

Consultancy Support for Electricity Transmission and Distribution Revenue Controls (2016-2020)

COMMISSION FOR ENERGY REGULATION (CER)

TSO

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Executive Summary

This report sets out the TSO's capital expenditure (capex) and operating expenditure (opex) over the PR3 (2011 to 2015) and PR4 (2016 to 2020) periods. The review considers the costs, systems processes, and initiatives of the TSO over PR3 and identifies key issues to be considered in PR4. The report then reviews the TSOs proposals for expenditure in PR4 and makes recommendations on the level of expenditure, outputs and incentives to be allowed by CER.

The total allowed controllable opex for PR3 was €215.3m. This includes an additional €2.8m allowed in 2012 for the cost of the introduction of Intraday trading. The outturn opex costs at a headline level are 4% below allowances issued by CER at €207.7m. There has been an increase in the staffing costs (€16.1m) and staff numbers over those expected during the setting of PR3 allowances. Staff levels chargeable to operating costs have increased from 230 in 2011 to an expected 278 by 2015. (Capex equivalent is 51 in 2011 rising to 65 in 2015). The PR3 assumption in the determination report CER 10/206 was that staff numbers for Opex activities would rise from 221 in 2009 to 239 in 2015. In explanation the TSO has identified a number of activities that they are currently undertaking which they consider were not included at the time of the PR3 settlement.

There has been a significant difference in the pass through costs incurred in comparison to the PR3 allowance which is due to clarifications occurring during the PR3 period.

The TSO indicate that the SONI integration has provided a significant impact within a number of areas and has provided a detailed paper on the expected benefits from the integration into EirGrid. This gives the TSO full period saving of €8.5m which, based on TSO controllable cost of €213m is a 4% saving. We note that the savings include staff reductions of 22 staff, which when apportioned to the TSO would be 17 staff, a saving of 6% on current staff levels. We consider these conservative and expect EirGrid to identify and realise more than minimum savings, in the longer term.

We recognise that that TSO has reduced costs in some areas, however the increase in staff cost over the allowance exceed the savings. The TSO state that they have an holistic approach to resourcing by developing a mix of fixed term recruitment, use of contractors and specialist recruitment where appropriate; thus reducing the professional fees and contractors and increasing the manpower cost but giving an overall cost reduction to the company. However we note that as the staff numbers are significantly above those expected in the allowance and consequently the Staff cost increase (€16.1m) is well above the Professional services reduction of (€8.4m), however once the increased recharges are taken into account the overall resource costs are broadly in line with allowances. Also the approach taken on payment of performance related payments appears to generate consistently high payments year on year across all levels. We would expect that targets should be set which are challenging and include operating cost reductions which would make increases over a base level self-financing. The TSO have paid consistently high awards to date in PR3, we would have expected a lower level of payment, especially given the economic challenges that the country has faced. We consider that €6m-€7m has been paid in excess of what we would consider efficient and reasonable.

The TSO has requested in their PR4 submissions an increase from €213.8m to €268.2m (€54.4m equivalent to 25%) in their regulated operating cost base compared to the PR3 forecast spend (at 2014 prices). The main areas of requested increase are, Staff and related costs (€21.0m), Telecoms (€10.8m) and R&D (€18.9m) offset by an increase in recharges of €10.6m. The pass through costs are forecast to increase from €2053.1m to €2307.7m in PR4, an increase of €253.4m or 12%. These costs are included in the TUoS tariff on an as incurred basis and so these have been allowed in their entirety as any changes will automatically be included in the annual TUoS calculations.

The TSO recognise that there is uncertainty over the level of resource required in PR4 and we have reflected that in the approach to the resource allowances. We have considered the proposed staff increases, and applied appropriate cost per FTE to identify an appropriate value of increased overall cost. We have then considered a more realistic level of performance related pay of 7% (this does not preclude TSO being able to pay higher levels through self-financing operating cost reduction) and it is considered that the proposed staff costs should be reduced by €19.7m against TSO requested over PR4 giving a total staff cost of €139.9m.

The Telecoms and IT costs associated with major new investment have been reduced as we believe there is likely to be delays in the delivery based upon historic capex performance, we consider that a more realistic view

of when the costs will be incurred, will result in a €5.6m of the expenditure moving into PR5, and therefore be a reduction over the PR4 period. If the TSO programme delivery is as planned then it is likely that there may be an overspend in this category and if this additional expenditure is efficiently incurred then this should be looked on favourably at the next periodic review.

