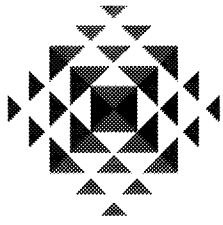

PowerSystems

Innovation Funding Incentive

Annual Report

Issue 2 – 23rd August 2005

'Early Start' Projects
Oct 04 – Mar 05

Prepared by
SP Power Systems Ltd
on behalf of SP Distribution and SP Manweb

Introduction & Background

Context

As part of the most recent Distribution Price Control Review, Ofgem introduced two new incentive mechanisms: the Innovation Funding Incentive (IFI) and Registered Power Zone (RPZ). They were consulted on as an integral part of the DPCR proposals and were widely supported by a large majority of consultees. As part of this development process Ofgem published a Regulatory Impact Assessment setting out the case for the introduction of the IFI and RPZs.

The primary aim of these two new incentives is to encourage the DNOs to apply innovation in the way they pursue the technical development of their networks. Ofgem recognised that innovation has a different risk/reward balance compared with a DNO's core business. The incentives provided by the IFI and RPZ mechanisms are designed to create a risk/reward balance that is consistent with research, development and innovation.

The two main business drivers for providing these incentives at this time are the growing need to efficiently manage the renewal of network assets and to provide connections for an increasing capacity of distributed generation at all distribution voltage levels. These are significant challenges that will both benefit from innovation.

Innovation Funding Incentive (IFI)

The IFI is intended to provide funding for projects focused on the technical development of distribution networks, up to and including 132kV, to deliver value (i.e. financial, supply quality, environmental, safety) to end consumers. IFI projects can embrace any aspect of the distribution system asset management from design through to construction, commissioning, operation, maintenance and decommissioning. The detail of the IFI mechanism is set out in the Special Licence Condition C3 and the DG Regulatory Instructions and Guidance (RIGs).

They can be summarised as follow:
A DNO is allowed to spend up to 0.5% of its Combined Distribution Network Revenue on eligible IFI projects. This GPG provides guidance on the characteristics of such projects. The DNO is allowed to recover from customers a significant proportion of its IFI expenditure. This proportion is set at 90% in 2005/6 reducing in equal steps to 70% in 2009/10.

Ofgem will not approve IFI projects but DNOs will have to openly report their IFI activities on an annual basis. Ofgem reserves the right to audit IFI activities if this is judged to be necessary in the interests of customers.

Registered Power Zone (RPZ)

In contrast to the IFI, RPZs are focused specifically on the connection of generation to distribution systems. The estimates made by DNOs as part of the DPCR process indicated that some 10GW of generation could be connected in the next five years. This generation could connect at every distribution voltage level bringing new system design and operating challenges.

RPZs are therefore intended to encourage DNOs to develop and demonstrate new, more cost effective ways of connecting and operating generation that will deliver specific benefits to new distributed generators and broader benefits to consumers generally. The detail of the RPZ mechanism is set out in the Special Licence Condition D2 and the DG Regulatory Instructions and Guidance (RIGs).

The RPZ mechanism is an extension of the Distributed Generation (DG) Incentive that is also being introduced as part of DPCR4. The DG incentive allows DNOs to recover their generation connection costs by a combination of pass through (80%) and incentive per kW connected

(£1.5/kW). This approach is expected to deliver a higher return to a DNO for generation connection schemes than other network investments.

If a DNO employs genuine innovation in the way that it connects generation it can seek to register the connection scheme with Ofgem as an RPZ. Ofgem will decide, using published criteria, whether the scheme qualifies as an RPZ. If it does, the incentive element of the DG Incentive is increased for the first five years of operation by £3/kW.

The RPZ mechanism is capped in two ways. For the first two years DNOs can only apply for two RPZ registrations per year; this will be reviewed in 2007. Also, in any year, a DNO's additional revenue from RPZ schemes cannot exceed £0.5 million.

Overview

A total of 12 IFI projects were undertaken by SP PowerSystems on behalf of the SP Distribution and SP Manweb Licence areas for the period 1st October 04 – 31st March 05.

No RPZ applications were submitted to Ofgem in the period 1st October 04 – 31st March 05.

Summary Tables

Table 1: IFI Summary - SP Distribution Licence Area

IFI Allowance (0.5% turnover)	£1.69m
IFI Carry Forward	£0
Number of Active IFI Projects	10 (end March 05)
NPV of costs and anticipated benefits from committed IFI projects	£200,337
Summary of other benefits anticipated from IFI projects	See individual reports
External expenditure to date on IFI projects	£70,185
Internal expenditure to date on IFI projects	£25,196
Total expenditure to date on IFI projects	**£95,381**
Benefits actually achieved from IFI projects to date	N/A

Table 2: IFI Summary - SP Manweb Licence Area

IFI Allowance (0.5% turnover)	£1.1m
IFI Carry Forward	£0
Number of Active IFI Projects	12 (end March 05)
NPV of costs and anticipated benefits from committed IFI projects	£410,814
Summary of other benefits anticipated from IFI projects	See individual reports
External expenditure to date on IFI projects	£121,956
Internal expenditure to date on IFI projects	£54,089
Total expenditure to date on IFI projects	**£176,045**
Benefits actually achieved from IFI projects to date	N/A

Cost Breakdown

As SP PowerSystems operates across both the SP-Distribution and SP-Manweb areas, successful developments undertaken in one part of the business will equally apply to both licences. In line with this, costs have been split against each licence based on the turnover and hence size of each network area.

Table 3: Cost Breakdown between Licence Areas

Licence Area	Annual Turnover	Percentage Split
SP-Distribution	£338m	~61%
SP-Manweb	£220m	~39%

Hence, for projects with an equal application between both SP-D and SP-M, costs have been apportioned on a 61% / 39% split (respectively). Projects identified as only applying to one licence, or that apply in favour of one over the other have been scaled accordingly (Table 4).

