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**Technical Support for TPCR4 Rollover.
Assessment of Non-Load Related & Load
Related Capex.
Final report - NGET**

London, July 12, 2011

On behalf of Ofgem



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EXECUTIVE SUMMARY

The current Transmission Price Control period (TPCR4) will be extended to include the additional year 2012/13, the Rollover year. This one year extension will apply to all 4 transmission owners (TOs): National Grid Electricity Transmission (NGET), Scottish Hydro Electric Transmission Limited (SHETL), Scottish Power Transmission Limited (SPTL) and National Grid Gas. KEMA was appointed by Ofgem to assess the additional one year forecast business plans with accompanying investment requirements as submitted by each TO for 2012/13.

This report focuses on the assessment of the Non-Load Related Expenditure (NLRE) and Load Related Expenditure (LRE) forecast by NGET for the Rollover year and makes recommendations regarding appropriate expenditure allowances for that year. A proportionate approach for the one year control has been adopted and the Capex analysis has focused on the most financially material issues. It is Ofgem's intention to perform a full efficiency review of historical Capex as part of RIIO-T1. Similar assessments for the other TOs are summarised in separate reports.

Non-Load Related Expenditure

NLRE is driven by asset replacement and refurbishment requirements to ensure the transmission network continues to deliver the reliability, security and performance levels demanded. This review of NGET's proposed NLRE for 2012/13 has determined that:

- NGET does appear to be utilising the risk-and-criticality approach to asset replacement agreed by all TOs and Ofgem in the development of the Network Output Measures (NOM) methodology. However, correlation of the asset Replacement Priority assessments with the schemes selected for inclusion in the 2012/13 plan is variable between the main asset classes. Transformer replacement exhibits the highest correlation and switchgear the lowest.
- During the TPCR4 period to date there has been a reappraisal of the condition of most major assets. NGET has concluded that, in general, asset condition is not deteriorating as quickly as previously modelled and has subsequently extended the technical asset lives of transformers, oil switchgear, overhead line conductor and protection and control systems.

- A more pragmatic approach to selective asset replacement, rather than whole route, for overhead lines is to be commended.
- Advances in technical feasibility and reduction in costs of refurbishment for several switchgear families has also contributed to increasing asset life. In the Rollover year, greater emphasis is placed on refurbishment over replacement but it is not clear whether the economic benefits of this approach has been realised to mitigate increasing expenditure requirements.
- Expenditure in 2012/2013 on asset replacement and refurbishment schemes due to be delivered in the RIIO-T1 period is considered to be high, even with due consideration to quoted lead times for particular equipment types of up to three years.
- NGET stated that an increase in the scope of works for switchgear (full bay refurbishment, off-line GIS), transformers (oil containment, environmental) and overhead lines (environmental) had resulted in increasing expenditure out to the Rollover year. However, these arguments were also proffered at the initial TPCR4 submission and should not represent material change to NGET's awareness of costs.
- In general, NGET unit costs are higher than both the TO Average and KEMA comparators with [REDACTED] equipment appearing to be consistently and significantly higher, particularly; [REDACTED] transformers, [REDACTED] switchgear and [REDACTED] cable.
- An integral part of this review is the assessment of several NLRE schemes in more detail. Whilst the need for the seven schemes examined and their design was generally considered to be reasonable there is significant concern over costs in four instances, primarily focused on the level of; on-cost, risk premium, professional services and contingencies applied to the project. These overheads added 20% to 40% to project costs and did not always appear to be fully justified.
- When all Capex is considered, particularly the Transmission Investment Incentive (TII) schemes, NGET is facing a substantial increase in demands on its delivery capability from an expenditure of £948.6m in 2009/10 to £1,362m in 2012/13; a 43% rise that incorporates, approximately, a five-fold increase in NLRE and TII overhead line expenditure. There is some uncertainty regarding the deliverability of the full Capex forecast as NGET continues to be reliant on Alliance partners that may represent a resourcing/delivery challenge. It would appear that no new suppliers have been identified or are being developed to assist with the ambitious Capex programme. It should also be recognised that the other electricity TOs are seeking to

significantly increase Capex expenditure in the Rollover year and beyond which will inevitably exacerbate any supply chain delivery constraints further.

From a detailed analysis of NGET's Capex plan and discussion of the main issues within this report KEMA has made an assessment of appropriate expenditure for each asset category in the Rollover year, 2012/13 as follows.

2012/13 Rollover Year (£m)	NGET F'cast	KEMA Estimate	Comment
NON-LOAD RELATED EXPENDITURE			
Assets - replacement and refurbishment			
Transformers	105.5	67.8	replacement volume beyond modelled, pre-RIO preparation cost high.
Reactors	7.6	7.6	
Switchgear	97.5	69.0	unit cost, risk & contingency levels, substation infrastructure and pre-RIO expenditure all high.
Overhead Lines	123.7	80.0	oh fittings volume very high, scheme and unit costs high, deliverability issues.
Underground Cables	31.0	26.4	Risk & contingency allowances high.
Cable tunnels	81.2	65.0	high levels of on-cost and contingency allowances.
Protection & control	40.3	35.0	unit cost high.
Sub-station other	13.7	13.7	
Other NLRE			
Other TO	56.7	43.5	asset management costs increased and high.
Quasi capex	7.3	7.3	
TOTAL	564.4	415.3	

Load Related Expenditure

Load-related expenditure comprises all spend in relation to reinforcement of the transmission system, excluding TII, to accommodate new generation and demand connections or changes to existing customer requirements.

This review of NGET's proposed LRE for 2012/13 has determined that:

- NGET's 2010 FBPQ submission has been based on the 'Gone Green' demand and generation scenarios appropriately updated to reflect the latest generation developments and the associated impacts on the investment and expenditure areas in 2012/13 in particular.

- Two alternative demand and generation scenarios, Accelerated Growth and Slow Progression have been considered by NGET. NGET stated that even though these two scenarios brought in some differences in the overall generation and demand mix, they were not significant in the Rollover year 2012/13 and hence did not impact on the associated investment for that year.
- Due to the unprecedented volumes of new generation applications and the current economic conditions, there is uncertainty over the likelihood and timescales for new connections. For generation connections affecting 2012/13, the confidence is much higher due to the closeness of the Rollover year.
- The connect and manage regime has also introduced uncertainty with customers having more control over the timescales for their connection.
- Inevitably there are some generation uncertainties which may impact 2012/13 and the associated expenditure. Some generation projects are themselves in the process of project development and may still face uncertainties over planning consents and project delivery timescales, which may lead to delays compared to that assumed in the generation background used to form this plan.
- The majority of expenditure, approximately 60%, is driven by the connection requirements of approximately 12GW of new generation projects contracted to connect between now and 2012/13.
- Demand connection expenditure is driven by demand growth and the forecast for 2012/13 growth is generally lower than the early TPCR4 years due to the current economic climate.
- An integral part of this review is the assessment of two specific LRE schemes in more detail. Whilst the need for the two schemes examined and their design was generally considered to be reasonable there is significant concern over costs in both cases, primarily focused on the high level of; substation costs, overheads, risk premium, and contingencies applied to the projects.
- Concerns on the deliverability of an increasing LRE expenditure with respect to the large rise forecast in total Capex expenditure are similar to those expressed for the NLRE.

From a detailed analysis of the largest element of NGET's Load Related Capex plan, which is the Infrastructure-entry triggered category, and discussion of the main issues within this report, KEMA has made an assessment of the appropriate expenditure for that category in

the Rollover year, 2012/13 as indicated below. The other LRE categories were not reviewed in detail.

2012/13 Rollover Year (£m)	NGET F'cast	KEMA Estimate	Comment
LOAD RELATED EXPENDITURE			
Generation connection - sole-use	1.0	1.0	Included in Infrastructure-entry triggered assessment methodology.
Demand connection - sole-use	38.2	38.2	not assessed, below TPCR4 average.
Total LRE - sole-use	39.2	39.2	
Infrastructure - entry triggered	236.4	181.5	
Infrastructure - general reactive (excl TIRG /TSS)	2.5	2.5	not assessed, below TPCR4 average.
Infrastructure - general non reactive (excl TIRG /TSS)	53.9	53.9	not assessed, below TPCR4 average.
Infrastructure - exit triggered	60.7	60.7	not assessed, aligns with TPCR4 average.
Infrastructure - TSS	9.4	9.4	not assessed, above TPCR4 average.
Total LRE - Infrastructure	363.0	308.0	
TOTAL	402.2	347.2	

1 INTRODUCTION

The present transmission price control set by Ofgem in 2006 runs from 1 April 2007 to 31 March 2012. Following recommendations from the RPI-X@20 review the next full transmission price control review will be the first to reflect the new RIIO (Revenue = Incentives + Innovation + Outputs) regulatory model.

In 2010 Ofgem took the decision to extend the current price review period by one year to provide a transition period to the new RIIO-T1 model. A one year 'Adapted Rollover' of the current TPCR4 period for the financial year 2012/13 is to be applied and implementation of the new price control review of GB's gas and electricity transmission companies will take effect from 1 April 2013. The Adapted Rollover applies to all four transmission companies (TOs): National Grid Electricity Transmission (NGET), Scottish Hydro Electric Transmission Limited (SHETL), Scottish Power Transmission Limited (SPTL) and National Grid Gas - National Transmission System (NGG – NTS).

Ofgem appointed KEMA to provide technical support for the Transmission Price Control 4 (TPCR4) Rollover. As the Rollover review spans a short transitional period Ofgem adopted a proportionate approach to the one year control. The technical support comprising:

- a proportionate review of forecast capital expenditure, drawing on historical information where appropriate;
- a proportionate assessment of non-load related expenditure (NLRE) for 2012/13 (including asset replacement expenditure); and
- a proportionate assessment of forecast load related expenditure (LRE) in 2012/13.