The other major change is the disallowance of the €18.9m R&D budget, for which there was no previous allowances, and is viewed as an area where once appropriate options are developed internally or proposed by external suppliers then there could be an approach to the CER for appropriate funding. The alternate would be an incentive to spend the budget in developing solutions with 3rd parties and the consumer paying suppliers for their R&D which may or may not benefit EirGrid customers. This could be better controlled on a specific case by case basis with a thoroughly reviewed business case when needed. This is not intended to go against the principles of ex-ante regulation but to promote the identification of key deliverables and objectives for the Research and Development expenditure for the benefit of consumers rather than a discretionary pot which would allow significant expenditure without any predetermined deliverables and potential of customer benefit. There are other minor adjustments but in general most areas the proposed expenditure seems reasonable. This has resulted in reductions of €50.7m being proposed against the TSO request, providing a total allowance of €217.4m which is 2% higher than expenditure in PR3.

The CER allowance for transmission capex in PR3 was €1449.9m split €110.4m for EirGrid and €1339.5m for ESBN, for the stretch network needs case. The Stretched Network Needs scenario was developed to provide a forecast level of capital expenditure for PR3 sufficient to enable the Irish transmission system to be developed to accommodate the expected significant increase in renewable generation required to meet national 2020 energy targets. The outturn current forecast for PR3 is for €44.8m for EirGrid and €982.3m for ESBN, a total of €1027.1m and an overall shortfall against original allowance of €422.8m

During 2011 it became evident that as a result of delays in the progression of generation projects under Gate 3 along with a reduction in electricity demand and greater awareness and engagement of the public in relation to transmission network development projects, that the originally envisioned transmission system development expected during PR3 would not materialise as planned. As a result, EirGrid in conjunction with ESBN and CER, agreed a revised PR3 transmission system expenditure forecast at October 2011, including estimates for years 2013 to 2015. The overall PR3 forecast expenditure was expected at that time to reduce by 21% to €1.15b.

From this review it is clear that over the PR3 period (2011 to 2015) there has been a significant change in the requirement for transmission system development in Ireland in comparison with the view in 2009/10, and further in relation to the actual capital expenditure incurred on individual projects..

From a review of projects developed and completed during PR3, outturn project development costs are largely at or under original project forecasts in most cases, excepting that some projects have more significant variations both positive and negative in comparison with the original forecast. A general cost underrun was identified for known projects completed in PR3. It is unclear if this underspend is a result of efficiency savings made during project implementation and construction, change in specification from original plan, or potentially even as a result of higher cost original forecasting

Although a reduction in overall TSO & TAO capital expenditure is forecasted to have occurred through PR3 to €1,027.1m, circa 70% of the original €1,449.9 m PR3 allowance, it is unclear if the outturn volume of asset delivery over PR3 is matched to a similar level. It would be expected that there should be some broad correlation between outturn PR3 asset installation rates and final expected expenditure. This is considered a reasonable metric indicating a notional measure of efficient asset planning, development and installation and should be improved upon in the PR4 period.

To provide supporting information, a review has been performed of 35 projects from the latest Grid 25 CAPEX Monitoring Report (Q3 2014) on expected project energisation (completion) dates. This identified that the majority had experienced some change in completion date such that only 14% are expected to be delivered on time (against original energisation date). It is reasonable to expect that the TSO should be able to demonstrate

a robust change management process, as part of overall efficient organisational working arrangements. Only limited information and explanation has been provided as to reasons underpinning changes in project requirements, timing, specifications and cost. Information has been provided on the volume of transmission assets that are expected to be installed over the course of PR3, although there is little to directly relate how the outturn volumes compare with the original estimates at the start of PR3, or the lower capital expenditure allowance resulting from the 2011 reforecasting exercise.

Overall then, it is still unclear exactly how efficient EirGrid has been in its role as TSO over the PR3 period, responsible for planning transmission asset projects in Ireland. The evidence provided to date suggests that there have been changes in project specification, timing and costs which coupled with delays in relation to the North-South project, has resulted in some inefficient capital spend. Whilst in general terms the quantum of this inefficiency is difficult to estimate and in relation to many capital projects is expected to be relatively low, in terms of the North-South project there have been additional incremental costs incurred as a result of delays and hence a proportion of costs incurred after the original planning application in 2011 have been deemed inefficient and hence disallowed. The disallowed capital expenditure for the North-South project amounts to €2.755m. For all other projects progressed during PR3 it is recommended the actual outturn PR3 TSO capital expenditure is allowed as is. Additionally, it is further recommended that significantly improved project performance tracking and monitoring regime is instituted for PR4. This should place the emphasis on EirGrid to demonstrate that they have been efficient in their role as TSO, rather than the presumption of efficiency by default, the view under which the TSO has been operating through the PR3 period, up to and including this review process.