Internal Costs

Internal costs for the period Oct 04 – Apr 05 for both SP-D and SP-M exceed the 15% cap set by Ofgem in the RIGs. The prime reason for this is in the start up of the IFI process, with much of the early costs being attributed to scoping a project and identifying the issues rather than in equipment purchase or consultation fees. It is expected that the 04/05 costs when added to those for 05/06 will be more in line with the 15% cap.

Projected Costs

An indication of future known costs for the years following 04/05 have been included to highlight the expected project costs that will be required prior to a project realising a stated benefit.

Full adoption costs of successful projects have not been included, but are expected to approach 10 times the project cost.

Project Reports

Summary sheets for each individual projects have been provided in the Appendices. In the interests of efficiency, only one summary sheet has been produced with associated internal / external costs and Net Present Value (NPV) calculations for a whole project (i.e. they are not split by licence area). The NPV calculations factor in the probability of a project's success. This factor can have a significant impact on the expected benefits a project may achieve.

NPV calculations for the de-minimis projects, e.g. the Strategic Technology Programme (STP) have been based on assumptions on the likely success and associated benefits achieved from a portfolio of projects. This has been done purposely to simplify the calculations - as each project within a programme has different benefits and start / finish times. All modules in the STP therefore give rise to the same NPV figures. The methodology for calculating the NPV of de-minimis projects will be reviewed and standardised by all DNOs prior to the final 05/06-report submission.

All NPV calculations utilise a 6.9% discount rate in line with the agreed cost of capital for the SP-Distribution and SP-Manweb licences in DPCR4.

Table 4: Overview of IFI Projects managed by SP Power Systems on behalf of SP-D and SP-M

Summary of IFI Projects undertaken by SP PowerSystems on behalf of SP-Distribution and SP-Manweb

Project Number	Project Description	*Project Net Present Value*	04/05 'Early Start' Budget (£)			Future Expentiture (total cost)			04/05 Budget Breakdow		
			External	Internal	Total	05/06 Budget (£)	06/07 Budget (£)	07/08 Budget (£)	SP-D	SP-D £	SP-M
IFI 0401-1	Strategic Technology Programme: Module 2 - Overhead Networks	*£17,171*	£17,487	£1,240	£18,727	£40,000	£40,000	£40,000	61%	£11,423	39%
IFI 0401-2	Strategic Technology Programme: Module 3 - Cable Networks	*£17,171*	£17,487	£2,680	£20,167	£40,000	£40,000	£40,000	61%	£12,302	39%
IFI 0401-3	Strategic Technology Programme: Module 4 - Substations	*£17,171*	£17,487	£2,680	£20,167	£40,000	£40,000	£40,000	61%	£12,302	39%
IFI 0401-4	Strategic Technology Programme: Module 5 - Distributed Generation	*£17,171*	£17,487	£2,980	£20,467	£40,000	£40,000	£40,000	61%	£12,485	39%
IFI 0402	LV Voltage Regulator	*£1,887*	£0	£2,990	£2,990	£180,000			61%	£1,824	39%
IFI 0403	Reference Network Development - Phase 2	*£139,131*	£0	£2,700	£2,700	£82,500			67%	£1,809	33%
IFI 0404	Alternative Insulating Oil Project	*£38,821*	£0	£1,040	£1,040	£8,870	£8,870	£8,870	61%	£634	39%
IFI 0405	New Design for 132kV trident lines	*£79,437*	£77,084	£33,236	£110,320	£120,000			0%	£0	100%
IFI 0406	Fault Passage Indication / GSM comms	*£6,216*	£0	£12,224	£12,224	£20,000			61%	£7,457	39%
IFI 0407	Kelman Circuit Breaker Intelligence Analysis	*£28,872*	£37,471	£7,505	£44,976	£40,000	£40,000		61%	£27,435	39%
IFI 0408	Minimum Switchgear project	*£216,978*	£0	£5,010	£5,010	£50,000			0%	£0	100%
IFI 0409	LV Fault Location devices	*£31,125*	£7,638	£5,000	£12,638	£20,000			61%	£7,709	39%
		£611,151	£192,141	£79,285	**£271,426**	£681,370	£208,870	£168,870			
	Percentage Internal Costs (across 04/05 portfolio)			29.21%					Total	£95,381	

Table 5: Breakdown of costs for SP Distribution projects

SP-Distribution: IFI Project Summary

Project Number	Project Description	*Project Net Present Value*	04/05 'Early Start' Budget (£)			Future Expenditure (total cost)		
			External	Internal	Total	05/06 Budget (£)	06/07 Budget (£)	07/08 Budget (£)
IFI 0401-1	Strategic Technology Programme: Module 2 - Overhead Networks	*£10,474*	£10,667	£756	£11,423	£24,400	£24,400	£24,400
IFI 0401-2	Strategic Technology Programme: Module 3 - Cable Networks	*£10,474*	£10,667	£1,635	£12,302	£24,400	£24,400	£24,400
IFI 0401-3	Strategic Technology Programme: Module 4 - Substations	*£10,474*	£10,667	£1,635	£12,302	£24,400	£24,400	£24,400
IFI 0401-4	Strategic Technology Programme: Module 5 - Distributed Generation	*£10,474*	£10,667	£1,818	£12,485	£24,400	£24,400	£24,400
IFI 0402	LV Voltage Regulator	*£1,151*	£0	£1,824	£1,824	£109,800	£0	£0
IFI 0403	Reference Network Development - Phase 2	*£93,218*	£0	£1,809	£1,809	£55,275	£0	£0
IFI 0404	Alternative Insulating Oil Project	*£23,681*	£0	£634	£634	£5,411	£5,411	£5,411
IFI 0405	New Design for 132kV trident lines	*£0*	£0	£0	£0	£0	£0	£0
IFI 0406	Fault Passage Indication / GSM comms	*£3,792*	£0	£7,457	£7,457	£12,200	£0	£0
IFI 0407	Kelman Circuit Breaker Intelligence Analysis	*£17,612*	£22,857	£4,578	£27,435	£24,400	£24,400	£0
IFI 0408	Minimum Switchgear project	*£0*	£0	£0	£0	£0	£0	£0
IFI 0409	LV Fault Location devices	*£18,986*	£4,659	£3,050	£7,709	£12,200	£0	£0
		£200,337	£70,185	£25,196	**£95,381**	£316,886	£127,411	£103,011