The result of the review and KEMA evaluation is a recommendation on the appropriate non-load related (NLR) and load related (LR) capital expenditure allowances for the Rollover year 2012/13. The report excludes consideration of operational expenditure and non-network capital expenditure.

2 APPROACH TO THIS ASSESSMENT

KEMA has reviewed NGET's capital expenditure for the year 2009/10 provided in the Regulatory Reporting Pack (RRP) and the 2010 Forecast Business Planning Questionnaire and accompanying Detailed Narrative submitted to Ofgem in July and October 2010 respectively. The levels of expenditure with respect to NLRE and LRE have been assessed

KEMA reviewed the total LR and NLR capital expenditure for NGET, comparing outturn against allowances and projecting forecasts forward through the Rollover year (2012/2013) to 2014/15. Further analysis was performed on the NLRE to obtain a clear understanding of the levels of investment and volumes of assets installed, replaced or refurbished by major asset category.

KEMA reviewed the Rollover FB PQ submissions and accompanying narratives paying particular attention to;

- explanations from the TOs with regard to any revision to planning methodologies, asset management strategies and investment criteria since the previous TPCR4 submission;
- clarification of queries raised from the RRP analysis;
- consistency of the Rollover FB PQ expenditure forecast with the 2009/10 RRP forecast; and
- expenditure in the 2012/13 Rollover year.

Responses to requests for clarification arising from the FB PQ review and issued by Ofgem on 30 November 2010 were submitted by NGET and have been taken into full consideration in this review. In addition, visits to NGET by Ofgem and KEMA on 24 and 25 January 2011 provided further clarification and understanding of the information submitted.

Using all available information KEMA has made an assessment of:

- appropriate non-load related expenditure for the Rollover year 2012/13; and
- appropriate load-related expenditure for the Rollover year 2012/13.

3 NON-LOAD RELATED EXPENDITURE

3.1 TPCR4 Expenditure to Date

NLRE investment levels have been reduced over the first three years of TPCR4 with an outturn of £959.4m against allowances of £1,198.8m. The under expenditure relative to allowance assumptions at the start of TPCR4 is largely attributable to reduced investment in switchgear and overhead line asset categories. NGET is anticipating a recovery of NLRE during the final two years of the current price review although total NLRE for the price control period will remain below allowance assumptions.

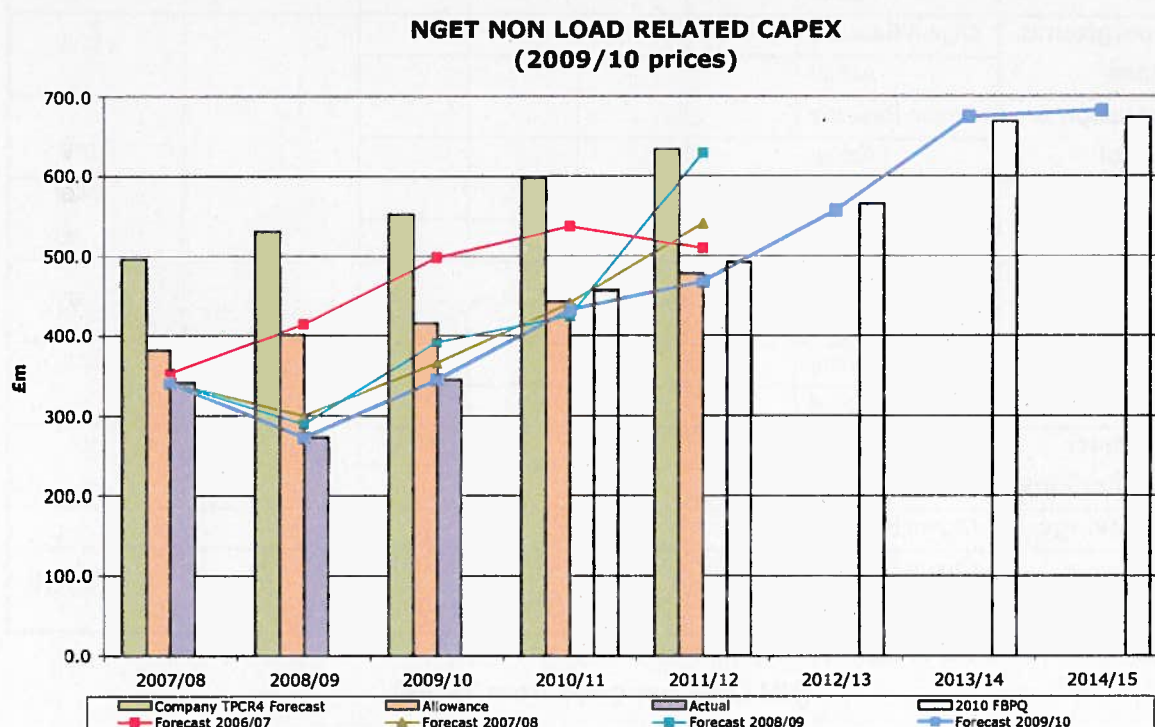


Figure 1: NGET Non-Load Related capital expenditure.

3.1.1 Comparison of actual expenditure and allowances

Analysis of NLRE to date by major asset category (as reported in the FBPQ) is shown in Table 1 and indicates an underspend against TPCR4 allowance assumptions in most asset

categories with the exception of transformers, Substation Other and Other TO categories which all exhibit expenditure beyond allowance assumptions.

Asset Replacement	Expenditure £m	2007/08	2008/09	2009/10	Total	Act. minus B'line £m	Act. minus B'line %
Transformers	Ofgem Baseline						
	Actual						
Reactors	Ofgem Baseline						
	Actual						
Switchgear	Ofgem Baseline						
	Actual						
Overhead Line	Ofgem Baseline						
	Actual						
Underground cables	Ofgem Baseline						
	Actual						
Protection & control	Ofgem Baseline						
	Actual						
Sub-station other	Ofgem Baseline						
	Actual						
Other TO	Ofgem Baseline						
	Actual						
Quasi capex	Ofgem Baseline						
	Actual						
Customer contributions	Ofgem Baseline						
	Actual						
Net savings	Ofgem Baseline						
Total	Ofgem Baseline	382.0	401.2	415.6	1,198.8	-239.4	-20.0%
	Actual	341.4	272.9	345.1	959.4		

Table 1: NLRE to date by major asset categories.

(NB Data removed from Table)

It should be noted that allowance assumptions by asset category are provided on an indicative basis. It is recognised that NGET has significant scope to reprioritise investments across asset categories in response to changing circumstances and emerging asset management considerations. Consequently, expenditure by asset category should not necessarily be expected to align with TPCR4 allowance assumptions. However, correlations between allowance assumptions (per asset category) and expenditure should be apparent.

Transformers

Transformer expenditure increased rapidly during TPCR4, from a slow start, to a level that is now exceeding allowance assumptions by over £28m.

NGET has reduced the original TPCR4 transformer replacement volumes, acknowledging that during recent condition assessments transformer condition in general was not deteriorating as quickly as originally estimated. In fact, transformer technical asset lives have been extended by five years. The temporarily heightened market demand for transformers was also cited by NGET as a reason to reduce replacement volumes, as commercial factors had created a surge in unit price.

NGET has purchased sixteen strategic spares to date and is buying two replacement units per annum to accommodate the replacement of failures. However, any comparison of unit costs is complicated by the two to three year gap between purchase and installation and it is not clear the extent to which NGET has been exposed to increased global unit costs in the early years of TPCR4.

NGET explained that environmental control measures, such as improved oil bunds, have also contributed to an increase in installed costs through the expanded scope of works now required for transformer replacements.

Whilst investment beyond allowance may be an indication that NGET regards transformer replacement as an investment priority and has closed the gap to allowances it is not clear that this has resulted in correspondingly newer equipment being installed on the network given procurement lead time and installation considerations, i.e. significant expenditure is committed in advance of network benefits arising.

Switchgear

Cumulative actual expenditure to date is 61% lower than that allowed and has been consistently lower than allowance assumptions from the inception of the TPCR4 period.

NGET has commented that reduced replacement volumes and expenditure are mainly due to factors identified in the current price review period:

- NGET claim that improved condition knowledge from extensive forensic examinations that has driven an increase in the technical asset lives of many switchgear types. The impact of this is not significantly tempered by the reduction in asset life of some high-duty circuit breakers.

- The revised technical feasibility and reduction in refurbishment costs, with resultant enhancement to asset lives, has made it economically viable to extend this option to additional switchgear types with large populations including the Frame-R and Reyrolle OHBR/OIBR designs.
- Work on the development and use of Network Output Measures has better informed asset prioritisation following the introduction of Health Indices.

Given that significantly lower expenditure than assumed in allowances has been apparent from the first year of TPCR4, KEMA has sought clarifications regarding NGET's decision to reduce switchgear replacement volumes and expenditure from the start of the current price control period.

NGET has revised its internal classification of maintenance, reconditioning and refurbishment activities, confirming that refurbishment is the term used for remedial work to extend technical asset life and reconditioning the term used for work to ensure the asset meets the original technical asset life.

Overhead Lines

Expenditure in 2007/08 was broadly in line with allowance but a subsequent marked decline in expenditure has resulted in 24% lower expenditure against allowances during TPCR4 to date. Several reasons were provided by NGET for the reduction in NLRE expenditure:

- Following extensive refurbishment programmes in 2005/06 the opportunity was taken to perform detailed forensic examination on conductor samples in particular. The conductor sampled was found to be in better condition than predicted and asset lives of conductor operating in a benign operating environment extended. This covers approximately 40% of conductor and asset lives were, in general, extended by ten years to 60 years with LOSU (Latest onset of significant unreliability) figures increased to 70 years.
- The early part of TPCR4 has seen increased load related expenditure (LRE) activity that NGET suggest has been partially coincidental with identified asset replacement projects. Actual age and condition replacement volumes have therefore not been fully captured in the NLRE figures as some ageing assets will have been removed from the system by load driven investment drivers.
- NGET stated that it was no longer the default policy to refurbish the full route length of a circuit but that refurbishment would be directed at only the higher priority sections. This can be regarded as a pragmatic policy change for selective asset replacement has been adopted.