Detailed review has identified that the composition of costs incurred between the original CER PR3 allowance and the PR3 outturn, differed significantly. Review of the internal authorisation scheme papers submitted by EirGrid has identified that while the costs presented in these documents were reasonably similar to the outturn, and EirGrid appear to be spending the level of capital expenditure for Stage 1 planning activities as forecast, the project development timelines were not. It was found that nearly all of the Stage 1 costs have been delayed to be capitalised within the PR4 period, although significant expenditure was still incurred during PR3. As a result, whilst the TSO has underspent significantly when comparing outturn capitalised expenditure with the original PR3 allowance (around 40%), when comparing the latest spend forecast figures for PR3 (based on the 2015 forecast data for PR4) the TSO has spent 89% of the original allowance. However, in terms of assets delivered (by the TAO), only around 40% of the assets originally expected to be installed during PR3 have actually been commissioned, meaning the majority will now be installed during PR4. However, it does raise questions over the level of capital expenditure being committed by EirGrid for planning activities and the ability to determine outturn efficiency given that the resultant assets commissioned as a consequence of new projects are likely to fall, in the majority of cases, out with the current regulatory review period.

For Forecast Capex there are two network development scenarios described in EirGrid's Forecast Submission Document Network Requirements 2016-2020. Both scenarios have been developed utilising a factored approach which considers the project status, project type, outage availability and overall deliverability in assessing the likelihood of the project proceeding and/or completing during the PR4 period. The total forecast expenditure is €1161.2 m for scenario 1 with EirGrid expenditure €123m and ESBN €1,038.2m. This is based on predominantly overhead lines to minimise overall cost. The forecast for scenario 2 is €1389.3m based on €116.1m for EirGrid and €1273.2m for ESBN. This is based on utilising a greater proportion of underground cable sections.

The review has identified that the project capital expenditure requested by the TSO (and TAO) through PR4 can be broadly split into the following categories:

- i. Project or capital expenditure areas which are well defined, supported by detailed costs or where review has identified that the requested expenditure is in line with previous price review periods.

This includes non-network as well as non-load related capital expenditure. The requested level of PR4 non-load related expenditure for the TSO is actually lower than the outturn experience in PR3 and as such is considered reasonable.

Total TSO non-network related capital expenditure (not included in Scenario 1) is provided as €38.53m which reflects the forecast expenditure, less €0.68m, €0.5m of which is proposed to be gained through improved IS infrastructure buying power with the integration of EirGrid, SONI and SEMO systems and €0.18m provision for capital expenditure on facilities which is recommended not to be included.

- ii. Projects which are reasonably well defined, ongoing and have a high likelihood of progressing as planned and to expected costs.

Projects in this category include all Ongoing Projects, certain work activities within the New System Reinforcements (new substations, busbar uprates and substation refurbishments) as well as capital expenditure for specific generation connections (32) and other EirGrid capital expenditure included in relation to DSO activities.

In order to incentivise the TSO to continue timely and efficient project planning, an efficiency target of 7.5% on gross allowance (equivalent to 5.77% on factored allowance) is to be applied. Whilst the adoption of any such efficiency target would effectively be a notional value, the use of such an approach will at least provide a driver for the TSO to maintain an efficient spend profile through PR4, and perhaps as critically, require significantly more detailed documentation and business case analysis to be provided to substantiate outturn expenditure.

Collectively this expenditure amounts to €83.47m following the efficiency incentive target for the TSO and accounts for the bulk of the requested PR4 capital expenditure.

- iii. For project areas where there is an acknowledgement of a requirement for capital expenditure during PR4 but for which current expenditure plans are not well enough detailed at present, it is recommended that a more significant reduction in PR4 allowed expenditure be applied.