Percentage Internal Costs (across 04/05 portfolio) 26.42%

Table 6: Breakdown of costs for SP Manweb projects

SP-Manweb: IFI Project Summary

Project Number	Project Description	*Project Net Present Value*	04/05 'Early Start' Budget (£)			Future Expentiture (total cost)		
			External	Internal	Total	05/06 Budget (£)	06/07 Budget (£)	07/08 Budget (£)
IFI 0401-1	Strategic Technology Programme: Module 2 - Overhead Networks	*£6,697*	£6,820	£484	£7,304	£15,600	£15,600	£15,600
IFI 0401-2	Strategic Technology Programme: Module 3 - Cable Networks	*£6,697*	£6,820	£1,045	£7,865	£15,600	£15,600	£15,600
IFI 0401-3	Strategic Technology Programme: Module 4 - Substations	*£6,697*	£6,820	£1,045	£7,865	£15,600	£15,600	£15,600
IFI 0401-4	Strategic Technology Programme: Module 5 - Distributed Generation	*£6,697*	£6,820	£1,162	£7,982	£15,600	£15,600	£15,600
IFI 0402	LV Voltage Regulator	*£736*	£0	£1,166	£1,166	£70,200	£0	£0
IFI 0403	Reference Network Development - Phase 2	*£45,913*	£0	£891	£891	£27,225	£0	£0
IFI 0404	Alternative Insulating Oil Project	*£15,140*	£0	£406	£406	£3,459	£3,459	£3,459
IFI 0405	New Design for 132kV trident lines	*£79,437*	£77,084	£33,236	£110,320	£120,000	£0	£0
IFI 0406	Fault Passage Indication / GSM comms	*£2,424*	£0	£4,767	£4,767	£7,800	£0	£0
IFI 0407	Kelman Circuit Breaker Intelligence Analysis	*£11,260*	£14,614	£2,927	£17,541	£15,600	£15,600	£0
IFI 0408	Minimum Switchgear project	*£216,978*	£0	£5,010	£5,010	£50,000	£0	£0
IFI 0409	LV Fault Location devices	*£12,139*	£2,979	£1,950	£4,929	£7,800	£0	£0
		£410,814	£121,956	£54,089	**£176,045**	£364,484	£81,459	£65,859

Percentage Internal Costs (across 04/05 portfolio) 30.72%

Appendix A – Project Reports
IFI Projects: October 04 – March 05

Table 1: IFI 0401-1: STP Module 2 – Overhead Lines

Description of project	EA Technology Strategic Technology Programme (STP): Module 2 - Overhead Networks		
Expenditure for financial year	Internal £1,240 External £17,487 Total **£18,727**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	STP Module 2 covers all aspects of overhead line design, specification and rating. A range of projects are selected by participating members, each with its own benefits and completion timescales. Further information on projects is given in the attached documentation.		
Type(s) of innovation involved	All innovation types involved (incremental, significant, technological substitution and radical)		
Expected Benefits of Project	As each project has variable benefits and different start / completion timeframes it is not possible to give a specific figure for the benefits achieved against a given financial year. The financial project benefits are expected to be approximately 8 times the cost of successful projects. The benefits will be across a range of areas including construction, maintenance, refurbishment and operation.		
Expected Timescale to adoption	3 years (average)	Duration of benefit once achieved	10 years (average)
Probability of Success	Success probability is expected to be 25% overall on the whole programme of projects.		
Project NPV (Present Benefits – Present Costs) x Probability of Success			£17,171 Based on the assumption that ~25% projects will succeed and that those projects delivering a benefit equal to 8x their cost.
Commentary on project progress and potential for achieving expected benefits	All projects are currently on target.		
Collaborative DNOs	Central Networks, United Utilities, United Utilities, Western Power Distribution, Scottish & Southern Energy, EDF Energy		

Table 2: IFI 0401-2: STP Module 3 – Cable Networks

Description of project	EA Technology Strategic Technology Programme (STP): Module 3 - Cable Networks		
Expenditure for financial year	Internal £2,680 External £17,487 Total **£20,167**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	STP Module 3 covers all aspects of underground cable design, specification and rating. A range of projects are selected by participating members, each with its own benefits and completion timescales. Further information on projects is given in the attached documentation.		
Type(s) of innovation involved	All innovation types involved (incremental, significant, technological substitution and radical)		
Expected Benefits of Project	As each project has variable benefits and different start / completion timeframes it is not possible to give a specific figure for the benefits achieved against a given financial year. The financial project benefits are expected to be approximately 8 times the cost of successful projects. The benefits will be across a range of areas including construction, maintenance, refurbishment and operation.		
Expected Timescale to adoption	3 years (average)	Duration of benefit once achieved	10 years (average)
Probability of Success	Success probability is expected to be 25% overall on the whole programme of projects.		
Project NPV (Present Benefits – Present Costs) x Probability of Success			£17,171 Based on the assumption that ~25% projects will succeed and that those projects delivering a benefit equal to 8x their cost.
Commentary on project progress and potential for achieving expected benefits	All projects are currently on target.		
Collaborative DNOs	Central Networks, CE Electric, United Utilities, United Utilities, Western Power Distribution, Scottish & Southern Energy, EDF Energy		