- During the current price control review period, a number of refurbishment schemes had been deferred and targeted maintenance undertaken to mitigate risk at critical crossings.
- No cases were cited of full refurbishment schemes being converted into partial 'fixtures and fittings' schemes.

KEMA questions if the increased LRE activity and reduction in NLRE activity might imply there are constraints in the supply chain capacity.

Underground Cables

Cumulative actual expenditure to date has been 21% lower than TPCR4 allowance assumptions and is forecast to remain so throughout TPCR4. Although expenditure on underground cables to date is lower than anticipated, NGET has delivered the planned schemes.

Protection & Control

After significant expenditure in the first year of TPCR4, protection and control investment has fallen considerably below allowance assumptions with a cumulative underspend to date of approximately 36%.

In the FBPQ narrative NGET stated a reduction from the original TPCR4 forecast in protection units from 1,329 to 463 and a reduction in control units from 591 to 344; a reduction of 65% and 42% respectively.

In the case of protection units this reduction in expenditure has been attributed to an extension of the technical asset lives of electromechanical equipment.

In the case of control units the reduction in volumes and expenditure has been attributed to the development of an 'upgrade' option for some first generation substation control systems.

Sub-station other

This expenditure category encompasses environmental works, fire protection, LVAC supplies, battery systems and strategic stock replacement. To date investments in this category have exceeded indicative allowance assumptions by approximately 22%. There is no obvious reason for this situation.

Other TO

In the FBPQ narrative NGET characterises 'other TO' expenditure category to include expenditure such as security, flood protection, operational telecommunications (OpTel), non-operational capex and Asset Management capex. Expenditure in this category is almost £40m (63%) beyond allowance assumptions to date and is forecast to increase significantly further.

There are two specific and exceptional OpTel projects incurring expenditure in this category that account for 28% (£32m) of expenditure to date. These are five and six year programmes and the expenditure was anticipated in the original TPCR4 submission.

The Asset Management substation other category as described in NGET response to question F54 "...includes various types of small-scale, substation related works including air systems replacement, battery replacement, transformer cooler works, diesel and LVAC system replacement, building and roofing works. Other substation civil works and any unplanned works that arise throughout the year." This description appears to have some overlap with the 'Substation other' category and was actually reported under that category prior to TPCR4.

Total Asset Management expenditure is the largest item in the 'Other TO' category, accounting for approximately £74m (63%) of expenditure to date.

Table 2 shows the expenditure for the Substation Other and Other TO categories excluding the two OpTel programme costs.

(Table Removed)

Table 2: Substation Other and Other TO expenditure excluding OpTel programmes.

The following observations can be made;

- There is a significant increase on Substation Other expenditure at the end of TPCR3. However, the average annual expenditure over the TPCR3 period was approximately £16m.
- The average annual Substation Other expenditure in TPCR4 is approximately £21m.

- Total expenditure was increased in years 2006/07 and 2007/08 partly due to costs associated with Alliance development.
- There is a significant increase in Other TO expenditure from 2007/08 when the Asset Management items were transferred to this category.
- There is no corresponding decrease in Substation Other expenditure due to the transfer of Asset Management expenditure to Other TO.

In terms of total Substation Other and Other TO expenditure it is not clear why there is a significant increase from the annual average in TPCR3 of approximately [REDACTED] to the TPCR4 annual average of [REDACTED], driven by the Asset Management items.

3.2 Forecast Expenditure for 2012/13

In the 2010 FBPQ submission NGET has provided expenditure forecasts for the period 2010/11 to 2017/18 with an annual expenditure peak of £673m in 2014/15. The forecasts and accompanying the detailed narrative have been considered in the assessment of:

- Updated forecast of the NLRE to the end of the current TPCR4 period;
- Forecast of the NLRE in the 2012/13 Rollover year; and
- Longer-term consideration of non-load related expenditure plans.

3.2.1 Application of Network Output Measures

The risk-and-criticality approach is not yet fully embedded in the NGET capital plan, with some 2012/13 projects driven by asset condition. NGET has provided a high level summary of the Network Output Measures (NOM) methodology agreed between the three TOs and Ofgem. The relationship between the Asset Health Index (AHI), as a measure of condition, the determination of technical asset life, definitions of criticality and the determination of Replacement Priorities was outlined and is indicated in Table 3.

(Table Removed)

Table 3: Derivation of Replacement Priorities, in years.

NGET also validates the NOM approach to modelling by comparing the AHI results with their probabilistic model, ALERT.

It is worth noting that during TPCR4 to date and the application of the NOM methodology NGET has declared that the condition of several asset classes is better than expected and their technical asset lives can now be extended, including:

- Overhead line core and fully-greased conductor operating in benign operating regions, approximately 40% of lines;
- Oil circuit breakers;
- Transformers (according to paragraph G17 of the narrative and stated during the visit, however this is not consistent with Figure 76 in the narrative); and
- Protection (electromechanical relays) and control systems.

During the current price control period, the re-assessment of asset lives combined with reassessments of the technical feasibility and economic arguments for asset refurbishment has resulted in significant reductions in planned asset replacement volumes relative to the levels forecast by NGET in 2006.

3.2.2 Trends in expenditure

Transformers

The chart in Figure 2 shows actual and forecast transformer expenditure and indicative TPCR4 allowances.

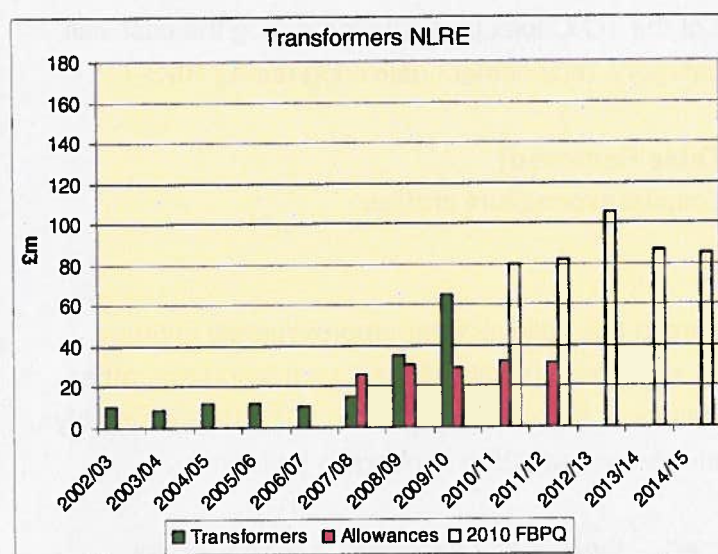


Figure 2: Actual and forecast transformer expenditure with indicative TPCR4 allowances.

Expenditure to date is running at approximately 34% above indicated allowances and is forecast to increase to an unprecedented level of £105.5m in the Rollover year. The highest expenditure previously committed was £64.6m in 2009/10. Whilst the volumes delivered are less than the TPCR4 forecast NGET is reporting significant increases in transformer unit costs, despite ordering TPCR4 replacements as bulk purchases.

During the first 3 years of TPCR4 NGET has purchased 16 strategic spares that, in association with unit cost increases, are likely to account for the increased expenditure to date. It would appear that most of these spares are due for fitment during TPCR4 but it is not clear if any will rollover into 2012/13.

NGET has noted that expenditure on transformer replacement starts up to 3 years in advance of commissioning, complicating the assessment of purchase and installation. For example, assuming a 2 year lag, the volumes reduced significantly from 2009/10 to 2010/11 yet the expenditure in 2007/08 to 2008/09 rose; there is correlation between rising volumes and prices between 2010/11 to 2011/12 and 2008/09 and 2009/10 respectively; but decreasing volumes to 2012/13 do not correlate with the significant expenditure increase forecast in 2010/11.

Given the above reasoning it would be prudent for Ofgem to monitor NGET's RRP outcome reported for 2010/11 with respect to transformer related expenditure and corresponding additions/disposals from the network.

The Transformers graph shown as part of the TO Capex presentation during the cost visit, and replicated in Figure 3, indicates a category 'replacement delivering during RIIO-T1'.

[Table Removed]

Figure 3: NGET transformer volume and capital expenditure profiles.

The magnitude of this forecast expenditure in the Rollover year, approximately £65m, appears to be large and would appear to align more readily with a 1 year lead-time rather than a 3 year lead-time. Forecast expenditure in this category prior to 2012/13 presumably covers scheme design and planning activities and at £35m appears to be high.

NGET has indicated that most transformers - there is one exception - scheduled for replacement in 2012/13 have been assessed as high priority replacements with 6 assigned Asset Replacement Priority (ARP) 0-2 years and 2 assigned an ARP of 2-5 years, of which Ferrybridge C has now been deferred to 2014.

The transformer volumes already purchased in TPCR4 and proposed to be installed by the end of 2012/13 already exceed the replacement volumes indicated by the revised NGET modelling by approximately [REDACTED]. It would appear that NGET is purchasing units ahead of requirement and that the sum of [REDACTED], based on the average unit cost of 400kV & 275kV/132kV transformers of [REDACTED], should be removed from the 2012/13 expenditure forecast.

Switchgear

The chart in Figure 4 shows actual and forecast switchgear expenditure and indicative TPCR4 allowances.