Project work included in this category includes further RD&D work during PR4. It is acknowledged that there is a requirement for such activities, and the solutions and technology options resulting from such research projects and trials can be useful in order to assess and evaluate future solution options that may bring benefits to network development efficiency, performance and reliability, as well as provide value for money to end customers. However, the existing TSO plans for PR4 are not currently well enough developed, which in conjunction with the lack of transparency over the benefits obtained from RD&D work undertaken during PR3, suggests that only a smaller allowance of €2.21m (10% of request) – note that this also is not included in Scenario 1 – is given at the outset of PR4 in order to allow progression of technology evaluations and concept assessment in advance of specific project trials.

It is however recommended that the TSO is allowed to submit applications for the funding of specific RD&D projects within the PR4 period on a case by case basis, once more clarity has developed over the specific projects / technologies to be trialled as well as the anticipated capital costs and associated benefits that are likely to be obtained. A close out report once the trial / project has been completed detailing how the TSO intends to integrate the findings / outputs from the RD&D work into their normal business practices should also be considered mandatory along with the approval of any project funding.

- iv. The final category of project expenditure are those projects that are classed as generic projects, which by definition are typically uncertain in project scope, timing and cost.

Project work in this category includes the proposed revised busbar policy, generic reactive compensation and harmonic mitigation projects, plus generic connection projects for eight generators. Whilst it is accepted that capital expenditure in relation to some or all of these generic projects may be required during PR4, the current specification and scope of these projects is limited and a minimised allowance of 10% of the forecast expenditure (equivalent to €0.61m) be provided at this time to allow works to continue.

A review of the allowance levels should be conducted once further details of the specific projects and requirements are developed and made available by the TSO within the PR4 period. It is expected that any

such PR4 allowance revision would be expected to be supported by a detailed business cases demonstrating costs, options, risks and benefits to end consumers from undertaking such project work.

In addition to the specific conclusions made relating to individual TSO and TAO capital expenditure during PR4, as part of the review process we have identified some suggested revisions to the ongoing monitoring and compliance review activities to be undertaken during PR4. This includes:

- The development of a set of expected PR4 transmission system output metrics for both TSO and TAO businesses e.g. number of projects completed, km of new / uprated transmission circuit, MVA capacity of generation plant connected, as of the start of PR4. This will be used to monitor outturn network development activities and associated capital expenditure efficiency.
- The introduction of periodic review stages within PR4 (suggested as annually) in order to monitor and evaluate TSO and TAO project and asset delivery and associated capital expenditure, against the defined output metrics. Whilst it is expected that any network development or business plan will inevitably change through a price review period, the documentation of the necessary changes in the transmission project portfolio and expenditure programme should be transparent and documented. The periodic reporting stages can be used to allow revisions to the expected PR4 output metrics for the businesses and provide documented commentary from the TSO / TAO explaining major deviations in project number, type, progress, cost and development since the last reporting stage. In addition to providing more transparency of TSO and TAO ongoing business activities, which will at least make the process of assessing PR4 outturn capital expenditure efficiency significantly easier, these periodic reporting stages will also allow the transmission businesses to present updated investment plans plus applications for funding areas not included at the outset of PR4.

For the highest capital and most complex transmission projects, typically 400 kV and regional interconnection projects, it is suggested that given the lengthy time to plan, obtain consenting and approval, design, develop and construct such projects which can span two or more price review periods, these could be removed from the base PR4 allowance for both the TSO and TAO. Such projects could be treated in a similar fashion to Strategic Wider Works projects by Ofgem in GB, allowing the transmission businesses more time to adequately refine and develop their proposed plans for such strategic projects, and seek funding on a project by project basis and subject to stakeholder review and challenge. The detailed development and documentation of such an approach or policy is beyond the scope of this work however key aspects that would need to be considered would include the definition of qualifying projects, as well as whether to apply this policy to existing projects already underway (there may be potential difficulties in tracking outturn costs for projects which have already achieved some level of capitalisation during PR3 or PR2) or only new projects expected to undergo TSO planning activities within PR4.

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to support the Client (Commission for Energy Regulation - CER) in setting the allowed revenues for the Distribution System Operator (DSO), the Transmission System Operator (TSO) and the Transmission Asset Owner (TAO) (the 'Companies') as part of the 4th Price Control Review Process in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client, the Companies and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any), the Companies and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report.

Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

The findings of this Interim Report are based on the data made available to Jacobs by the Client and the Companies prior to the agreed submission deadline.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs's Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

1. Introduction

The Commission for Energy Regulation (CER) is Ireland's independent energy regulator, responsible for overseeing the liberalisation of Ireland's Energy Sector. The CER was established and granted powers over the electricity market in 1999 (under the Electricity Regulation Act, 1999). Regulatory responsibilities in the Gas, Petroleum Exploration and Extraction and Water sectors followed in 2002, 2010 and 2013 respectively. Consequently, CER has a wide range of economic, customer protection and safety responsibilities in the energy sector of Ireland. CER's mission is to act in the interests of consumers to ensure that:

- the lights stay on,
- the gas continues to flow,
- the prices charged are fair and reasonable,
- the environment is protected, and,
- energy is supplied safely.
- CER regulates to the highest international standards

The CER's primary economic responsibilities in the electricity sector are to regulate electricity generation, the electricity networks and electricity supply activities. The overall aim of the CER is to protect the interests of electrical customers, maintain security of supply, and to promote competition in the generation and supply of electricity.

Under section 36 of the Electricity Regulation Act, 1999, and Statutory Instrument 445 of 2000 (as amended), CER approves charges for the use of the electricity distribution and transmission systems. CER is also required to examine the costs and revenues underlying such charges. As such, CER approves revenues for:

- ESB Networks as Distribution System Operator (DSO)
- ESB Networks as Transmission Asset Owner (TAO); and
- EirGrid as Transmission System Operator (TSO).

These revenues are determined every five years for the following five year period. CER has previously determined transmission and distribution revenue controls for the periods 2001 to 2005, 2006 to 2010 and 2011 to 2015 inclusive. CER issued an Invitation to Tender (ITT) requesting consultancy support to provide technical and financial advice in regard to the fourth set of transmission and distribution revenue controls to cover the next 5 year period from 2016 to 2020 (PR4).

Jacobs were appointed as technical consultants to support CER in setting the allowed revenues for the DSO, TSO and TAO businesses in PR4.

1.1 This Report

This report sets out the TSOs capital expenditure (capex) and operating expenditure (opex) over the PR3 (2011 to 2015) and PR4 (2016 to 2020) periods. The review considers the costs, systems processes, and initiatives of the TSO over PR3 and identifies key issues to be considered in PR4. The report then reviews the TSO's proposals for expenditure in PR4 and makes recommendations on the level of expenditure, outputs and incentives to be allowed by CER.

This report also presents Jacobs' benchmarking and incentives analysis relative to the TSO in addition to asset lives and depreciation.

This report is divided into 6 sections and 1 appendix. The report sections are structured as follows:

- Section 1 contains this introduction
- Section 2 contains our review of the TSO's actual and expected PR3 operating expenditure (opex) and compares this to the TSO allowances as outlined by the CER for the same period.

- Section 3 presents the TSO's proposed opex allowances for PR4. These proposed allowances are reviewed and subsequently we present the Jacobs' proposed allowed opex for the PR4 period.
- Section 4 contains our review of the TSO's actual and expected PR3 capital expenditure (capex) and compares this to the TSO allowances as outlined by the CER for the same period.
- Section 5 presents the TSO's proposed capex allowances for PR4. These proposed allowances are reviewed and subsequently we present the Jacobs' proposed allowed capex for the PR4 period.
- Section 6 provides a summary of the allowed opex and capex as discussed and presented in Sections 3 and 5.

1.2 Data Sources and Assumptions

The review has been informed by the companies' response to the questionnaire on historic operating and capital costs and associated information papers and network plans, together with further data provided by the companies at meetings and from supplementary questions raised by CER and consultants.

The review takes into account provisional outturn costs and performance for 2014 and 2105.

CER has also provided a significant amount of background information on previous price reviews and updated information.

All prices in this report are expressed as real prices at 2009 price levels, unless otherwise stated, based on the inflation factors presented in Table 1.1 below.

Table 1.1 : HICP Adjustment Factors

	2009	2010	2011	2012	2013	2014
HICP Adjustment Factor	1.000	0.984	0.996	1.015	1.020	1.024

CER allowed costs are as set out in the CER PR3 decision paper with annual adjustments made during the price control period by CER for pass through items along with volume related items included as part of the PR3 settlement.

2. Review of PR3 Operating Expenditure

In this section of the report we review the reported PR3 opex outturn of the TSO and compare this outturn against the TSO's PR3 opex allowances, as determined by CER in the CER PR3 Decision Paper¹.

