

# LCN Fund Full Submission

## Supplementary Answer Form

Tick if this answer is Confidential: ☐

Tick if this answer has been provided verbally: ☐

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| Project code:                          | ENWT205  | Question Number | 28              |
| Question date                          | 3 October 2013   | Answer date     | 11 October 2013 |
| Submission section question relates to | Expert Panel Bilateral   |                 |                 |
| Topic                                  | Costs  |                 |                 |
| Question                               | Please provide further information on the potential adverse impacts to customer equipment resulting from the use of the capacitors on HV and especially LV networks (eg. due to harmonics, fast transients).   |                 |                 |
| Notes on question                      |  |                 |                 |
| Answer                                 | <p>Capacitors are used extensively worldwide for a range of differing reasons.</p> <p>Around the globe network operators use capacitors extensively to manage network voltages; for example network operators in America and Australia use capacitors to regulate voltage on distribution lines. Whereas capacitors are very rare on the LV and HV networks in the UK; <i>eta</i> will demonstrate the use of capacitors on HV and LV networks in the UK.</p> <p>In the UK (and worldwide) Industrial and Commercial customers use switched capacitors to correct poor power factors so there is significant experience both on the potential fast transient and harmonic issues and the successful mitigation measures.</p> <p>The interconnecting of networks creates electrically stronger networks which are less influenced by transients and flicker issues; the interconnection also delivers a network with a higher impedance and this will help to move any resonant frequencies away from the lower orders where significant injections occur.</p> <p>Our Technical Support, TNEI, often work with suppliers of capacitors and the frequency of switching planned for the <i>eta</i> Project is significantly less than capacitors in power factor correction equipment; which switches approximately every minute and are often switched with contactors with rarely any fast transients issues. If switching transients are a concern then thyristor controlled switching is also an option and will be considered at the site design stage.</p> <p>If harmonic issues are a concern then it is normal to 'de-tune' the capacitor banks using a reactor to avoid any unwanted resonances on the system. This is extremely</p> |                 |                 |

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|  | <p>effective in mitigating this issue and will be considered at the site design stage.</p> <p>TNEI, PB Power and S&amp;C Europe have all undertaken electrical studies with capacitors of Electricity North West's network in the preparation for the <i>eta</i> bid and all are supportive of the technological approach within <i>eta</i>.</p> |
| Attachments                            |  |
| Verbal Clarifications<br>(Consultants) |  |