Table 3: IFI 0401-3: STP Module 4 – Substations

Description of project	EA Technology Strategic Technology Programme (STP): Module 4 - Substations		
Expenditure for financial year	Internal £2,680 External £17,487 Total **£20,167**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	STP Module 4 covers all aspects of substation / plant design, specification and rating. A range of projects are selected by participating members, each with its own benefits and completion timescales. Further information on projects is given in the attached documentation.		
Type(s) of innovation involved	All innovation types involved (incremental, significant, technological substitution and radical)		
Expected Benefits of Project	As each project has variable benefits and different start / completion timeframes it is not possible to give a specific figure for the benefits achieved against a given financial year. The financial project benefits are expected to be approximately 8 times the cost of successful projects. The benefits will be across a range of areas including construction, maintenance, refurbishment and operation.		
Expected Timescale to adoption	3 years (average)	Duration of benefit once achieved	10 years (average)
Probability of Success	Success probability is expected to be 25% overall on the whole programme of projects.		
Project NPV (Present Benefits – Present Costs) x Probability of Success	£17,171 Based on the assumption that ~25% projects will succeed and that those projects delivering a benefit equal to 8x their cost.		
Commentary on project progress and potential for achieving expected benefits	All projects are currently on target.		
Collaborative DNOs	Central Networks, CE Electric, United Utilities, United Utilities, Western Power Distribution, Scottish & Southern Energy, EDF Energy		

Table 4: IFI 0401-4: STP Module 5 – Distributed Generation

Description of project	EA Technology Strategic Technology Programme (STP): Module 5 - Distributed Generation		
Expenditure for financial year	Internal £2,980 External £17,487 Total **£20,827**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	STP Module 5 covers all aspects in the connection of distributed generation to the DNOs network. A range of projects are selected by participating members, each with its own benefits and completion timescales. Further information on projects is given in the attached documentation.		
Type(s) of innovation involved	All innovation types involved (incremental, significant, technological substitution and radical)		
Expected Benefits of Project	As each project has variable benefits and different start / completion timeframes it is not possible to give a specific figure for the benefits achieved against a given financial year. The financial project benefits are expected to be approximately 8 times the cost of successful projects. The benefits will be across a range of areas including construction, maintenance, refurbishment and operation.		
Expected Timescale to adoption	3 years (average)	Duration of benefit once achieved	10 years (average)
Probability of Success	Success probability is expected to be 25% overall on the whole programme of projects.		
Project NPV (Present Benefits – Present Costs) x Probability of Success	£17,171 Based on the assumption that ~25% projects will succeed and that those projects delivering a benefit equal to 8x their cost.		
Commentary on project progress and potential for achieving expected benefits	All projects are currently on target.		
Collaborative DNOs	Central Networks, CE Electric, United Utilities, United Utilities, Scottish & Southern Energy, EDF Energy		

Table 5: IFI 0402: Single Phase LV Voltage Regulators

Description of project	Single Phase LV Voltage Regulator		
Expenditure for financial year	Internal £2,990 External £0 Total **£2,990**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	Development of a single-phase power electronic LV voltage regulator, for connection into a LV line to provide fast response voltage compensation for both over and under-voltages. Two prototype units from a US manufacturer have been used in a limited trial on the SP-Manweb network by SP PowerSystems. This project seeks to undertake an extended field trial with detailed monitoring in the SP-Distribution and SP-Manweb areas to ascertain the devices short / medium term performance and potentially the full type approval of the device.		
Type(s) of innovation involved	Technology Substitution / Significant		
Expected Benefits of Project	It is envisaged that this device will primarily used as a means of rapidly resolving voltage complaints in rural areas. It may be capable of both temporary and permanent solutions dependent on the type of complaint and the economics of the situation. • Where there is a clear case for network reinforcement, which would require time to engineer the most cost effective solution, the voltage regulator could be used to resolve the complaint whilst a reinforcement scheme is designed, wayleaves negotiated and construction undertaken. • Where the voltage complaint is due to disturbing loads or unidentified causes it could provide a permanent solution due to the fast response of the device to voltage dips and sags. • Where voltage rise is caused by Small Scale Embedded Generators (SSEG's) the regulator could be used to maintain the local network within statutory voltage limits. • There may be an eventual case where LV voltage regulators are used to maintain statutory voltages, to compensate for a less static voltage on the 11kV networks due to an increased penetration of distributed generation.		
Expected Timescale to adoption	2 years	Duration of benefit once achieved	10 years
Probability of Success	50%		

Project NPV (Present Benefits – Present Costs) x Probability of Success		£1,887 Based on the average cost of LV reinforcement Vs installation of a regulator
Commentary on project progress and potential for achieving expected benefits	This report covers only spend prior to 1st April 05. Costs in this phase were associated with preliminary meetings, the collection of previous data and outlining a project scope. Since this date the project has developed further and is currently on target for pilot in 05/06.	
Collaborative DNOs	N/A	

Table 6: IFI 0403: Reference Networks Phase 2

Description of project	Reference Networks - Phase 2		
Expenditure for financial year	Internal £2,700 External £0 Total **£2,700**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	The development of a framework that enables network performances to be objectively compared, the differences to be understood and explained, and cost and benefits of alternative distribution network investment strategies to be evaluated. The project will produce a practical software tool to create optimum disaggregation groups and analyse existing networks and proposed performance improvement strategies.		
Type(s) of innovation involved	Incremental		
Expected Benefits of Project	Ensuring that capital expenditure on improving the performance of the network will be optimised both in respect of applying the expenditure to circuits where the greatest benefit can be obtained. The financial benefits of greater understanding of network performance drivers, and improved regulation are difficult to quantify but have the potential to be extremely large.		
Expected Timescale to adoption	3 years	Duration of benefit once achieved	5 years
Probability of Success	75%		
Project NPV (Present Benefits – Present Costs) x Probability of Success			£139,131 Based on 2.5% capital efficiency for a 5 yr period
Commentary on project progress and potential for achieving expected benefits	Good progress is being made in ensuring that the reference networks derived by the developing software are truly representative of the real networks from which they are derived. The project remains on-track to achieve the expected deliverables.		
Collaborative DNOs	United Utilities, Central Networks		