The objective of CER in setting allowed operating costs is to ensure that efficiency improvements within the TSO continue to be made, to the benefit of customers. This should result in setting the company challenging but realistic and achievable targets and incentives, all the while moving closer to international best practice. The objective of this review is to assess the TSO's performance in achieving the outputs required by CER during PR3 within the CER allowed costs. The review identifies any changes in circumstances put forward by the TSO and CER to explain any variances in outputs and costs.

Our review of PR3 opex assesses:

- Historic trends in opex
- Comparison of actual opex against allowed opex

The data presented, analysed and commented on in this report is based on data provided by the TSO to the CER and Jacobs via:

- Regular workshops hosted by the CER
- The return of Questionnaires issued by the CER in July 2014
- Ongoing communications between Jacobs and the CER following the submission of the historical PR3 data at the end of October 2014.

It should be noted that 2011 to 2013 performance and cost data is based on actual recorded values, whilst 2014 and 2015 performance and cost data is based on the latest forecast data available.

CER allowed costs are as set out in the CER PR3 decision paper with annual adjustments made during the price control period by CER for pass through items along with allowed adjustments included as part of the PR3 settlement.

2.1 General

The CER decision paper CER/10/206 set out the TSO's allowed operating expenditure for each year over the period 2011-2015. At 2009 prices the total allowed was €215.3m as shown in Table 2.1 below this includes an additional €2.8m allowed in 2012 for the cost of introduction of Intraday trading. There has been a significant difference in the pass through costs incurred in comparison to the PR3 allowance; this is due to clarifications occurring during the PR3 period. These actuals are reflected in the year on year TUoS changes.

The Controllable opex costs at a headline level are 4% below allowances issued by CER. There has been an increase in the staffing costs and numbers and contractors over those expected during the setting of PR3 allowances. Staff levels chargeable to Operating costs have increased from 230 in 2011 to an expected 278 by 2015. (Capex equivalent is 51 in 2011 rising to 65 in 2015). The PR3 assumption in the determination report CER 10/206 was that staff numbers for Opex activities would rise from 221 in 2009 to 239 in 2015.

EirGrid has provided the allocation principles for roles and sections that also contribute to SONI – these allocation principles seem reasonable.

¹ CER Decision Paper CER/10/206 dated 19-11-2010.

Table 2.1 : Summary of PR3 TSO Opex Allowances

PR3 Costs (€m 2009 Prices)	CER PR3 Allowed	TSO PR3 Outturn	Variance	%
Controllable costs				
Staff and related costs	118.6	134.7	16.1	14%
Contractors	6.0	6.8	0.8	14%
Telecommunications	19.2	19.4	0.1	1%
Premises	22.7	21.4	-1.3	-6%
IT Costs	12.0	11.8	-0.2	-2%
Insurance and compensation	1.4	1.4	0.1	7%
Selling and Advertising	1.7	0.7	-1.0	-60%
Maintenance and professional services	26.1	17.7	-8.4	-32%
Promotion of Research	2.0	2.0	-0.0	-2%
Other	5.7	4.6	-1.1	-19%
Recharges	-	-12.7	-12.7	-
Total Controllable costs (excl Depn)	215.3	207.7	-7.6	-4%
Non Controllable costs				
CER Levy	4.8	4.7	-0.1	-2%
DUoS costs	2.0	4.3	2.3	113%
Interconnector costs	3.0	-	-3.0	-100%
Inter TSO Compensation	5.6	4.8	-0.8	-14%
Ancillary services	244.2	224.3	-19.9	-8%
TAO Payment	0.0	856.8	856.8	-
PSO	0.0	893.5	893.5	-
Stage 1 working Capital	15.2	-	-15.2	-100%
EWIC	162.5	-	-162.5	-100%
Total Non Controllable costs	437.3	1,988.3	1,551.1	355%
Total Allowance	652.6	2,196.0	1,543.4	237%

2.2 Resources

The company structure has developed since 2010. Table 2.2 below is provided by the TSO and identifies the sections and associated FTE's.

