



Flexible Networks for a Low Carbon Future



**Project Cost
Benefit Analysis**
- Energy Efficiency
September 2015

Part A – Costs of the trial and future roll-out

1. Introduction

This document provides cost versus benefit analysis of the deployment of energy efficiency incentivisation measures for larger customers. The document aims to quantify the cost per kVA of capacity gain by applying this alternative approach against the cost per kVA of traditional business as usual reinforcement solution

2. Planned Innovation and Benefits

The objective of this work package was to achieve a reduction in the network demand (and thereby free up capacity, for possibly other Low Carbon Technology loads), by helping larger customers identify energy efficiency opportunities within their premises. Then where deemed appropriate, to incentivise the implementation of those energy efficiency measures. The target for this work package was 2% reduction of the peak demand within the trial sites.

3. Activities of the Work Package

- Engage a project partner (BRE) to undertake stakeholder engagement and energy efficiency opportunity identification surveys of larger customers in the trial site areas.
- Analyse energy efficiency opportunities and provide support and advice to the customers regarding the opportunities, gaining stakeholder buy-in and agreement to implementing the measures.
- Identify cost/benefit priority for support funding allocation towards energy efficiency measures and assist the development of appropriate delivery mechanisms.
- Support customer implementation of energy efficiency measures.

4. Work package Outturn against budget (trial Base Cost)

The submission budget for this work package was £362K.

Table 1 below is a summary of the overall work package 2.2 expenditure and lists the original budget against the actual spend for the trial.

Activity	Budget (£k)	Actual (£k)	Variance (£k)	Commentary
Labour	44	41	-3	Minor under spend
Equipment				
Contractors	195	220	+25	Additional contractor costs and the use of iBoost devices.
IT				
Travel/Exp's				
Contingency & Others	23	18	-5	Used towards additional contractor costs and the use of iBoost devices.
Payments to users	100	0	-100	Unable to secure the customers to undertake the agreed energy efficiency measures.
Totals	362	279	-83	

Table 1

Labour – The internal labour costs were slightly lower than budget,.

Contractors – The contractor costs were higher than planned and iBoost devices were trialled in selected customer premises.

Contingency – Part of the contingency budget was used towards the increased contractor costs and iBoost installations.

5. Future Roll out cost of Energy Efficiency initiative

The table below shows a breakdown of the Trial Project Cost versus Repeated Method Cost for deployment of the energy efficiency incentivisation technique. The trial cost shows the expenditure of the trial in the activities which were undertaken. The Repeated method costs show an estimate of future costs now that we know how to deploy the technique. The benefit column shows the estimated load reduction we agreed with a customer (although the measures were not undertaken at this time.) The Cost/Benefit ratio shows the cost of each kVA of capacity reduced had the measures been implemented.

Activity	Trial cost (£)	Repeated Method Cost (£)	Benefit (kVA)
Research and surveys of area occupants to evaluate opportunities.	79000	5000	
Contact and evaluation of target occupant’s energy efficiency.	25000	10000	
Energy efficiency analysis and customer liaison.	45000	12000	
Prioritising incentive contribution from project.	15000	3000	
Customer support	25000	5000	
Demand/efficiency benefit monitoring and evaluation.	10000	3000	
Project management	40000	20000	
Incentivisation to customers to implement efficiency measures	40000*	15000	
Totals	239000	73000	87.6
Cost/Benefit Ratio (£/kVA)		842	

*Incentivisation payment planned for this capacity reduction

Table 2

Research and surveys of area occupants to evaluate opportunities – This was a study to determine the building types, energy usage and benchmark against national building energy statistics, to identify target customers.

Contact and evaluation of target occupant’s energy efficiency – This was to make contact with target customers, survey their energy usage and identify opportunities.

Energy efficiency analysis and customer liaison – This was to discuss, explain and understand the appetite of customers to implement the efficiency opportunities identified at their sites from the surveys.

Prioritising incentive contribution from project. – Following the customer’s energy surveys, these were analysed to determine the priority list for any incentivisation contributions..

Customer support – This includes for liaising with the customers and discussing/advising them on the energy efficiency opportunities available to them from the surveys, to determine their attitude towards undertaking the measures and agree any incentivisation terms.

Demand/efficiency benefit monitoring and evaluation.– This allows for post evaluation of the energy efficiency measures.

Project management – This covers the practical aspect of the coordination, justification, and governance of such project.

Incentivisation to customers to implement efficiency measures – This element of the project budget may be necessary dependent upon the appetite of the customers towards undertaking the energy efficiency measures.

Part B – Financial Assessment

The below assessment figures are based on a real scenario which the project had agreed to implement with a customer, but unfortunately wasn't able to be completed within the project timescales.

Reinforcement Base Cost

A generic base cost of £262.50/kVA has been estimated for the 33kV and 11kV reinforcement.