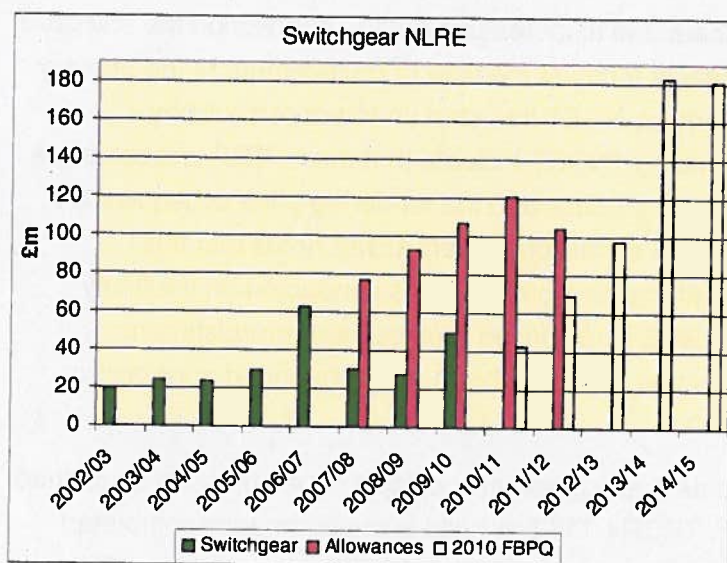


Figure 4: Actual and forecast switchgear expenditure with indicative TPCR4 allowances.

As outlined in Section 3.1.1, there has been significant underspend relative to assumed allowances throughout TPCR4 to date and this trend is forecast to continue to the end of the period. A reduction in expenditure is forecast for the current year with step increases of approximately £30m proposed for each of the two subsequent years to attain a Rollover year forecast of £97.5m. This level of expenditure is unprecedented over the last two price control review periods, the previous highest being approximately £60m, and it is noteworthy that this expenditure virtually doubles again in value at the start of RIIO-T1.

In responses to RRP and FBPQ clarification questions, R12 and F133 respectively, NGET has suggested the increased expenditure in 2012/13 is due to:

- The requirement to replace an increased volume of circuit breakers. It was also explained at the cost meeting that whilst the asset replacement 'S-curve' had been moved to later years, deferring expenditure, in 2012/13 a move up the curve, increasing volumes, would be necessary. However, NGET only propose to replace ■ circuit breakers, which is considerably less than the ■ replaced in 2008/09.
- Refurbishment of ■ circuit breakers is proposed, representing 67% by volume of circuit breaker works in the Rollover year. It is not clear if the full economic benefit of this approach has been incorporated in mitigating increasing expenditure.
- NGET has stated that the scope of future works will be more extensive as they have now identified it is more cost-beneficial, and utilises outages more effectively, to complete whole bay refurbishment/replacement rather than circuit breaker only works. These arguments were also proffered by NGET in the TPCR4 review conducted by

KEMA in 2006: “..NGET do indicate due to increasing outage congestion the standard practice is to replace all the assets in a bay at the time of replacement of the primary asset..” and “In certain circumstances, NGET has chosen to adopt a full bay replacement strategy..” and on pricing “NGET indicate that most PDD¹ unit costs are stated at bay level that simplifies the process and the tendering price schedules are also set at bay level that makes data extraction easier. KEMA notes that this automatically assumes that all switchgear replacement is conducted on a full bay basis..” It therefore appears that NGET has priced replacement/refurbishment schemes on a full bay policy for some time and this is not a change in approach or policy.

- The query responses also indicate that a greater proportion of off-line build is planned in future years than was seen in TPCR4. Off-line build is predominantly completed utilising GIS technology and a comparison of the forecast GIS volumes in the 2006 TPCR4 Review with the present position (2009/10) in Figure 65 of the 2010 FBPQ Detailed Narrative indicates that GIS penetration already approximates to the TPCR4 forecast;
 - 400kV GIS is respectively 40% and 50%,
 - 275kV GIS is respectively 35% and 34%, and
 - 132kV GIS is respectively 48% and 50%.

In conclusion, with the exception of 400kV GIS, the penetration of GIS with predominantly off-line build reflects that predicted at the start of the review period and does not appear to be higher than planned.

- Asset condition deterioration has also led to critical replacement programmes such as CT and VT replacement following three catastrophic failures during 2009 and 2010 and accounts for less than £10m of the 2012/13 expenditure.
- Works associated with nine off-line substation replacement builds due to be completed by 2015 has also been included in the expenditure.
- The cost visit presentation graph, replicated in Figure 5, also indicates a category of expenditure ‘circuit breaker spend delivering replacement during RIIO-T1’. Given that NGET state that spend on circuit breaker replacement precedes commissioning by 1 to 2 years it is not clear why significant expenditure is indicated for these schemes from 2008/09 onward, some 5 years before the commencement of RIIO-T1.

¹ NGET Project Definition Document

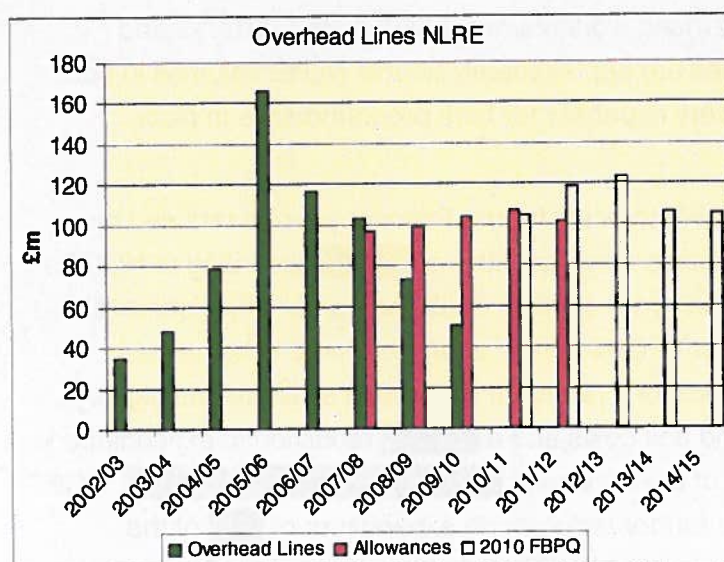
(Table Removed)

Figure 5: NGET switchgear volume and capital expenditure profiles.

Unit costs are considered to be high in relation to KEMA cost data and TO Average unit costs by factors in the range [REDACTED] and it is suggested that circuit breaker expenditure be reduced by [REDACTED] to approximately [REDACTED]. Scheme costs (reviewed in Section 6), particularly scheme overheads (e.g. engineering and professional services costs) are also considered high, accounting for up to 20% of scheme costs and it is suggested that a further [REDACTED] be deducted from the forecast circuit breaker expenditure. 'Substation Infrastructure' cost is [REDACTED] greater than the TPCR4 average annual expenditure and it is suggested it is reduced by [REDACTED] which aligns with the forecast spend of this category in 2011/12. Proposed Rollover expenditure will remain significantly higher than the anticipated TPCR4 annual average but will align with 2011/12 forecast expenditure.

Overhead Lines

The chart in Figure 6 shows actual and forecast overhead line expenditure and indicative TPCR4 allowances.

**Figure 6: Actual and forecast overhead expenditure with assumed TPCR4 allowances.**

The early years of TPCR4 expenditure show a marked year-on-year decline followed by a forecast rapid increase in the last two years of the period followed by a small increase in the Rollover year to £123.7m. Reasons for the pronounced reduction in TPCR4 expenditure followed by a significant increase, against a flat forecast, are not apparent.

At the cost meeting with NGET there was a suggestion that the planning group endeavour to optimise LRE and NLRE delivery, implying resource optimisation and/or a potential supply chain capacity constraint. It was further elucidated that the Alliance partners were able to procure resources from abroad but it was not clear if this was to address the proposed 2011/12 and 2012/13 volume increases or to redress current resourcing shortfalls.

Apparent reasons for increasing overhead line expenditure to 2012/13 include:

- A catch-up on asset replacement volumes to recover the modelled S-curve volumes due to significantly lower levels of asset replacement being undertaken during TPCR4 than anticipated.
- A significant increase in fittings only refurbishment to a level approximately 1.5 times the TPCR4 average.
- Increased environmental costs to protect Greater Crested Newts and Peregrine Falcons was cited as a contributor to increasing costs. However, KEMA believes that environmental requirements are not new and were already required during TPCR3

KEMA notes that the volume of LR overhead works remains high during 2011/12 and 2012/13 (LR conductor addition volumes are approximately double NLRE volumes in both years) and questions whether the delivery capability for both programmes is in place.

It is proposed that the overhead line NLRE forecast for the Rollover year be reduced by [REDACTED], equating approximately to a 'fittings only' reduction of [REDACTED] according to NGET's quoted units costs. Thus bringing Rollover year combined full and partial refurbishment delivery volumes in line with the forecast TPCR4 annual average. Some scheme costs (reviewed in Section 6, with some clarifications required) have been assessed as high by factors up to 20% due to overheads and unit costs and a [REDACTED] reduction in expenditure is suggested, based on a 20% reduction of the remaining [REDACTED]. NGET unit costs also appear to be high and a further reduction in expenditure of [REDACTED] of the remaining [REDACTED] is suggested. It appears that NGET had a less challenging forecast of overhead line refurbishment requirements for the Rollover year in their 2009/10 RRP submission and a further minor reduction is proposed so that NLRE is set at £80m, matching the 2009/2010 RRP forecast.

Underground Cables and Tunnels

The chart in Figure 7 shows actual and forecast cable expenditure and indicative TPCR4 allowances along with the forecast tunnel expenditure.