Table 2.2 : EirGrid FTEs by Directorate

Business Directorate	opex	capex	2010 total	opex	capex	2013 total	opex	capex	2014 total	opex	capex	2015 total
Chief Executive	2		2	2		2	2		2	2		2
Legal	5		5	8		8	8		8	8		8
Audit and Compliance	2		2	2		2	1		1	2		2
Grid Development & Commercial	61	47	108									
Grid Development				15	42	57	15	42	57	16	49	65
Operations	74		74	59	7	66	63		63	66		66
Finance and Purchasing	25		25	27		27	31		31	31		31
HR & Corporate services	12		12									
HR in Facilities				7		7						
HR							9		9	9		9
Information Services	38	2	40	52	2	54	53	2	55	55	2	57
Corporate Planning	1		1									
Corporate Affairs & Planning				66		66						
Graduates	9		9	4		4	5		5	7		7
European Affairs				5		5	3		3	3		3
ISEM											14	14
Future Grids							57		57	61		61
Public affairs							6		6	9		9
SEMO/ SONI							9		9	9		9
Total	229	49	278	247	51	298	262	44	306	278	65	343

In order to identify how the new categories equate to the organisational changes, EirGrid have provided organisation charts for 2009, 2010 and 2014, which are provided below in Figure 2.1, Figure 2.2 and Figure 2.3. We note a significant difference to the 2009 organisation chart provided as part of the PR3 submission.