Table 7: IFI 0404: Alternative Insulating Oils

Description of project	Alternative Insulating Oils Project		
Expenditure for financial year	Internal £1,040 External £0 Total **£1,040**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	Evaluation of the Characteristics of Alternative Oils for Retro-Filling Power Transformers and for use in New Transformers. This research program consists of a series of investigations designed to make a thorough evaluation of the electrical/ageing properties of alternative oils for used in both aged power transformers and new plant.		
Type(s) of innovation involved	Technological Substitution		
Expected Benefits of Project	The benefits of using alternative oils in transformers are based around two main points, safety/environment and lifetime ageing performance.		
Expected Timescale to adoption	5 years	Duration of benefit once achieved	20 years
Probability of Success	50%		
Project NPV: (Present Benefits x Probability of Success) – Present Costs	£38,821 Based on a reduction in capital through removing the potential need for transformer bunds		
Commentary on project progress and potential for achieving expected benefits	Progress is being made, preliminary tests have been carried out, and the project is continuing on target. Stages completed: *Basic Testing*: Test a range of alternative oils and minerals oil to compare electrical characteristics for new and aged oils with cellulose materials found in transformers.		
Collaborative DNOs	United Utilities		

Table 8: IFI 0405: Alternative Design for 132kV Overhead Lines

Description of project	New design of Wood Pole Trident 132kV Overhead Line c/w under slung Fibre Optic Earth Wire		
Expenditure for financial year	Internal £33,236 External £77,084 Total **£110,320**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	The design of a new heavy Trident 132kV wood pole overhead line specification, incorporating an underslung OPGW earthwire for counteracting the rise of earth potential issues and for communications purposes. This is a project initiated to combat issues raised for the connection of renewable generation in Wales (SP-Manweb network).		
Type(s) of innovation involved		Significant	
Expected Benefits of Project	To design a new type of Wood Pole OHL Earthed construction to counteract rise of earth potential under fault conditions and at 132kV that can take a single Cct load of circa 180MVA. There are currently no single circuit overhead line specification in the UK that will facilitate 'Upas' conductor and incorporate an earthwire. This project involved the scoping and development of an appropriate specification that achieves both aims and conforms to BS EN 50341:2001. There are multiple benefits to this project, including: • Safety: Lower Rise of Earth Potential at substations through the addition of an earthwire • Environmental: A higher rated single circuit line may prevent the construction of multiple overhead lines for a given network connection – there is also a significant cost benefit to customers / connectees associated with this. • Provision of communications: May permit the use of active network management into rural areas with previously poor communications (again cost benefits).		
Expected Timescale to adoption	2 years	Duration of benefit once achieved	20 years
Probability of Success			75%
Project NPV (Present Benefits x Probability of Success) – Present Costs			£79,437 Based on the use of a higher rating overhead line over the installation of two standard trident lines (plus numerous non financial benefits)
Commentary on project progress and potential for achieving expected benefits	Specification is 90% complete. The project on target to deliver in immediate future. Stage 2 of this project will be the construction of a prototype line.		

Table 9: IFI 0406: Overhead Line Fault Passage Indicators

Description of project	Overhead Line Fault Passage Indicators		
Expenditure for financial year	Internal £12,224 External £0 Total **£12,224**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	This project seeks to pilot a number of programmable fault passage indicators to measure and records transient and permanent system faults. The device also stores time stamps and interprets results. It has both local and remote indicators that show when the unit is in service and operate when a system fault is detected.		
Type(s) of innovation involved	Incremental		
Expected Benefits of Project	To find a reliable fault passage indicator for use on both our 33kV and 11kV overhead network. The Company has installed devices by various other manufactures over the past decades but their performance has been unreliable at best giving misleading information and inconsistent results.		
Expected Timescale to adoption	1 year	Duration of benefit once achieved	10 years
Probability of Success	75%		
Project NPV (Present Benefits x Probability of Success) – Present Costs	£6,216 Based on potential IPP penalty savings for an overhead line circuit		
Commentary on project progress and potential for achieving expected benefits	Trial devices scoped and purchased prior to Oct 04, but installed since this time. Monitoring is ongoing – project is currently on target to deliver.		
Collaborative DNOs	N/A		

Table 10: IFI 0407: Kelman Circuit Breaker Intelligence

Description of project	Kelman Circuit Breaker Intelligence Analysis		
Expenditure for financial year	Internal £7,505 External £37,471 Total **£44,976**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	Development of hardware/software "expert system tool" that provides an assessment a circuit breakers' tripping characteristics. This is with a view to reduce supply interruptions by highlighting problems with the electrical and mechanical mechanisms associated with circuit breakers.		
Type(s) of innovation involved	Significant Innovation		
Expected Benefits of Project	Expected improvement in network performance associated with stuck circuit breakers of around 12.5% in the first year following implementation. Moves towards condition based maintenance, provides objective CB performance interpretation, targeted and informed remedial work, reduced CML/CI and a quality stamp establishing CB condition after maintenance.		
Expected Timescale to adoption	3 years	Duration of benefit once achieved	5 years
Probability of Success	50%		
Project NPV (Present Benefits x Probability of Success) – Present Costs	£28,872 Based on potential IIP penalty savings due to 'sticking' circuit breakers		
Commentary on project progress and potential for achieving expected benefits	Development stages complete. Project is now in the trial stages and is currently on target for delivery.		
Collaborative DNOs	N/A		