In order to allow for the potential amount of capacity released by this technique to be provided by conventional reinforcement, 87.6kVA of capacity would need to be provided. Using the pro-rata base cost of £262.50/kVA for additional capacity, the base cost of network reinforcement is;

$$\text{Capacity} = 87.6\text{kVA} @ \text{£}262.50/\text{kVA} = \text{£}22,995$$

Carbon Saving:

A saving of approximately 338,000kWh could be realised through the implementation of the energy saving measures installed by the customer. These included;

- Motor variable speed drives
- Enhanced cooling controls
- PIR lighting controls
- Replacement of low efficiency lighting

Cost of Carbon = Energy x Conversion Factor x Value of Carbon

Using the equation above;

Energy = 338,000kWh

Conversion Factor = 0.45211 kgCO₂e/kWh (average over RIIO ED1 8 year period to 2023)

Value of Carbon = £14.03/tCO₂e (average over RIIO ED1 8 year period to 2023)

The Cost of Carbon/year = 338,000kWh x 0.45211 ÷ 1000 x 14.03 = £2,144

Carbon Saving over 10 years = a saving of £21,440

The Benefits rating of the project as per Table 1 is calculated at 4 (significant) as the project will avoid >£10,000 in CO₂.

Saving: £21,440

Benefit rating: 4 (Significant)

Social and Environmental Benefit

The project could provide significant energy saving benefits to the customers who participated in the exercise. The demand reduction from the energy saving could allow additional low carbon technologies to be connected (utilising the released capacity) such as electric vehicles or heat recovery pumps. The energy savings achieved provide corresponding carbon savings. The speed of deploying the energy saving measures could be much quicker than reinforcement works of a particular network which is at capacity, thereby allowing an accelerated connection of low carbon technologies.

Benefit of the trial as planned:

Total cost of efficiency measures = £106k
Proposed incentivisation payment to customer = £40k
Anticipated energy savings = 338,000kWh (with 87.6kW of peak demand)
Capacity release or avoiding network reinforcement @ £262.50/kVA = £22,995
Customer energy savings = 338,000kWh x £0.08/kWh = £27,040pa (or £270,400 over 10years)

The customer proposed investment was £66,000, which gave a payback period of 2.4years. Had the (£40k) project incentivisation not been available, the £106,000 investment would have given a payback period of 3.9years. Over this period the measures may not have been a priority for the customer.

Benefit rating: 4 (Significant)

Financial Benefit:

The project identified and incentivised energy saving measures which could be undertaken by the customer

Base Cost: £22,995 (pro-rata cost of creating capacity)

Method Cost: £73,000 (repeat cost of energy efficiency methodology as undertaken in the trial)

Non-Network Derived Benefits:

Carbon + Social = £21,440 + £27,040 = £48,440

Method Cost – Non Network Derived Benefits;

£73,000 - £48,440 = £24,560

Financial Benefit = Base Cost – Method Cost

Financial Benefit = £22,995 – £24,560

Financial Benefit = - £1,565

Benefit rating: 0 (nil)

Safety Benefit:

None envisaged standard health and safety processes will be applied and any new learning gained from the project will be shared.

Benefit rating: 0 (nil)

Network Reliability Benefit:

The project has no measureable reliability benefit to the network.

Benefit rating: 0 (nil)

6. Benefit Scorecard

Grading of Benefit	Financial Benefit	Safety Benefit Per Reported Case	Social and Environmental Benefit	Network Reliability Benefit	Carbon Saving
High (5)	Major £1M+	Lead to the reduction of fatalities >£1m	Managed realignment (significant) –High incurred costs and environmental benefit/value > £50k	Leads to significant and permanent improvement in Regulatory performance targets >£100k	Major >£30k £/tCO ₂ e
Significant (4)	Significant £100k-£1M	Significant improvement to public safety £100k-£1m	Managed realignment (minor) –Minor to medium incurred costs and environmental benefit/value > £25k	Leads to sustainable improvement in Regulatory performance targets >£50k	Significant >£10k £/tCO ₂ e
Medium (3)	Medium £10k-£100k	Reduction of reportable injuries >£20k	Improve (significant) Significantly improve existing processes and systems to adapt the existing environmental characteristics > £10k	Leads to improvement in performance >£10k	Medium >£5k £/tCO ₂ e
Minor (2)	Small £1k-£10k	Lead to the reduction of absence due to ill health >£11k	Improve (minor); Improve existing processes and systems to adapt the existing environmental situation > £1k	Contributes to improvement in performance £1k	Minor >1k £/tCO ₂ e
Low (1)	Low £0-£1k	Avoidance of minor injury >£0.33k	Do minimum; This is a continuation of existing processes and maintenance, delaying but not avoiding or improving < £1k	Small but measurable improvement <£1k	Low <£1k £/tCO ₂ e
Nil (0)	None or Negative	No Tangible Benefit	No Tangible Benefit	No Tangible Benefit	No Tangible Benefit

	Financial Benefit	Safety Benefit Per Reported Case	Social and Environmental Benefit	Network Reliability Benefit	Carbon Saving
Benefit Rating	0	0	4	0	4
Total	8				