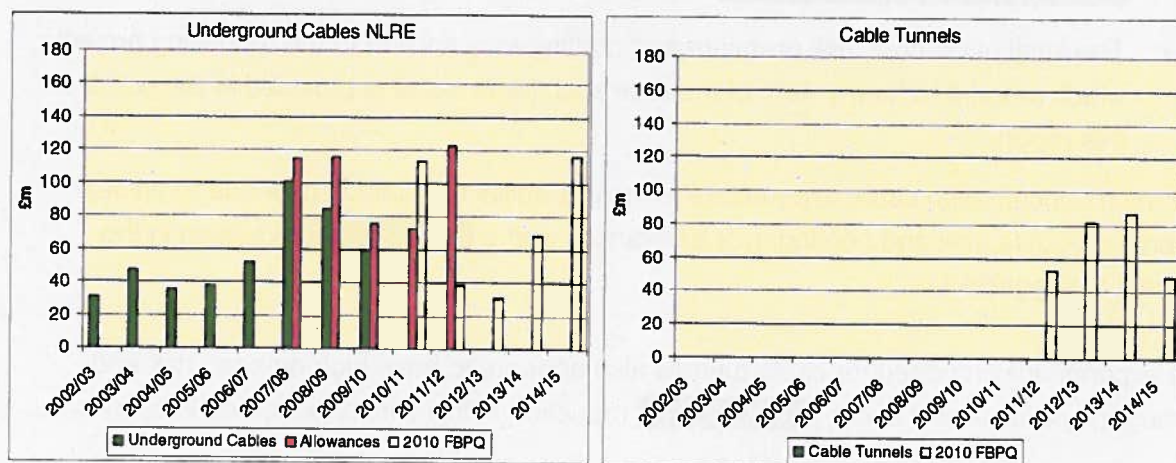


Figure 7: Actual and forecast cable and tunnel expenditure with assumed TPCR4 allowances.

Expenditure on underground cables to date is lower than anticipated but NGET has delivered the planned schemes.

NGET is embarking on the London cable replacement programme and is taking the opportunity to optimise network configuration to meet modern needs at the same time. This is a positive change to the scheme proposals at the beginning of TPCR4.

Although underground cable expenditure in 2012/13 is forecast to be lower than any year during TPCR4, NGET clearly anticipate commencing extensive cable projects beyond the Rollover year. It would appear that the major projects are already sanctioned, have contracts in place and are underway.

The only major concern arising from cable scheme discussions is the level of risk premium and contingency applied to these projects.

NGET has limited experience with respect to tunnelling projects and has large investments planned from 2011/12 onward with a forecast expenditure of [REDACTED] in the Rollover year.

A contract for the tunnelling works that bundles several of the projects to optimise pricing has recently been awarded with work due to commence this year.

There remain two significant areas of concern;

- The extent of the professional services fees, approximately [REDACTED] to providers outside the Alliances, and
- The level of on-cost, risk premium and contingency applied to the tunnelling projects, which amount to nearly 40% of the total cost. More detail is provided in Section 5 of this report.

The main concern with cable expenditure is the possibility of inflated costs due to unclear scheme on-costs, risk and contingency allowances and a [REDACTED] reduction in the forecast is suggested.

The expenditure proposed for cable tunnels also appears to have high on-cost, risk and contingency allowances and a [REDACTED] reduction in forecast expenditure is suggested.

Other TO

The chart in Figure 8 shows actual and forecast Other TO expenditure and indicative TPCR4 allowances.

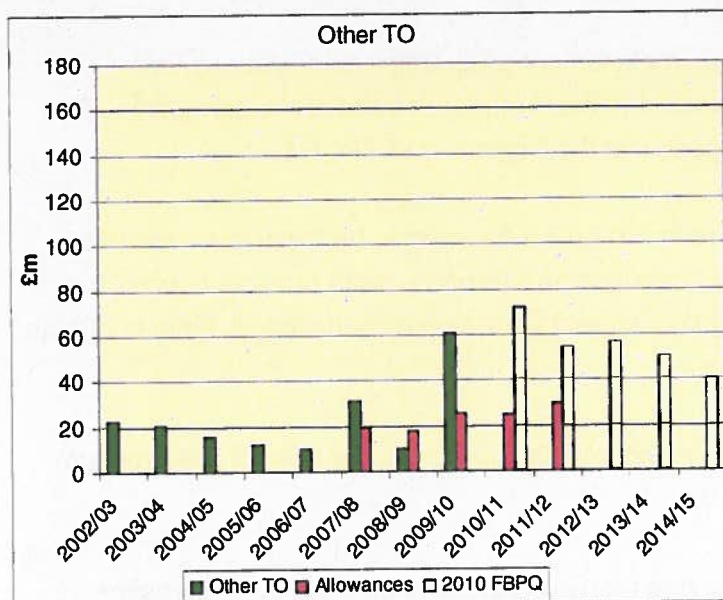


Figure 8: Actual and forecast Other TO expenditure with assumed TPCR4 allowances.

There are three major factors driving the increase in this expenditure during TPCR4 and beyond;

- The inclusion of the OpTel T&T (Transformation & Transition) Programme to deliver a new fibre optic network and new electronics systems to all substations and the control centres. This programme runs from 2009/10 to 2014/15 at a cost of [REDACTED].
- The re-categorisation of Asset Management schemes from the 'Substation Other' category to 'Other TO' category in 2007/08 at a total TPCR4 expenditure of £139m.
- There is also a programme of OpTel asset replacement being delivered during the TPCR4 period at a total cost of [REDACTED].

During TPCR4 to date the Asset Management items within the Other TO expenditure category have averaged an annual expenditure of £24.4m, considerably less than the £37.6m proposed in the Rollover year.

In conclusion, the expenditure within Other TO (excluding OpTel initiatives) during the Rollover year appears to be high and the transfer of Asset Management items from Substation Other does not appear to have resulted in a corresponding change in expenditure in this category.

Rollover year expenditure for the Asset Management items under this category is significantly higher than the TPCR4 annual average to date of £24.4m and a reduction of £13.2m is suggested for Other TO expenditure to align with the TPCR4 average.

3.2.3 Scheme condition and priority assessment

NGET has provided evidence of the correlation between Asset Health Index, Criticality and Replacement Priority when prioritising scheme selection for the Rollover year, 2012/13. An assessment of the relationship between these factors is considered by major asset category.

Transformers

The transformer replacement schemes selected for 2012/13 indicate a high degree of correlation with the designated Replacement Priorities, Figure 9.

[Table Removed]

Figure 9: Transformer scheme replacement priorities.

Switchgear

Direct correlation between the selected switchgear schemes and their designated Replacement Priority, Figure 10, is less apparent than for transformers with most schemes in the lowest two replacement categories. NGET has cited site subsidence, strategic replacement and DNO drivers as reasons for prioritising these schemes in the Rollover year.

[Table Removed]

Figure10: Switchgear scheme replacement priorities.

Indicative replacement priorities of the 44 circuit breakers proposed for refurbishment was not provided by NGET.

Overhead line full refurbishment

The selected full refurbishment schemes indicate a good degree of correlation with their Replacement Priority, with prudent reasoning² provided for the lower priority scheme, Figure 11.

[Table Removed]

Figure11: Overhead line refurbishment scheme replacement priorities.

Overhead line fittings only

Correlation between the Replacement Priority and the 'fittings only' schemes, Figure 12, selected for the Rollover is only moderate, i.e. less well correlated than for transformers. Outage constraints appear to be driving replacement priorities on the South Coast rather than condition or criticality.

[Table Removed]

² It is noted that Lynx conductor technical asset life of 35 years appears low compared to the 60 years declared by NGET for other conductor lives.

Figure12: Overhead line fittings only scheme replacement priorities.

3.2.4 Comparison of unit costs

The unit cost data provided by NGET in Table 4.27.3 of the FBPQ has been drawn from the IP1 Cost Book with a 28% uplift added for project management and site condition variations and therefore represents installed costs. NGET note that individual projects assess the variable factors independently and are more refined than the general 28% uplift adopted overall.

Installed unit costs have been provided by all TOs and averaged to provide a basis for comparison. Further comparison against KEMA unit cost data has also been performed. Table 4 summarises these comparisons by asset category.

[Table Removed]

Table 4: Comparison of unit costs .

Transformers

NGET's unit cost for 400kV transformers are a little lower or in alignment with both the TO Average and KEMA comparators. However, the average 275kV/132kV transformer cost appears to be approximately 27% higher in comparison to the KEMA data although it aligns with the TO Average.

Switchgear

Since the start of TPCR4 NGET has increased 400kV switchgear unit costs by approximately 23% and reduced 275kV switchgear costs by approximately 15%. The cost of 132kV switchgear has also been reduced by approximately 19%. NGET has explained this movement by the change in the ratio of AIS to GIS switchgear following an update of the original TPCR4 assumptions presented in the 2008/09 RRP.

NGET's 400kV unit costs align with the KEMA cost data comparator but are almost 10% higher than the TO Average, possibly due to the revised AIS/GIS ratio. Despite a reduction in the 275kV costs the NGET cost remains high against the KEMA data and is significantly higher than the TO Average. KEMA has used the same AIS/GIS ratio as NGET which may

explain why the NGET cost is closer to the KEMA comparator than the TO Average. Switchgear costs are based on whole bay costs.

Overhead lines

It is not evident that the TO costs submitted have been done so on the same basis and any comparison with the TO Average is not considered valid. However, when compared to the KEMA data both the conductor and fittings only costs appear to be high.

Underground cable

Subsequent to a 3.5% reduction in unit costs by NGET since the beginning of the TPCR4 period to both 400kV and 275kV installed cable costs, 400kV costs appear to be favourable compared to the KEMA cost data comparator, but 275kV cable costs are slightly higher and significantly higher than the TO Average.

It should be noted that cable installation costs can vary significantly from scheme to scheme and are sensitive to local topology and obstacles that may require specialist installation techniques.

