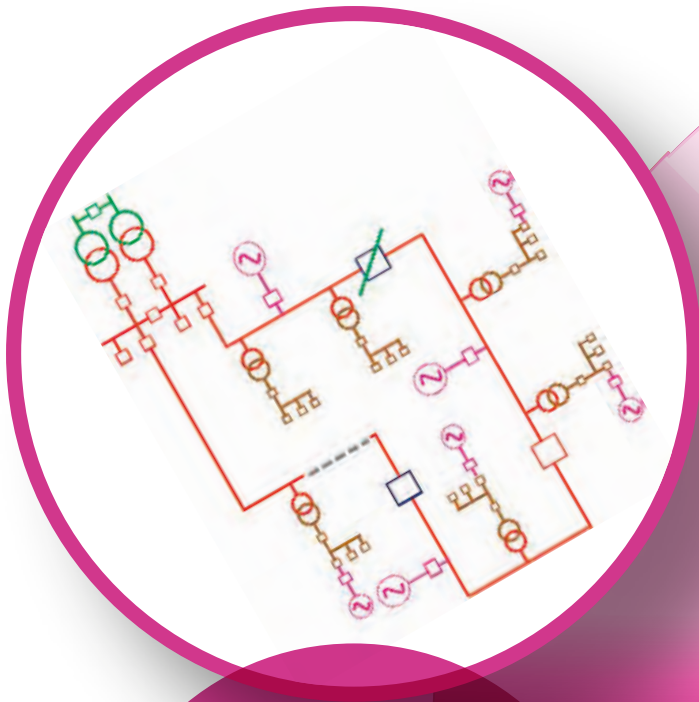


Flexible Networks for a Low Carbon Future



Project Cost Benefit Analysis

- Flexible Network
Control

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 Flexible Network Control on 11kV networks. The document aims to quantify the cost per kVA of capacity gain by applying a “smart” 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 achieve an increase in the available capacity. The savings target for this work package was 9% of the demand within the trial sites.

3. Activities of the Work Package

- Network modelling and analysis of the trial site areas to identify the capacity opportunities.
- Determination of the most cost-effective and practical network automation points.
- Installation and commissioning of equipment.
- Reviewing operational performance and control algorithms.

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

The submission budget for this work package was £851K.

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	165	96	-69	Contractors used instead of internal labour
Equipment	340	416	+76	More network apparatus needed automation applying than originally envisaged
Contractors	270	219	-51	
IT	24	14	-10	PowerOn algorithms undertaken and included in contractor costs
Travel/Exp's				
Contingency & Others	53	36	-17	Equipment, comms and installation costs were contractors higher than anticipated.
Payments to users				
Totals	851	781	-70	

Table 1

Labour – The internal labour costs were significantly lower than budget, due to not being able to release staff from the businesses with the required skills 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 £435k and the actual expenditure was £315k.

Equipment – The equipment envisaged for this work package included the new communication systems, switchgear interface/ and replacement apparatus and the Central Control Units (CCU). Several additional/replacement units of apparatus were required which accounted for the additional cost, due to them not being suitable for obtaining the analogue information.

Contractors – This is explained above in the labour category.

Contingency – Part of the contingency budget was used across a few elements of the work package. E.g. equipment and contractors.

5. Future Roll out cost of Flexible Network Control

The table below shows a breakdown of the Trial Project Costs versus Repeated Method Cost for deployment of Flexible Network control. The trial cost shows the expenditure in the activities which were undertaken. The Repeated method costs show an estimate of future costs now that we know how to deploy the technology. The benefit column shows the capacity gained through the deployment of Flexible Network Control and the Cost/Benefit ratio shows the cost of each kVA of headroom created.

Activity	Trial cost (£k)	Repeated Method cost	Benefit (kVA)
Network modelling/analysis	165000	10000	
Site & radio surveys	5000	5000	
Automation equipment	275000	50000	
Equipment assembly/pre-testing	7000	5000	
Network apparatus	173000	75000	
Land consents	6500	3000	
Apparatus/Equipment installation	35000	25000	
NMS configurations	25000	5000	
Engineering & project management	89000	10000	
Totals	780500	188000	
Cost/Benefit Ratio (£/kVA)		£94.00	2000

Table 2

Network modelling/analysis – This is required to evaluate the demand and capacity of the selected group to apply the Flexible Network Control and the adjacent network groups to

identify the capacity which can be transferred between the groups. The output from this work is the high level design for Flexible Network Control.

Site & Radio surveys – This is necessary to determine if the location is suitable to establish the necessary communications. E.g. topography, range and number of repeater stations needed.

Automation equipment – This is the apparatus interface, communications and central control units necessary to obtain the network data, transmit data to the central control unit (CCU) and to switch the apparatus state.

Equipment assembly/pre-testing – Before site installation the equipment is programmed and configured in a workshop in controlled conditions.

Network apparatus – This includes for a certain number of network apparatus units, typically pole mounted switches, ring main switches or pole mounted reclosers to be replaced with modern units which have current transformers and voltage sensors built-in, to enable loading data to be utilised.

Land consents – This allows for the necessary consents to be obtained to install new (possibly pole mounted) equipment on private land.

Apparatus/Equipment installation – This allows for the installation of the new/replacement switchgear and the automation equipment.

NMS configurations – This allows for the logic algorithms to be created and set up in the network management systems for the Flexible Network condition activation and switching sequencing.

Engineering & project management – This covers the practical aspect of delivery of a Flexible Network control system.

Part B – Financial Assessment

Reinforcement Base Cost at 11kV

A generic base cost of £225/kVA has been estimated for 11kV reinforcement (additional 11kV cabling and secondary transformers).

In order to allow for the potential amount of capacity released by this project to be provided by conventional reinforcement, 2000kVA of capacity would need to be provided. Using the pro-rata base cost of £225/kVA for additional 11kV capacity, the base cost of network reinforcement is;

$$\text{Capacity} = 2000\text{kVA} @ £225/\text{kVA} = £450,000$$

Carbon Saving:

No specific carbon saving can directly be attributed to this work package element.

Benefit rating: 0 (nil)

Social and Environmental Benefit

The speed of deploying the network automation system could be quicker than traditional reinforcement works of a particular network which is at capacity, thereby allowing an accelerated connection of low carbon technologies.

Benefit rating: 2 (Minor)

Financial Benefit:

Base Cost: £450,000

Method Cost: £188,000

Financial Benefit = Base Cost – Method Cost

Financial Benefit = £450,000 – £188,000

Financial Benefit = £262,000

Benefit rating: 4 (Significant)

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 £/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	4	0	2	0	0
Total	6				