

- Having now seen the longer leaflet, do you think this is sufficient and does it focus on the right points?
- Is the strap line better/worse – would either be more inclined to make you read the leaflet

IMAGES

- Probe on images used, understand which they like or dislike etc.
- Would most customers recognise the image of the Pole Mounted Transformer is or is the fenced off equipment better to illustrate a substation?
- What do you think about the thermal camera image? Did you understand what it was? Does it help to illustrate the project better than the image of the thermometer?

4 Technique show cards (15 minutes):

- MODERATOR please explain that on the basis of the feedback received last week there have been some changes made to the information about the cooling techniques, mainly in relation to the costs of implementing each technique.

SHOW TRADITIONAL REINFORCEMENT CARD

- Is the base case clear?
- Review text and the new cost information and evaluate interpretation of it
  - Is the additional information helpful and/or relevant? What does it add?
  - Is it perceived as credible?
  - It the cost surprising? Greater/less than expected?
  - Has the provision of this information changed perceptions at all, if so, why?
- Gauge acceptability of the technique now it has been 'priced'?
- **This price is per substation, ENWL has around 35,000 of these. What are your thoughts about having to carry out this kind of work across the whole network?**

SHOW ALTERNATIVE COOLING TECHNIQUE CARDS

- Do the cards convey that these are quick, simple and inexpensive techniques to help ENWL **release capacity and accommodate greater demand by cooling equipment**?
- How do they feel about the way cost has been illustrated? Is it clear how it compares to the base case?
- Does the comparison bring about more questions?
- Evaluate reaction to the relativity of the cost for each technique
  - Is it perceived as credible?
  - It the cost surprising?

- Has the provision of this information changed perceptions at all, if so, why?
- Gauge acceptability of the technique now it has been 'priced'?

OVERALL

- **Evaluate the overall appeal of the leaflet as a standalone piece**
  - **Comparison to the video/ other materials?**
- **Evaluate overall acceptability of the techniques relative to traditional reinforcement**
- If we could speak face to face, to people near to substations were these techniques will be implemented, rather than just giving them a leaflet, would there be a better way of convening this information? What extra information would you want and in what format?

5 Summarise (10 minutes)

Summarise what has been discussed –understanding of the Celsius project, traditional reinforcement and the alternate technologies.

- Any stand out communication methods which explain Celsius most clearly?
- Anything that they think should have been changed from last week which wasn't?
- Any final questions on the project and their role in it?

8 Thank and Close (5 minutes)

Thank you for your contribution these last two weeks

Hand out incentives

The status quo: Traditional reinforcement of the electricity network

Solution description:

DNOs typically adopt a traditional approach to expanding electricity networks to meet additional demand requirements and the short term spikes that require additional capacity.

This expansion of existing infrastructure is know as **'network reinforcement'** and involves investing **in *more overhead lines, underground cables and substations***.

This is a costly, lengthy and disruptive undertaking but ensures that sufficient operational margins are always guaranteed to cope with the worst case supply and demand scenario.

Potentially, what am I likely to notice?

- **Urban areas** - Extensive works to replace/install more underground cables and equipment. This will involves disruptive excavation work, which will typically last a week. It causes noise and inconvenience to customers living or working in the immediate vicinity of the substation. Road works/barriers, road closures and heavy lifting equipment can disrupt traffic flow, parking and impact the trade of local businesses.
- **Rural areas** - The impact of installing new overhead poles, lines and equipment is different but equally as disruptive to the local community.
- Reinforcement costs are reflected in an increase in bills to cover the additional investment required

What are the benefits?

✓ The network can meet increased demand

✓ No restrictions on electricity usage and to some degree, a customers ability to generate electricity

£ £ £ £ £

Typically between £15,000 and £25,000 per site

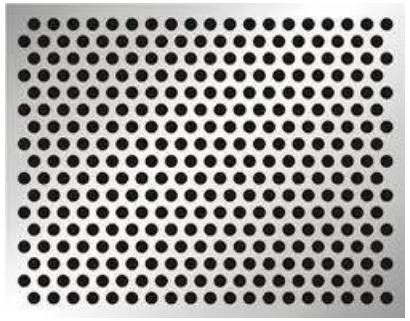
TECHNIQUE A:

Shading substations to protect them from the heat generated from direct sunlight

Solution description:

Shading could be fitted over the top of pole mounted transformers (pictured right) or potentially over equipment you could see in the compound of our ground mounted substations.

The shading would be provided by insulated, perforated panels, installed over the equipment.



Potentially, what am I likely to notice?

- A change in the appearance of the substation
- A planned supply interruption to install the technology. Electricity North West will manage these impacts by standard written notification and the work would take approx. one day.