In general, NGET unit costs are higher than both the TO Average and KEMA comparators with 275kV equipment appearing to be consistently and significantly higher, particularly;

[REDACTED]

3.2.5 Assessment of replacement volumes

The asset addition volumes provided in Table 5 are sourced from the 2010 FBPQ Table 4.15.

[Table Removed]

Table 5: Major asset category replacement volumes

It can be observed that;

- Transformer replacements are reasonably constant throughout TPCR4 and the forecast additions for 2012/13 falls below the TPCR4 annual average.
- There has been a significant fall in switchgear replacement in the middle of TPCR4 which then surges again in 2011/12 and maintained in the Rollover year. The volumes proposed in the Rollover year align with the TPCR4 average. Although it should be noted that refurbishment volumes increase significantly to ■ units.
- Replacement of overhead conductor has fluctuated and is below that anticipated due to related Load Related work as some ageing conductor will have been removed from the system by load driven investment drivers. In the Rollover year forecast volumes broadly align with the annual average to be delivered during TPCR4.
- Overhead fittings work in 2012/13 is forecast to increase significantly beyond TPCR4 average annual level raising some concern over the deliverability capability in relation to that demonstrated since establishment of the Alliances.
- Underground cable works are intermittent and the major London cable replacement works do not lay significant lengths of cable until after the Rollover year.

4 LOAD RELATED EXPENDITURE

NGET's 2010 FBPQ submission has been based on the 'Gone Green' demand and generation scenarios appropriately updated to reflect the latest generation developments and the associated impacts on the investment and expenditure areas in 2012/13 in particular.

For the avoidance of doubt, expenditure associated with TIRG and TII related projects is not included in this LRE assessment.

4.1 TPCR4 Expenditure to Date

There has been a step change in load related expenditure in the first year of TPCR4 of approximately £141m (60%) from the level delivered during the last two years of TPCR3. This level of expenditure has increased significantly throughout TPCR4, peaking at £530m³ in 2009/10 then forecast to significantly decrease in the next two years before increasing to £470m in 2013/14, Figure 13.

³ Includes Regulatory WIP.

Expenditure to date is currently £452m (51%) higher than the allowances assumed at the start of TPCR4.

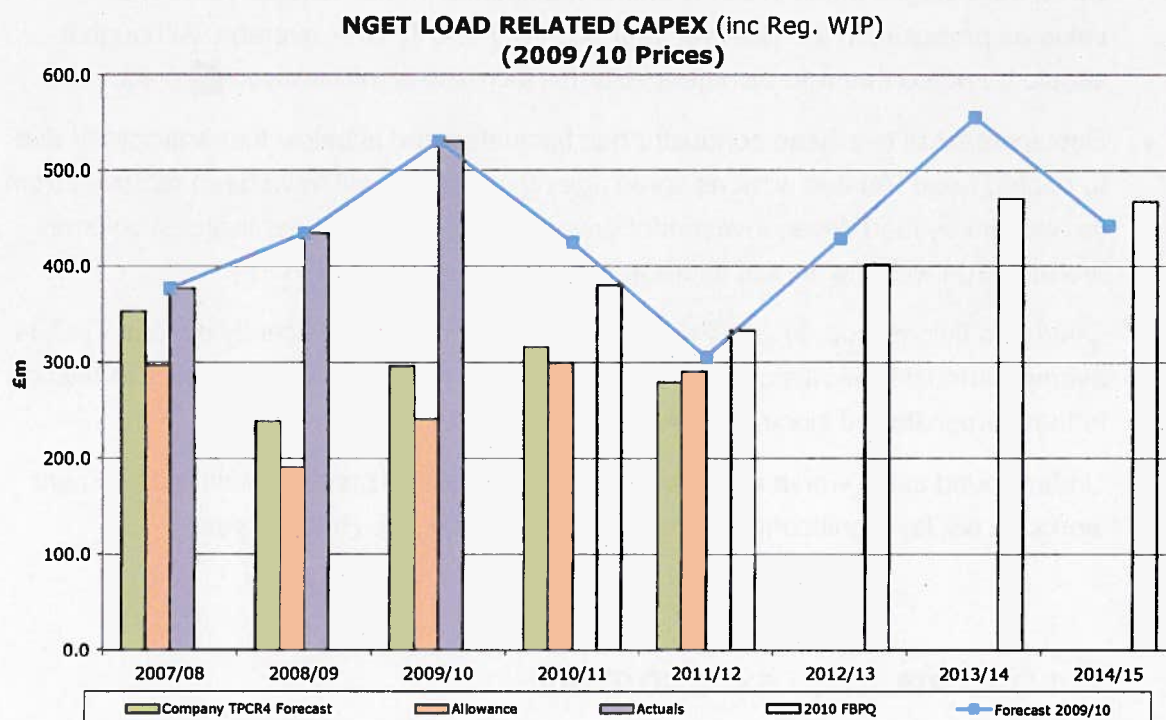


Figure 13: NGET Load related capital expenditure

4.2 Forecast Expenditure for 2012/13

In the 2010 FBPQ submission NGET has provided expenditure forecasts for the period 2010/11 to 2017/18. The forecasts and accompanying detailed narrative have been considered in the assessment of:

- Updated forecast of the LRE to the end of the current TPCR4 period;
- Forecast of the LRE in the 2012/13 Rollover year; and
- Longer-term consideration of all load related expenditure plans, including TIRG and TII.

Two alternative demand and generation scenarios, Accelerated Growth and Slow Progression have been considered by NGET. NGET stated that even though these two

scenarios brought in some differences in the overall generation and demand mix, they were not too significant in the Rollover year 2012/13 and hence did not impact on the associated investment for that year.

Actual LRE to 2009/10, and forecast LRE from 2010/11, for the period 2005-2015 is shown in Figure 14. The expenditure in each year comprises all expenditure needed to accommodate new generation and demand connections or changes for existing connections

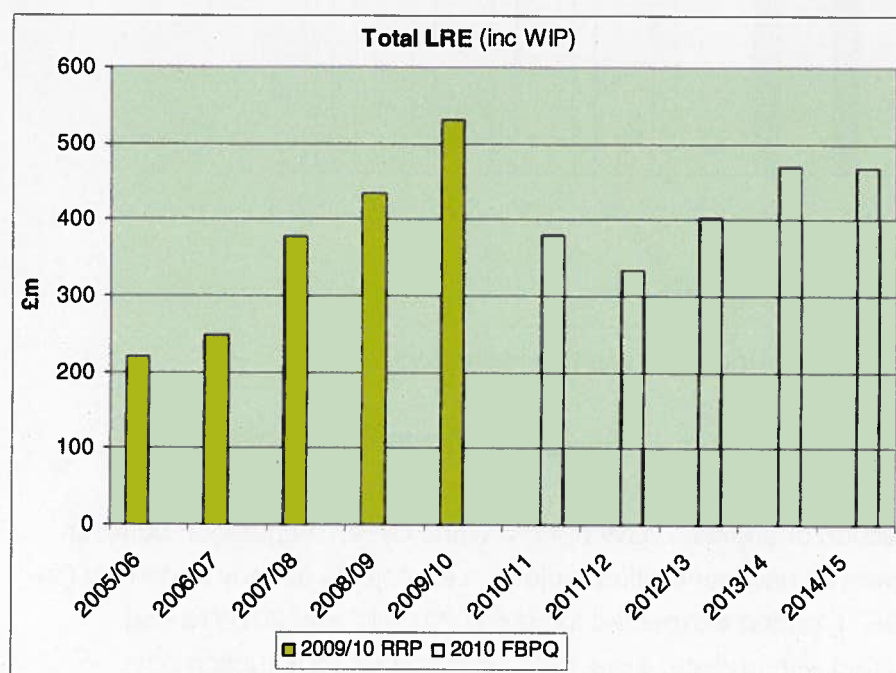


Figure 14: Actual and forecast load related expenditure

In relation to the recent LRE of £530m in 2009/10, the expenditure is expected to significantly decrease in the next two years and then to increase to £470m in 2013/14. NGET is forecasting an investment level of £402m for the Rollover year 2012/13.

The most significant element of the increased expenditure in 2012/13 is the 'Infrastructure – entry triggered' category indicated in Figure 15.

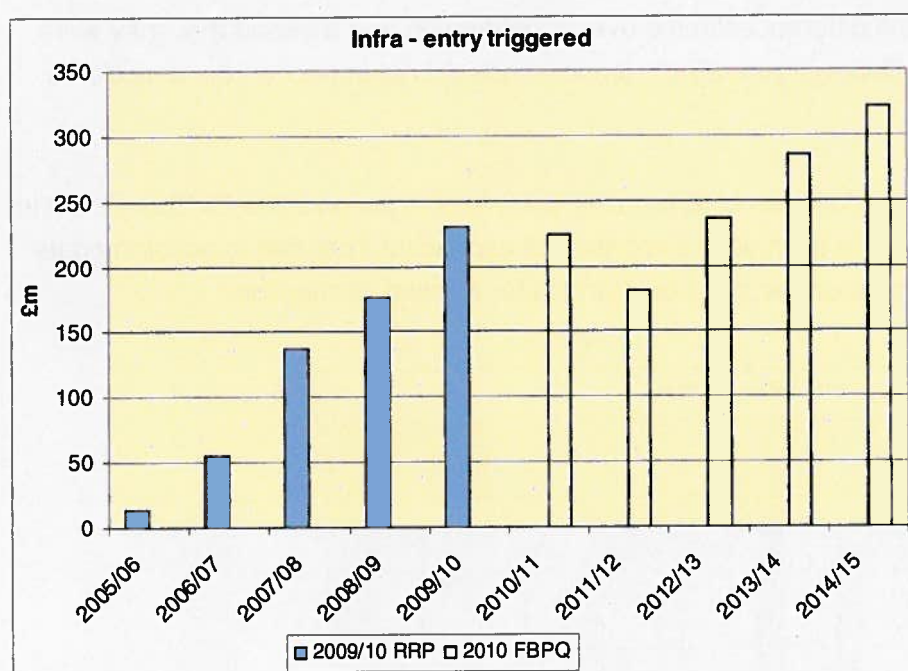


Figure 15: Actual and forecast entry-triggered capital expenditure

Infrastructure – entry triggered investment is forecast to be £236m in the Rollover year, accounting for 59% of the load related expenditure. This expenditure appears to be associated with the connection of approx 12GW of new ‘Gone Green’ generation between now and 2012/13 and covers all new generation projects, i.e. projects already underway (‘in-flight’ as described by NGET), projects expected to start in 2011/12 and 2012/13 and development work associated with projects expected to commence construction post 2012/13.