Table 11: IFI 0408: Minimum Switchgear Project

Description of project	'Minimum' Switchgear Project		
Expenditure for financial year	Internal £5,010 External £0 Total **£5,010**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	This project seeks to investigate, design and specify an alternative switchgear / protection arrangement to the 11kV 'unit' protected substations in the urban areas of the SP-Manweb network, in an attempt to reduce capital costs.		
Type(s) of innovation involved	Incremental		
Expected Benefits of Project	This project has the potential to reduce the cost of each 11kV substation, thereby gaining efficiencies to target network spend more appropriately. If a design were found that would significantly reduce the cost of this network design, it has the potential of being rolled out into previously radialised networks to give the CI / CML benefits and equipment utilisation associated with interconnected networks.		
Expected Timescale to adoption	3 years	Duration of benefit once achieved	10 years
Probability of Success	25%		
Project NPV (Present Benefits x Probability of Success) – Present Costs	£216,978 Based on potential capital savings		
Commentary on project progress and potential for achieving expected benefits	Oct 04 – Mar 05: Early meetings held with internal stakeholders, to discuss potential design changes. Project is currently on target to deliver benefits.		
Collaborative DNOs	N/A		

Table 12: IFI 0409: LV Fault Location Devices

Description of project	LV Fault Location		
Expenditure for financial year	Internal £5,000 External £7,638 Total **£12,638**	Expenditure in previous (IFI) financial years	Internal £ N/A External £ N/A Total **£ N/A**
Technological area and / or issue addressed by project	A device for use on the Low Voltage (LV) networks to capture transient fault information and correlate to an associated fault location. The device allows remote access to the data and downloading of files in real time, if required by means of a GSM (mobile phone network) modem.		
Type(s) of innovation involved	Significant		
Expected Benefits of Project	Preliminary use will be for fault location on persistent LV faults. Their use is expected to reduce the number of repeated fuse replacements, excavate fewer joint holes and remove the fault from the system in a shorter timescale than traditional 'cut-and-test' methods used at present.		
Expected Timescale to adoption	2 years	Duration of benefit once achieved	Typically 8-10 years depending on technology development
Probability of Success	75%		
Project NPV (Present Benefits x Probability of Success) – Present Costs	£31,125 Based on a reduced number of holes in cut-and-test LV fault location		
Commentary on project progress and potential for achieving expected benefits	Proved that the technology works but the system still requires some development on the software and there is still some work required to get round the problem of getting communications when the locator is in a metal pillar.		
Collaborative DNOs	N/A		

Appendix B – Overview of Projects undertaken through the Strategic Technology Programme (STP) 04/05

MODULE 2 – OVERHEAD NETWORKS

Project No	Project Title	Project Objective	Commitment Date	Completion Date	Budget	Partners
S2114_2	Lightning risk contour map - Stage 2: Prototype risk map	A map showing how the risk from lightning damage varies from place to place will help companies target lightning protection measures to reduce operational expenditure.	May 2004	Oct 2004	£11,200	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF
S2118	Module co-ordination	Administration	Apr 2004	Mar 2004	£18,800	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF
S2119	Effect of lightning on insulated earth wires.	There will be quantifiable benefits in network performance as well as improvement in operator health and safety through re-evaluation of cable design based on this study of lightning effects.	Aug 2004	Feb 2005	£12,100	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF
S2120	Detection of defective surge arresters	Network performance will be improved by reducing over-voltage transients to customers, reducing equipment failure due to over-voltage stress, identification of under performing network protection and early detection of incipient faults in surge arresters.	May 2004	Oct 2004	£16,325	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF
S2121	Tracking tests on new and old covered conductor samples from Finland and Sweden	Covered conductor networks will experience improved performance, particularly in coastal or polluted areas, through the respecification of these conductors.	Apr 2004	Oct 2004	£23,780	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF
S2122	Arc gaps for long-rod polymeric 132kV insulators on wood pole and tower lines - Stage 1: Arc Gaps and Grading rings – Use of existing data	Improved network performance and operational cost reduction will stem from this best practice definition of long rod insulator specification.	Jul 2004	Feb 2005	£11,580	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF

S2123	Continued involvement with Cigre WG11	By determining and distributing best practice across the industry through cost effective identification of world-wide best practice, all aspects of customer benefits should be positively impacted.	May 2004	Apr 2005	£17,070	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF
S2124	Vibration tests on new covered conductor types	Premature replacement of new conductor types should be reduced and conversely in service failure of these conductors should be reduced, resulting in operational cost reduction and improved network performance.	Apr 2004	Oct 2004	£11,575	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF
S2125	Monitoring Cigré 2004/5	By determining and distributing best practice across the industry through cost effective identification of world-wide best practice, all aspects of customer benefits should be positively impacted.	Aug 2004	Apr 2005	£9,250	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF
S2126	Long-term monitoring of conductor temperature at fixed current to confirm/reassess validity of using Leatherhead 1976 data as basis of distribution ratings	Up-rating of distribution network conductors could substantially reduce the cost of replacing these items by deferring temporarily or permanently the need for replacement.	Apr 2004	May 2005	£27,300	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF
S2127	Attend 2nd Wrap seminar and report	Positive environmental benefits will stem from the improvement in disposal practices of treated utility poles.	Apr 2004	May 2005	£1,360	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF
S2112	Call-out for leakage currents on suspect poles – 10% additional funding		Nov 2003	Sep 2004	£980	Mod 2 DNOs: CN, UU, SP, WPD, S&S, EDF