What are the benefits?

✓ ***Long term network and customer benefits from removing thermal constraints on equipment***

✓An effective solution in locations where solar heat gain is significant
✓ No audible impact on customers
✓ Minimal customer impact in terms of the change in appearance

Cost to implement relative to traditional reinforcement:

£ £ £ £ £

Traditional reinforcement between x15 and x25 the cost of this technique to implement

TECHNIQUE B:

Heat exchange and air conditioning related solutions

Solution description:
Cooling transformers through the use of fans and pumps will involve the installation of a unit, similar to that illustrated here, in the substation compound. This would be strategically placed against the substation building. This system is controlled automatically by thermostats.

Additional vents would also be required in the substation building (or the metal/plastic housing) to allow air flow, to remove heat from the substation and cool-the equipment inside it. The vents are likely to be positioned high up in the door or high on the wall.

Potentially, what am I likely to notice?

- A change in the appearance of the substation
- A small audible difference (similar to a desk fan in an adjacent room)

What are the benefits?

- ✓ ***Long term network and customer benefits from removing thermal constraints on equipment***
- ✓ Minimal impact, relative to the size of the substation
- ✓ Minimal customer disruption during installation
- ✓ No supply interruption would occur during installation

Cost to implement relative to traditional reinforcement:

£ £ £ £ £

Traditional reinforcement between x2 and x3 the cost of this technique to implement

TECHNIQUE C:
Solar reflective paint

Solution description:

Painting substations with highly reflective paint to deflect solar radiation and reduce the impact of the sun in raising the temperature of equipment.

Less heat will be absorbed from the sun, but internal heat will still be emitted.

Potentially, what am I likely to notice?

- A change in the colour of the substation. This could be white or beige.
  - It is likely that only the roof would change colour for ground mounted substations
  - A pole mounted substation would be painted in its entirety
- A planned supply interruption might be required to change/modify a pole mounted transformer

What are the benefits?

✓ ***Long term network and customer benefits from removing thermal constraints on equipment***

✓ Minimal customer impact during installation

✓ Easy to implement and widely available

✓ No impact in terms of noise

✓ Different colours can be utilised

✓ No supply interruption would occur during modifications to ground mounted substations

✓ An effective solution in locations where solar heat gain is significant

Cost to implement relative to traditional reinforcement:

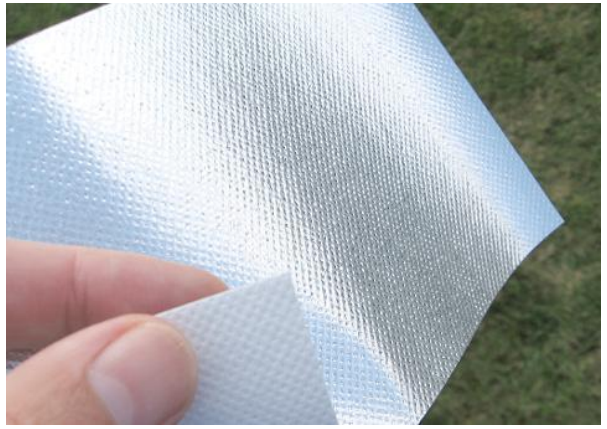
£ £ £ £ £

Traditional reinforcement between x15 and x25 the cost of this technique to implement

TECHNIQUE D:
Solar reflective materials or grating

Solution description:

Reflective material placed on the top of substations to reflect the sun to prevent the building/housing and the equipment inside from overheating.



Potentially, what am I likely to notice?

- Visible only from the upper stories of buildings
- Some possible glare when looking down on the substation roof.

What are the benefits?

- ✓ ***Long term network and customer benefits from removing thermal constraints on equipment***
- ✓ No impact in terms of noise
- ✓ Minimal impact in terms of appearance
- ✓ No supply interruption would occur during installation
- ✓ Less heat radiation will be absorbed from the sun, but internal heat will still be emitted efficiently.
- ✓ Provides a solution for exposed substations, un-shaded by buildings or vegetation.

Cost to implement relative to traditional reinforcement:

£ £ £ £ £

Traditional reinforcement between x15 and x25 the cost of this technique to implement

TECHNIQUE E:
Cable backfill

Solution description:

This technique involves removing the traditional backfill materials (aggregate, sand and earth), in the ground, around electric cables, with materials that have extremely high thermal conductivity. This removes the heat from the cable and there are different materials which can be used for this purpose.

This technique will only be applied to cables very near, and going into the substation.

Potentially, what am I likely to notice?