4.2.1 Review of proposed programme

NGET acknowledges that not all contracted generation developments will proceed to fruition and generally develops longer-term business plans on the assumption that approximately 50% will be successful. However, for the Rollover year, uncertainty is reduced with a higher level of confidence in the proposed expenditure.

As the dominant expenditure category, Infrastructure–entry triggered has been reviewed to assess the practicality of the proposed NGET programme. Several assessment factors have been studied to examine the relationship between:

- NGET schemes and their investment stage;

- NGET scheme consent status;
- NGET forecast construction authorisation date;
- Developer project status (construction, planning consents) associated with each NGET scheme; and
- Developer project contracted connection dates.

A total of 57 schemes have been reviewed that cover £222.7m of the forecast £236.4m expenditure in 2012/13, based on:

- Schemes with a total expenditure greater than £5m;
- Scheme expenditure in 2012/13 less than £1m being excluded if it is the last year of expenditure; and
- All scheme expenditure in 2012/13 being included where the bulk of expenditure is incurred beyond the Rollover year.

A scheme by scheme assessment of the degree of certainty that each one is likely to incur expenditure in the Rollover year has been made based on the assessment factors above. Results of the scheme assessments have been graded High (H), Medium (M) and Low (L) in relation to the certainty of expenditure in 2012/13. For instance;

- H has been awarded where there is a high degree of correlation between all the factors above and therefore the need and timing of the scheme is clear;
- M has been awarded where there is a moderate degree of correlation (e.g. there may be uncertainty in the consent process in relation to the contracted connection date) but there remains reasonable certainty of the need and timing of the scheme; and
- L has been awarded where there is a lower degree of correlation between the assessment factors (e.g. several developer schemes may be in the scoping phase or have long contracted connection dates) and therefore the need and timing of scheme expenditure in the Rollover year is not clear.

The analysis results are grouped by the NGET Investment Management Process phases:

- IP1 Project outline;
- IP2 Development;

- IP3 Design; and
- DDD Delivery.

These phases define a sequential progression of detail in the investment process with greater investment and design clarity at each stage. It is therefore intuitive to expect that the assessment factors considered would become stronger with each phase of development

The assessment of NGET schemes listed as IP1 is summarised in Figure 16.

[Table Removed]

Figure 16: Assessment summary of NGET IP1 schemes.

It can be observed that:

- Schemes in the IP1 project outline phase are generally not consented, with consent options and consultations being considered;
- NGET scheme construction authorisation generally isn't expected until the end of the Rollover year or beyond;
- As this phase occurs prior, or in parallel, to a developer connection offer being made there are relatively few developer projects (22) associated with these schemes;
- Of the associated developer projects approximately 27% are under construction, have consents approved or are awaiting consent decisions; and
- The scheme assessments of the certainty of expenditure during the Rollover year are considered to be Low or Medium.

The assessment of NGET schemes listed as IP2 is summarised in Figure 17.

[Table Removed]

Figure 17: Assessment summary of NGET IP2 schemes.

It can be observed that:

- Schemes in the IP2 project development phase have 6 of 12 schemes requiring consent with consents granted or submitted;
- NGET scheme construction authorisation for the consented schemes is anticipated in the TPCR4 and Rollover year period;
- There are a relatively high number of associated developer projects (133) with approximately 35% under construction, with consents approved or awaiting consent decisions; and
- Nine out of twenty schemes have been assessed to have a certainty of expenditure during the Rollover year of High or Medium.

The assessment of NGET schemes listed as IP3 is summarised in Figure 18.

[Table Removed]

Figure 18: Assessment summary of NGET IP3 schemes.

It can be observed that:

- Schemes in the IP3 project design phase have 8 of 15 schemes requiring consent with consents granted or submitted and a further 2 imminent;
- NGET scheme construction authorisation for the consented schemes, and for the majority of the remainder, is anticipated within TPCR4;
- There are 68 associated developer projects with approximately 44% under construction, with consents approved or awaiting consent decisions; and

- Nine out of sixteen schemes have been assessed to have a certainty of expenditure during the Rollover year of High or Medium.

The assessment of NGET schemes listed as DDD (delivery phase) is summarised in Figure 19.

[Table Removed]

Figure 19: Assessment summary of NGET DDD schemes.

It can be observed that:

- Schemes in the DDD project delivery phase have consents awarded for all schemes requiring consent;
- NGET scheme construction authorisation for all schemes is in place;
- There are 47 associated developer projects with approximately 47% under construction, with consents approved or awaiting consent decisions; and
- All schemes have been assessed to have a High certainty of expenditure during the Rollover year.

In conclusion, analysis of the assessment factors of each of the schemes proposed by NGET does demonstrate alignment with the Investment Management Process as the factors considered generally exhibit a higher degree of confidence at each phase.

Where schemes have been assessed to be of Low expenditure certainty in the Rollover year this is often due to a perceived lack of certainty by KEMA over the need and timing of the scheme. In these instances it is considered that expenditure may be deferred beyond 2012/13 and it is suggested that forecast expenditure for the Infrastructure-entry triggered investment category be reduced by the Low certainty 2012/13 forecast scheme expenditure total of approximately £55m. It is suggested that the requirements of the Low certainty schemes be reviewed further during the RIIO-T1 price review.

A detailed review of the other LRE categories has not been performed but the context of the forecast expenditure is highlighted in Table 6.

Other LRE category expenditures (£m)	TPCR4 Total to date	TPCR4 annual average	2012/13 forecast expenditure
Demand connection - sole-use	265.2	88.4	
Infrastructure - general reactive schemes (excl TIRG /TSS)	28.6	9.5	
Infrastructure - general non reactive schemes (excl TIRG /TSS)	321.9	107.3	
Infrastructure - exit triggered	168.5	56.2	
Infrastructure - TSS	6.3	2.1	

Table 6: Context of 2012/13 expenditure in other LRE categories.

With the exception of Infrastructure-TSS expenditure the forecast for remaining LRE categories in 2012/13 is substantially less, or broadly aligns with, average annual TPCR4 expenditure to date.

5 TOTAL CAPEX PROGRAMME DELIVERY

The total Capex forecast by NGET in the four main categories of Load Related, Non-Load Related, TIRG and TII is presented in Figure 20.

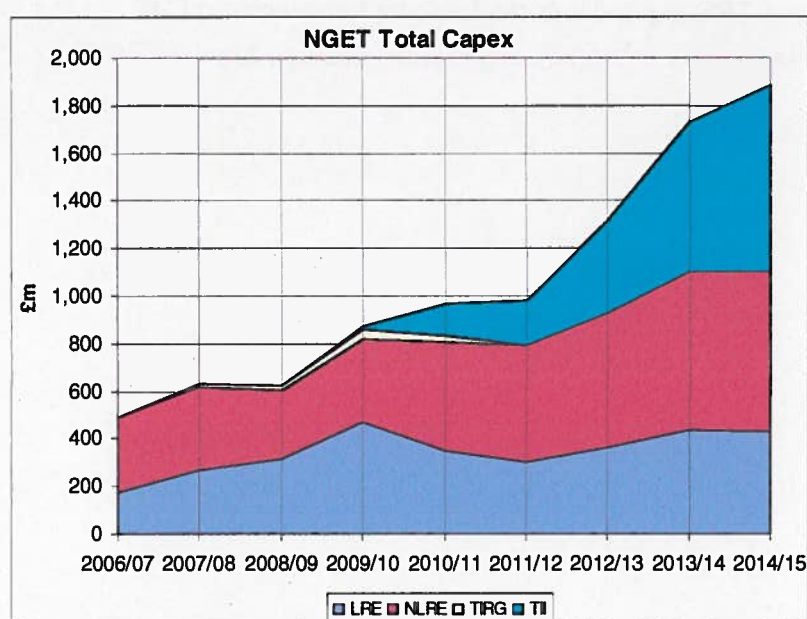


Figure 20: Total NGET Capex forecast

Total expenditure delivered in 2009/10 was approximately £948m of which the traditional LR and NLR elements represented 94% of activity. By 2012/13 this figure is forecast to increase to £1,362m of which traditional expenditure accounts for £975m (72%) of activity.

The TII forecast expenditure in 2012/13 includes £139.7m (out of £387m TII forecast) for HVDC (and associated AC) works for the Deeside connection to Scotland.

NGET has recognised that the HVDC works are likely to be delivered by providers outside of the Alliance partnerships but this represents a small proportion of total works.

During 2010/11 NGET has recruited 85 engineers to fulfil design, planning and project management roles and intends to recruit an additional 30 in each of the years 2011/12 and

2012/13. There is a considerable challenge to be met in training new technical staff to fulfil the necessary duties effectively by 2012/13.

It is anticipated that NLRE and TII overhead line expenditure alone will increase from £50.6m in 2009/10 to approximately £257m⁴ in 2012/13, a five-fold increase. Inclusive of LR works the total kilometres forecast will be the highest delivered (794km) by the Alliances against a TPCR4 annual average to date of 716kms. Substation related NLRE and TII works are forecast to increase from approximately £123m in 2009/10 to approximately £322m⁵, a 2.5 times increase.