MODULE 3 – CABLE NETWORKS

Project No	Project Title	Project Objective	Commitment Date	Completion Date	Budget	Partners
S0352	Module 3 administration	Provide an efficient administration for the module, including the following services as set out in the STP agreement:- ❑ Provide support to the steering group ❑ Prepare proposals for new projects against the objectives set by the steering group ❑ Ensure as far as reasonably possible that projects are delivered to the required time, budget, and quality standards ❑ Ensure accurate and timely communication with the participants ❑ Make recommendations for protection or exploitation of the IPR arising from the Module Programme and Outputs	Apr 2004	Mar 2005	£13,000	Mod 3 DNOs: EDF, CN, CE, S&S, UU, WPD
S3100_2	Specification for link boxes. Stage 2: Final specification	Through correct specification of link box characteristics, to increase reliability and thereby reduce operating costs.	Apr 2004	Oct 2004	£8,000	Mod 3 DNOs: EDF, CN, CE, S&S, UU, WPD
S3113	Current rating tools for cables	Through the development of user friendly software for the calculation of cable ratings, to ensure best engineering design practice and to reduce the cost of purchase of cables by more accurately matching cable specification to functional requirement. Stage 1: Extend the functionality of the existing CRATER cable rating software to include user defined input of load curve. Stage 2: Create a tool to calculate ratings of cables in banks of ducts	Apr 2004	Nov 2004	£38,000	Mod 3 DNOs: EDF, CN, CE, S&S, UU, WPD
S3115	Corrosion resistance of aluminium foil cables	To improve reliability and to reduce operating costs by reducing life-reducing corrosion in 132 kV foil laminate cables.	May 2004	Jan 2005	£21,000	Mod 3 DNOs: EDF, CN, CE, S&S, UU, WPD
S3116	Mechanical properties of	To introduce best engineering practice and	Apr 2004	Dec 2004	£20,000	Mod 3 DNOs:

	corrugated ducting	to reduce operating costs by better understanding and hence correct selection of cable duct.				EDF, CN, CE, S&S, UU, WPD
S3120	Burn-back of cables in ducts, basements and ducts	To improve network performance, to reduce the impact of cable failure and to reduce health and safety risks from serious fires, by testing coating systems which can prevent the propagation of fire along PE sheathed cable.	Apr 2004	Dec 2004	£26,670	Mod 3 DNOs: EDF, CN, CE, S&S, UU, WPD

MODULE 4 – SUBSTATIONS

Project No	Project Title	Project Objective	Commitment Date	Completion Date	Budget	Partners
S0425	Module Co-ordination 04/05	To provide support to the steering group and its sub-groups to enable them to function as efficiently as possible.	Apr 2004	Mar 2005	£21,630	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD
S0499_3	Extension of TASA Trial	To improve network performance as a result of reduced failure of on-load tap changers by ensuring that the TASA Technique is rigorously tested to give confidence in its approach and methodology to enable a condition based maintenance strategy to be implemented for on load tap changers.	May 2004	May 2005	£35,920	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD
S4127_7	Scoping Study: Identify relevant Electro-technical forums to monitor	To further Module 4's understanding of other, mainly European, organisations activities in line with Objective 5 of STP's Substation Module core scope and objectives.	May 2004	Jun 2004	£1,000	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD
S4127_8	Scoping Study: Seminar to discuss S0485 Safety	To reach a consensus opinion amongst member companies regarding the safety implications for the design and operation of substation plant in the UK in light of the on-going "Europeanisation" of substation plant design.	Jul 2004	Jul 2004	£1,000	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD
S4130_2	Dry Wipe Assessment	To rank the performance of wipe products	Apr 2004	Aug 2004	£11,200	Mod 4 DNOs:

		depending on their suitability for cleaning the tanks of HV oil filled equipment during maintenance.				CN, CE, UU, S&S, SP, EDF, WPD
S4145	Environmental Aspects of Substation Operation	To present a summary of worldwide techniques and solutions currently employed to reduce the environmental impact of existing and planned substations.	Apr 2004	Aug 2004	£7,100	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD
S4146	Impact of Distributed Generation	To present a high level perspective of the fundamental issues and implications of connecting Distributed Generation to the distribution network focused at the 11kV level and take into account those factors, issues and implications for substation plant.	Jun 2004	Aug 2004	£13,000	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD
S4147	On-line oil regeneration	To review available online oil regeneration processes for oil filled equipment in the context of reducing cost of maintenance, thereby improving network performance through increased reliability and extending life.	Jun 2004	Dec 2004	£22,500	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD
S4149	Reliability of existing and newly installed plant	To provide an objective assessment of the extent and severity of the issues regarding the performance of newly installed plant which in some instances is not performing as well as older, more established plant.	Jun 2004	Dec 2004	£21,500	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD
S4150	Arc Suppression Coil Systems	To produce a concise report which clearly reviews the recent development in ASCS and the issues that need to be considered when applying this technology to UK distribution networks rated up to 36kV.	May 2004	Jun 2004	£7,680	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD
S4155	Investigation of Ester Based Insulating Oils	To understand where and when vegetable based oils would be more advantageous than mineral based oils and where on the system would most advantage be gained from its use .	Jul 2004	Sep 2004	£13,289	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD
S4156	Current Cigre Substation Work Group	To provide up-to-date information on work applicable to the UK DNO's from world-wide sources.	May 2004	Aug 2004	£10,790	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD

S4157	Review of last 10 years of Cigre Substation work	To provide a source of new ideas for UK use as well as providing information on world-wide progress and experience of substations.	May 2004	Aug 2004	£11,620	Mod 4 DNOs: CN, CE, UU, S&S, SP, EDF, WPD

