

Flexible Networks for a Low Carbon Future



Project Cost Benefit Analysis

- Enhanced Network
Monitoring

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 enhanced secondary substation network monitoring. The document aims to quantify the cost per kVA of capacity gain by applying an “alternative” or new technology solution against the cost per kVA of the traditional business as usual reinforcement solution.

2. Planned Innovation and Benefits

The objective of this work package was to install new monitoring which could harvest network data that could then be analysed to determine the appropriate application and effectiveness of the other work package initiatives within the trial sites. Therefore the monitoring itself wasn’t planned as an action to deliver a specific benefit. However the enhanced data available for analysing network loading with a time base has provided a benefit in a more accurate determination of network capacity headroom, thereby allowing network reinforcement to be deferred and thus additional load to be applied, where the network loading is less than was previously estimated.

3. Activities of the Work Package

- To determine the data requirements of the other project work packages.
- To specify, procure, install and commission monitoring equipment transmitting data to a hub with web enabled access to the data for analysis.
- To maintain the monitoring system and data availability for the duration of the project.

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

The original submission budget for this work package was £2,212K.

Below is a summary of the work package expenditure.

Activity	Budget (£K)	Actual (£K)	Variance (£K)	Commentary
Labour	591	229	-362	
Equipment	1,133	1,176	+43	
Contractors	129	44	-85	
IT	100	128	+28	Additional costs for data hub and comms
Travel/Exp's				
Contingency & Others	259	86	-173	Most of the contingency was not used.
Payments to users				
Totals	2,212	1,663	-549	

Table 1

Labour – The internal labour costs were lower than budget, due to not being able to release staff with the required skills from the businesses to the project for the 3+years. Therefore the resource requirements were fulfilled by using external contract staff. The combined budget for internal staff and contractors was £720k and the actual expenditure was £511k.

Equipment – The overall costs for the 3 sites were close to budget.

Contractors – This is explained above in the labour category.

Contingency & Others –Most of the contingency budget was not required, the other costs include decommissioning and the CI/CML budget which was not required.

5. Future roll out cost of Network Monitoring

Table 2 below shows a breakdown of the Trial Method Costs versus Repeated Method Cost deployment for the network monitoring. The trial cost shows the cost of undertaking the trial of the monitoring. The repeated method costs illustrate the costs of further deployment to other sites in future. The benefit column shows the capacity gained through the deployment of monitoring and the Cost/Benefit ratio shows the cost of each kVA of headroom benefit, if the monitoring was deployed as a stand-alone initiative.

Activity	Base cost (£k)	Repeated Method cost	Benefits
Site & Communication surveys	17000	6000	
Monitoring equipment	1175000	180000	
Monitor installation/commissioning	90000	25000	
Data hub/IT support	159000	24702	
Data communication	95000	24000	
Equipment maintenance	20000	3000	
Data quality & performance upkeep	15100	4000	
Engineering & project management	92000	40000	
Totals	1663100	306702*	

*Total repeated method cost is for approximately 100 substation sites

Per secondary substation		£3,067	
Average Benefit Enhancement (kVA per substation)			39kVA
Average Cost/Benefit Ratio (£/KVA)			£78/kVA

Table 2: Trial Method Costs versus Repeated Method Costs

Site & Communication surveys – This is necessary to determine if the sites are suitable for the installation of the monitoring equipment, in terms of space, connectivity, safety and communication medium (e.g. signal strength for GPRS comms).



Monitoring Equipment – This covers the purchase of the monitoring units, measurement sensors and ancillary items.

Monitor installation/commissioning – This covers the resources for installation and setup of the monitors.

Data hub/IT support – This covers the hosting service and web portal access for the monitoring data.

Data communication – This covers the data communication costs, which was SIM cards and a monthly data charge.

Equipment maintenance – This allows for the ongoing attendance to monitors and communication equipment which is necessary for a large number of units continually running.

Data quality & performance upkeep – This allows for the regular checking of the data collection and quality, to identify and target equipment operation and performance issues.

Engineering & project management – This covers the practical aspect of delivery of a monitoring population.

6. Project

This comprised a £2,212,000 work package to install enhanced network monitoring to provide data across the three trial sites of St Andrews, Wrexham and Whitchurch and included provision of a data hub with web enabled access for user analysis.

The estimated method cost for replicating the project is £306,702 to the DNO for the installation of approximately 100 substation and network monitors, a data hub with a web access portal and to provide the communications between the monitors and the hub for the data. At the secondary substations on the trial sites where we installed the monitoring, the enhanced load information gave us the confidence that on average, we had additional capacity available from what was previously understood from the maximum demand indicator (MDI) data. The value of the additional capacity at 86 substations with an average rating of 490kVA was 8%, equating to an average of 39kVA* per substation.

In this trial this was assessed from:-

- 86 substations with enhanced monitoring and MDI comparison.

- Transformer capacities varied from 100-1000kVA (averaging 490kVA)

- Substation loading of MDI versus monitoring demand was between -43% and +44% (averaging +8%)

*Note, This was found on a specific group of secondary substations, at another site this figure may be more or less than the average additional capacity figure found to be available in this trial.

Base Cost

The base cost for this capacity is £5,880 for the DNO. This is the typical pro-rata cost for the reinforcement for a secondary substation that is currently at full capacity.

Capacity of 39.2kW @ £150/kVA = £5,880

Carbon Saving:

No carbon savings can directly be attributed to this project.

Benefit: 0 (nil)

Social and Environmental Benefit

This part of the project does not provide specific social or environmental benefits, but is an enabler for other network interventions to be deployed based on the analysis of the data the monitoring provides.

Benefit rating: 0 (nil)

Financial Benefit:

Base Cost: £5,880

Method Cost: £3,067

Financial Benefit = Base Cost – Method Cost

Financial Benefit = £5,880 – £3,067

Financial Benefit = £2,813

Benefit rating: 2 (minor)

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)

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 £/tCO2e
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 £/tCO2e
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 £/tCO2e
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 £/tCO2e

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 £/tCO2e
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	2	0	0	0	0
Total	2				