- This technique will involve excavation work but most will occur in the substation compound. There could be limited noise, disruption and inconvenience to customers living or working in the immediate vicinity of the substation and barriers/roadworks could disrupt parking the day the solution is implemented

What are the benefits?

✓ ***Long term network and customer benefits from removing thermal constrain on cables and equipment***

✓ No change to the appearance or noise from the substation
✓ No supply interruption would occur during installation

Cost to implement relative to traditional reinforcement:

£ £ £ £ £

Traditional reinforcement between x15 and x25 the cost of this technique to implement

TECHNIQUE F:
Solar panels installed on roof

Solution description:

Solar panels placed on the top of substations to absorb and reflect the sun to prevent the building/housing and the equipment inside from overheating, while generating electricity.

Potentially, what am I likely to notice?

- Visible only from the upper stories of buildings
- Some possible glare when looking down on the substation roof
- Installation over a couple of days

What are the benefits?

- ✓ ***Long term network and customer benefits from removing thermal constraints on equipment***
- ✓ No impact in terms of noise
- ✓ Minimal impact in terms of appearance
- ✓ Generation of electricity
- ✓ No supply interruption would occur during installation
- ✓ Solar heat gain, that might overheat internal substation equipment will be absorbed by the panels but internally generated heat will still be emitted efficiently.
- ✓ Provides a solution for exposed substations, un-shaded by buildings or vegetation.

Cost to implement relative to traditional reinforcement:

£ £ £ £ £

Traditional reinforcement between x5 and x8 the cost of this technique to implement

TECHNIQUE G:

Other internal substation cooling techniques

Solution description:

There are a range of techniques that will be carried out inside substations, which will have no obvious visual or audible effect. However, these technique may need us to install one or more vents, a flue or a small chimney.

Potentially, what am I likely to notice?

- A small change in the appearance of the substation

What are the benefits?

✓Long term network and customer benefits from removing thermal constraints on equipment

- ✓ Minimal impact, relative to the size of the substation
- ✓ Minimal customer disruption during installation
- ✓ No supply interruption would occur during installation

Cost to implement relative to traditional reinforcement:

£ £ £ £ £

Traditional reinforcement between x15 and x25 the cost of this technique to implement

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Bringing energy to your door

CLIMATE CHANGE ACT 2008

The Climate Change Act 2008 requires the UK to reduce greenhouse gas emissions by 80% by 2050. This will mean that we have to burn fewer fossil fuels.

At the same time, the demand on electricity networks is expected to double because:

- More homes are likely to be heated by electricity instead of gas or oil; and
- Domestic cars and commercial vehicles will be electric or plug in hybrid rather than petrol fuelled.

PROBLEM STATEMENT

Government forecasts predict an increase in electricity demand by of **60% by 2050**. It's difficult to predict how quickly the wholesale use of low carbon technologies **(solar generation / electric vehicles / electric heat pumps)** will become the norm but we expect to see **notable changes over the next 10 years.**

Distribution Network Operators (DNOs) are under a regulatory obligation to make sure that their distribution networks can accommodate the forecasted uptake in these technologies.

This chart illustrates the scale of the challenge:

- In an area of domestic properties with **gas central heating**, the electricity network is designed to supply **a peak demand of up to 2kW per property**
- Changing the gas heating to an **'all electric'** alternative and adding a new **electric vehicle** could result in a total demand of **up to 15kW per property**, over seven times the peak demand the network was originally designed to accommodate.

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THERMAL CONSTRAINTS

Greater demand for electricity will mean an increase in the current flowing on the network. The greater the current, the **greater the heat** generated and the **hotter cables** and the equipment located in substations **(transformers)** become. In some cases this will lead to equipment operating close to its **maximum operating temperature**.

In addition to the challenge of increased current, substations operate in different environments and in some cases **sun glare** can significantly affect the internal operating temperature of equipment.

Currently, if equipment exceeds its capacity rating it is replaced with new, higher capacity equipment. This is both expensive and disruptive and these costs are borne by all customers in the form of higher bills.

A POSSIBLE SOLUTION

Our innovative project, Celsius, will develop simple 'Thermal monitoring' techniques, which will identify where our equipment is starting to operate close to its 'thermal capacity'.

As these sites, we will trial a range of cooling techniques to:

- ✓ **Reduce heat in cables and equipment caused by high load and current**
- ✓ **Improve air flow inside substations to assist in cooling this equipment**
- ✓ **Make some external modifications to help absorb or deflect solar heat.**

Cooling techniques will **quickly & cost effectively release capacity** from existing equipment, enabling the network to be **utilised more efficiently** to help meet increased demand, without increasing bills.