MODULE 5 – DISTRIBUTED GENERATION

Project No	Project Title	Project Objective	Commitment Date	Completion Date	Budget	Partners
S0581_4	Voltage control policy assessment tool	Developing effective policies for applying voltage control technologies is key in enabling distributed generation Developers and Customers to connect increasing numbers of small generators. This project is developing a tool for DNOs to assess new approaches and find the best that allows maximum connections at lowest cost to developer, customer & DNO.	Apr 2004	May 2004	£7,500	Mod 5 DNOs: CN, EDF, CE, SP, UU
S0581_5	Voltage control policy assessment tool (workshop)	See previous for project objective. This workshop tested whether the tool functioned as required and gave DNO staff the opportunity to gain knowledge of how to use it.	Jun 2004	Jul 2004	£5,635	Mod 5 DNOs: CN, EDF, CE, SP, UU
S0594_3	Rapid response to regulatory consultation documents	To ensure that knowledge gained from STP projects is effectively provided into the consultation processes. Thereby ensuring that the impact of regulatory developments on innovative technology solutions in development is known and can be accounted for to the long term benefit of network customers.	Apr 2004	Mar 2005	£11,500	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5100_2	Enhancing protection & control systems to maximise network benefits ...	Future network performance will be enhanced by defining best practice management of protection and control systems, as will the ability to manage the risks associated with DG connection.	Mar 2004	May 2004	£9,900	Mod 5 DNOs: CN, EDF, CE, SP, UU

S5102	A watching brief on distributed generation	This project assembles the key information published in UK & internationally to ensure that all the projects in STP use best knowledge and do not duplicate work. It benefits DNOs, DG Developers & customers in bringing to their notice best practice.	Apr 2004	Jan 2005	£12,500	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5113	Seminar on Module 5 work – Stability	Knowledge & understanding of stability issues as the amount of DG in distribution networks increases is an increasing concern. This seminar will transfer knowledge from 8 STP projects to DNO design engineers, thereby enabling them to better accommodate connection requests without incurring Supply Quality dis-benefits.	Jun 2004	Sep 2004	£7,100	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5119	Stability assessment policies: generic guidance	A best practice guide for stability assessment policy will communicate the output from previous STP projects on stability and will assist in enhancing network performance and reduce operational costs stemming from instability caused by DG connection.	Mar 2004	Apr 2004	£5,000	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5122_2	Guidance as to LOM protection settings on distribution networks	Having the right setting on generator Loss of Mains protection is vital to ensure customers see the minimum number of loss of supply events. This project gives advice founded upon earlier stage testing of commonly used relays in the UK. Major reductions in numbers of nuisance false trips are expected	Jun 2004	Aug 2004	£5,800	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5123_2	BAM Solution 3.5 - Line voltage regulation	To improve future network performance by developing a guide through improved operational design practices, to communicate effectively innovative options for line voltage regulation.	Jun 2004	Aug 2004	£9,250	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5124_2 & 3	BAM Solution 2.2 - Increase impedance of components S2	To assess the potential for increasing the impedance of transformers by identifying and enumerating the network benefits and disadvantages. To identify methods to reduce the disadvantages. To design and	Apr 2004 Jul 2004	Jun 2004 Sep 2004	£8,000 £9,800	Mod 5 DNOs: CN, EDF, CE, SP, UU

		cost demonstration trials.				
S5125	BAM Solution 2.1 - Uprate network components	To investigate the engineering, practical and fiscal considerations and constraints associated with the options of holding the 11kV fault level at the design fault level of 250MVA during normal running arrangements and increasing the design fault level. The investigation will consider implications to HV and LV connected customers as well as implications to the DNO system	May 2004	Jul 2004	£7,500	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5126	BAM Solution 2.3 – Converter technology	To obtain outline costs and high-level technical benefits for commercially available converters across a range of generator types. Aim being to assist the process of implementation of TSG Workstream 3 solution 3.5 by DNOs.	Apr 2004	Jun 2004	£5,000	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5128	Module 5 co-ordination	Administration	Apr 2004	Mar 2005	£15,000	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5130	Network risk management	To assist DNOs to form a set of views on issues surrounding network risk including those associated with increasing network utilisation and risks of relying on DG to avoid network reinforcement, ideally, before the draft P2/6 network security standard is published for consultation.	Jun 2004	Sep 2004	£13,500	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5132	Overview of system behaviour with large amounts of windpower	To assist in ensuring supply quality in disturbances on networks with large amounts of windpower, the key aspects of this recent work in Denmark are to be identified for application in UK.	Jun 2004	Jul 2004	£3,000	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5133	Tapchangers - reverse power capabilities	Tap changers are key items in achieving good voltage control with significant amounts of distributed generation. There is no definitive reference document of the equipment out on the networks reverse	Jun 2004	Sep 2004	£15,000	Mod 5 DNOs: CN, EDF, CE, SP, UU

		power capability. The project will give this, enabling the most cost-effective option to be selected.				
S5138	Review of Industry Codes	To identify likely new Distribution Code provisions relating to distributed generation and comment on their implications	Jun 2004	Jul 2004	£7,250	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5139	Potential of RPZ framework	To improve future network performance and reduce network costs by defining specific RPZ scenarios and quantifying the commercial issues, in order to facilitate the identification and establishment of optimum RPZs.	Aug 2004	Sep 2004	£4,200	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5140	Domestic CHP potential	To produce an up to date estimate of rollout for key dCHP products to establish a time plan against which DNOs may have to respond with technical solutions to the supply quality and financial implications.	Jul 2004	Sep 2004	£7,000	Mod 5 DNOs: CN, EDF, CE, SP, UU
S5141	IFI work portfolio	To identify potential project outlines that meet the IFI benefit criteria for customers, generators and DNOs through a brain storm and project formulation workshop.	Jun 2004	Jul 2004	£2,500	Mod 5 DNOs: CN, EDF, CE, SP, UU