[REDACTED]

Reductions in NLRE and LRE previously suggested in this report result in a level of capital expenditure that NGET has previously demonstrated it can deliver and no reduction is proposed in this review due to delivery capability. However, delivery issues may become apparent when progressing the TII projects, but the impact of this eventuality has not been assessed in this review.

⁴ TII overhead line contribution estimated from Table 4.23 of 2010 FBPQ.

⁵ TII substation related works estimated from Table 4.23 of 2010 FBPQ.

6 SCHEME ASSESSMENTS

KEMA identified a total of 9 schemes from the FBPQ for detailed investigation and requested the appropriate scheme information from NGET. These schemes consisted of:-

- 2 Load_related, 7 Non-load related;
- 2 overhead line schemes;
- 1 switchgear scheme;
- 2 transformer schemes;
- 1 major substation asset replacement/upgrade; and
- 1 cable scheme.

On receipt of the scheme data, however, errors were found in two of the schemes: the Burwell switchgear scheme should not have been included in the Business Plan and was subsequently withdrawn by NGET, and the stated scope of the Cilfynydd – Walham reconductoring works did not reflect NGET's current forecast.

Table 7 summarises the schemes, their status and details of the associated expenditure.

General conclusions and a scheme assessment summary are outlined in this section with full scheme assessments provided in Appendix A. General findings are:

- The cost of overhead line [REDACTED]
[REDACTED]
[REDACTED];
- NGET is now building a larger proportion of Gas-Insulated (GIS) substations than previously. Such substation designs are considerably more expensive than Air-Insulated substations: KEMA estimates a "benchmark" [REDACTED], as against a more [REDACTED];
- NGET are showing significant "overhead" costs. These include "engineering" at 6%, and "professional services" covering project management, quality assurance, quantity surveying, etc. These costs appear to be high;

- In a number of instances NGET has quoted ancillary costs which appear difficult to justify. Examples include [REDACTED] to replace what should be a completely serviceable [REDACTED] for "unspecified civils and demolition costs" [REDACTED]; and
- For one scheme, the Cilfynydd – Walham overhead line reconductoring in South Wales, whilst there was clear evidence that part of the line required refurbishment, it was not clear that the entire route needed refurbishment. A differentiated approach would have been consistent with NGET's revised Overhead Line refurbishment policy introduced during TPCR4.

[Table Removed]

Table 7: Summary of schemes assessed in detail.

A good example of a scheme where overheads and on-costs appear high is the St. John's Wood – Willesden tunnelling project. Section 2.8.4 provides costing information for this project that indicates on-costs of [REDACTED]. Whilst this example shows a particularly high level of on-cost, others also exhibit unusually high levels.

[REDACTED]

[REDACTED]

[REDACTED]

Table 8 summarises the conclusions concerning the NGET schemes considered. Each scheme has been assessed under the following three headings:

- Need (i.e. has NGET provided a reasonable justification for the work?);

- Design (i.e. has NGET identified the optimum design?); and
- Cost (i.e. are the costs reasonable?).

and for each issue a bullet “colour-coding” scheme has been used, where:

- Green indicates concurrence;
- Amber indicates that there are uncertainties regarding aspects of the scheme; and
- Red indicates there are unjustified aspects of the scheme.

[Table Removed]

Table 8: Summary of detailed scheme assessments.

7 CONCLUSIONS

KEMA has reviewed the total NLR and LR capital expenditure for NGET, comparing outturn against allowances and projecting forecasts forward through the Rollover year (2012/2013) to 2014/15. Further analysis was performed on the NLRE to obtain a clear understanding of the levels of investment and volumes of assets installed, replaced or refurbished by major asset category.

In conclusion:

- Transformers; Replacement volumes purchased to date appear to be high and will significantly exceed cumulative replacement levels indicated by the revised NGET modelling in 2012/13 by approximately [REDACTED]. However, the proposed schemes do correlate well with the NOM Replacement Priority. There is some complexity over the timing of expenditure and installation of the associated assets. The proposed level of expenditure in 2012/13 for scheme delivery in RIIO-T1 also appears high.
- Switchgear; Expenditure and delivery of schemes has been inconsistent and misaligned with the previous expenditure forecasts. There is a greater emphasis on refurbishment rather than replacement during the Rollover year and it is not clear if the full economic benefit of this approach has been incorporated in mitigating

increasing expenditure. NGET arguments for increased expenditure is based on an increased scope in works (full bay refurbishment) and more off-line build; these arguments were also proffered in the initial TPCR4 review and do not represent a change in approach or policy. NGET is forecasting expenditure for RIIO-T1 schemes up to five years ahead and the amount attributed for this expenditure in 2012/13 appears high. Unit costs range between 0% and 20% higher than the GB industry average.

- Overhead lines; A pragmatic policy change for selective asset replacement has been adopted along with conductor asset life extension in benign operating areas. Whilst full refurbishment volumes are modest in 2012/13, in line with life extension, there is a significant increase in 'fittings only' schemes giving a combined kilometre volume not delivered since 2007/08. [REDACTED]
[REDACTED]. Full refurbishment unit costs remain higher than those determined by KEMA.
- Underground cables and tunnels; NGET is embarking on the London cable replacement programme and is taking the opportunity to optimise network configuration to meet modern needs at the same time. The only major concern arising from cable scheme discussions is the high level of on-cost, risk premium and contingency applied to these projects of [REDACTED]
- Protection and control; Replacement volumes have been reduced due to life extension and the purchase of 'upgrade' options but protection costs are 13% higher than GB industry average.
- Other TO; The expenditure within Other TO (excluding OpTel initiatives) during the Rollover year appears to be high, £37.6m against a TPCR4 average of £24.4m, and the transfer of Asset Management items from Substation Other does not appear to have resulted in a corresponding change in expenditure in this category.
- Scheme assessments; Nine schemes were examined in detail (7 NLR and 2LR) and assessed by project need, design and cost. In general the need and design of the schemes examined is considered to be valid but in five cases the costs are deemed to be excessive due to high unit costs and levels of contingency.

- [REDACTED]

Adopting the proportionate approach encouraged by Ofgem for this review KEMA has made an assessment of appropriate expenditure, incorporating a reduction in on-costs and overheads of approximately 15% at the low end, for each NLRE asset category in the Rollover year, 2012/13. This assessment is presented below.

2012/13 Rollover Year (£m)	NGET F'cast	KEMA Estimate	Comment
NON-LOAD RELATED EXPENDITURE			
Assets - replacement and refurbishment			
Transformers	105.5	67.8	replacement volume beyond modelled, pre-RIIO preparation cost high.
Reactors	7.6	7.6	
Switchgear	97.5	69.0	unit cost, risk & contingency levels, substation infrastructure and pre-RIIO expenditure all high.
Overhead Lines	123.7	80.0	oh fittings volume very high, scheme and unit costs high, deliverability issues.
Underground Cables	31.0	26.4	Risk & contingency allowances high.
Cable tunnels	81.2	65.0	high levels of on-cost and contingency allowances.
Protection & control	40.3	35.0	unit cost high.
Sub-station other	13.7	13.7	
Other NLRE			
Other TO	56.7	43.5	asset management costs increased and high.
Quasi capex	7.3	7.3	
TOTAL	564.4	415.3	

A proportionate approach to LRE category analysis has also been adopted by reviewing the single largest expenditure category, encompassing approximately 60% of total expenditure, of Infrastructure-entry triggered.

In conclusion:

- In general, NGET acknowledges that not all contracted generation developments will proceed to fruition and prudently develops longer-term business plans on the assumption that approximately 50% will be successful.
- Inevitably there are some generation uncertainties which may impact 2012/13 and the associated expenditure. Some generation projects are themselves in the process of project development and may still face uncertainties over planning consents and project delivery timescales, which may lead to delays compared to that assumed in the generation background used to form this plan.
- A review of the 57 major schemes proposed by NGET and forecast to incur expenditure in the Rollover year examined the linkage of several key scheme assessment factors to NGET's internal Investment Management Process and concluded there is a good alignment.
- Each scheme was assessed on the status of planning consents, expenditure authorisation, developer contracted connection dates and developer consent progress to determine the likelihood of it incurring expenditure in the Rollover year. An assessment of High, Medium or Low was awarded to each scheme and it is suggested that the expenditure need, approximately £55m, and timing of the Low ranked schemes may be deferred beyond 2012.

From a detailed analysis of the largest element of NGET's load related Capex plan, the Infrastructure-entry triggered category, and discussion of the main issues within this report KEMA has made an assessment of the appropriate expenditure for that category in the Rollover year, 2012/13 as indicated below. The other LRE categories were not reviewed in detail.

2012/13 Rollover Year (£m)	NGET F'cast	KEMA Estimate	Comment
LOAD RELATED EXPENDITURE			
Generation connection - sole-use	1.0	1.0	Included in Infrastructure-entry triggered assessment methodology.
Demand connection - sole-use	38.2	38.2	not assessed, below TPCR4 average.
Total LRE - sole-use	39.2	39.2	
Infrastructure - entry triggered	236.4	181.5	
Infrastructure - general reactive (excl TIRG /TSS)	2.5	2.5	not assessed, below TPCR4 average.
Infrastructure - general non reactive (excl TIRG /TSS)	53.9	53.9	not assessed, below TPCR4 average.
Infrastructure - exit triggered	60.7	60.7	not assessed, aligns with TPCR4 average.
Infrastructure - TSS	9.4	9.4	not assessed, above TPCR4 average.
Total LRE - Infrastructure	363.0	308.0	
TOTAL	402.2	347.2	

APPENDIX A - DETAILED SCHEME ASSESSMENTS

(Appendix removed)