Figure 2.1 : 2009 Organisational Structure - submitted for the PR3 price control

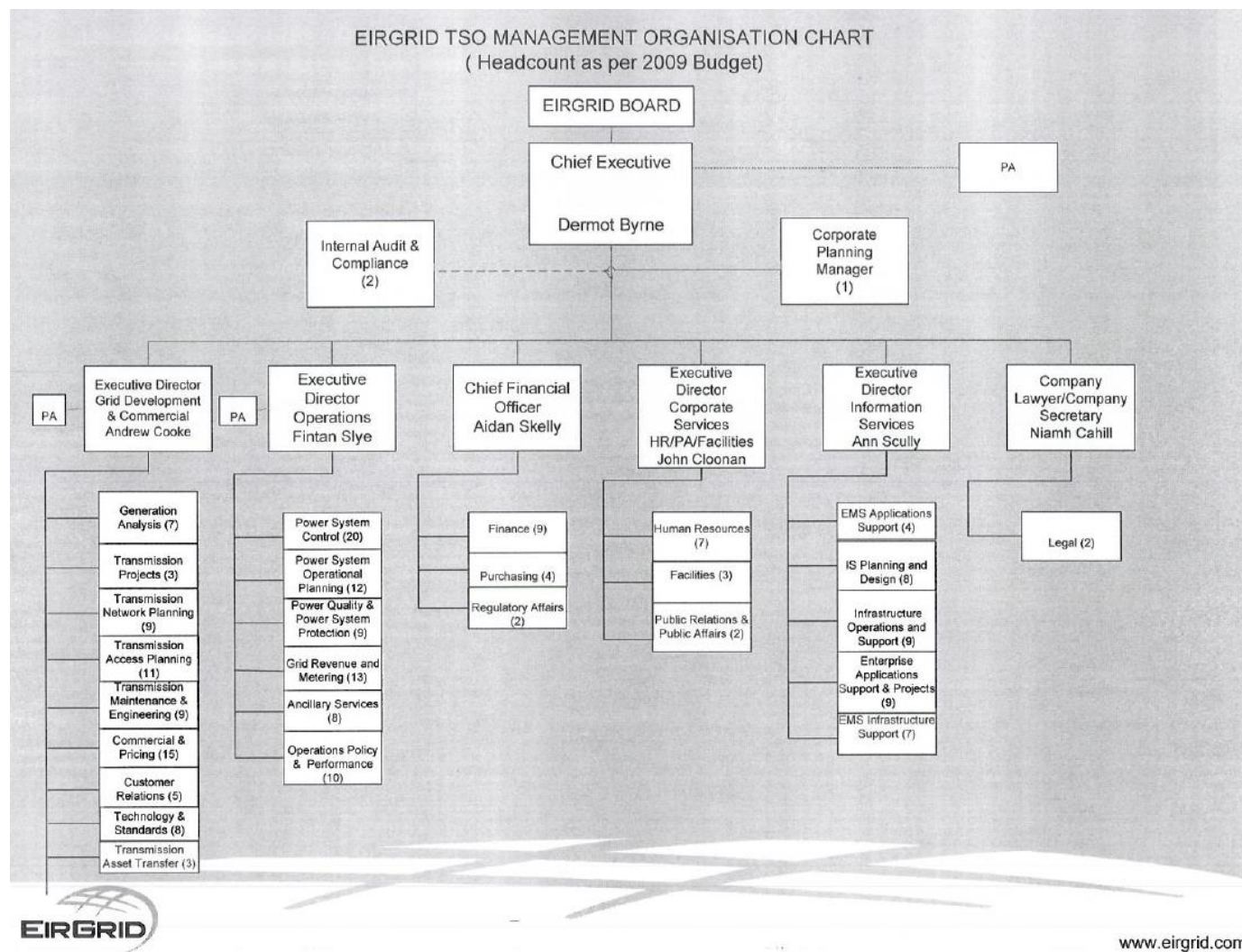


Figure 2.2 : 2010 Organisation Structure - submitted as part of PR4 submission

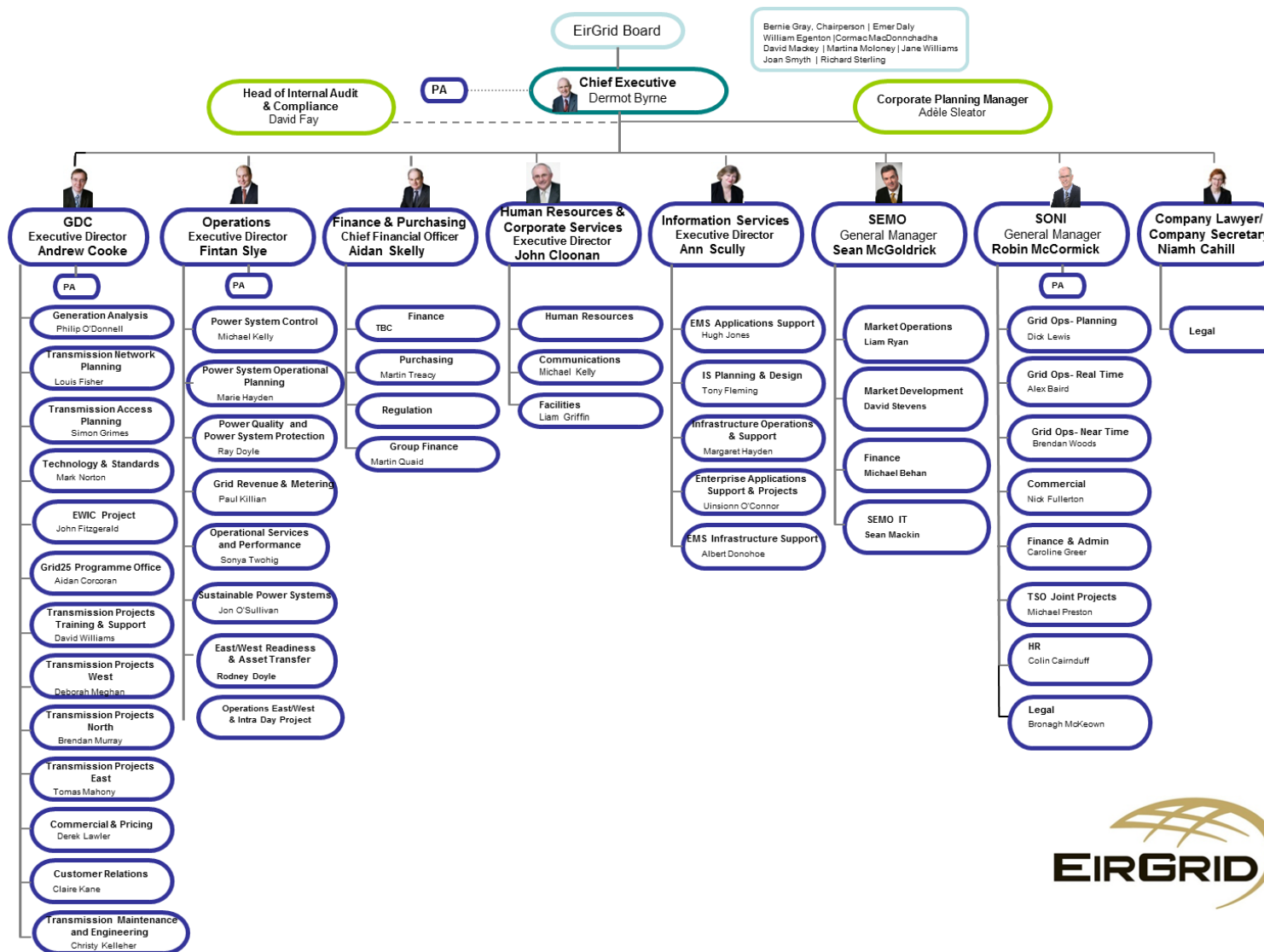
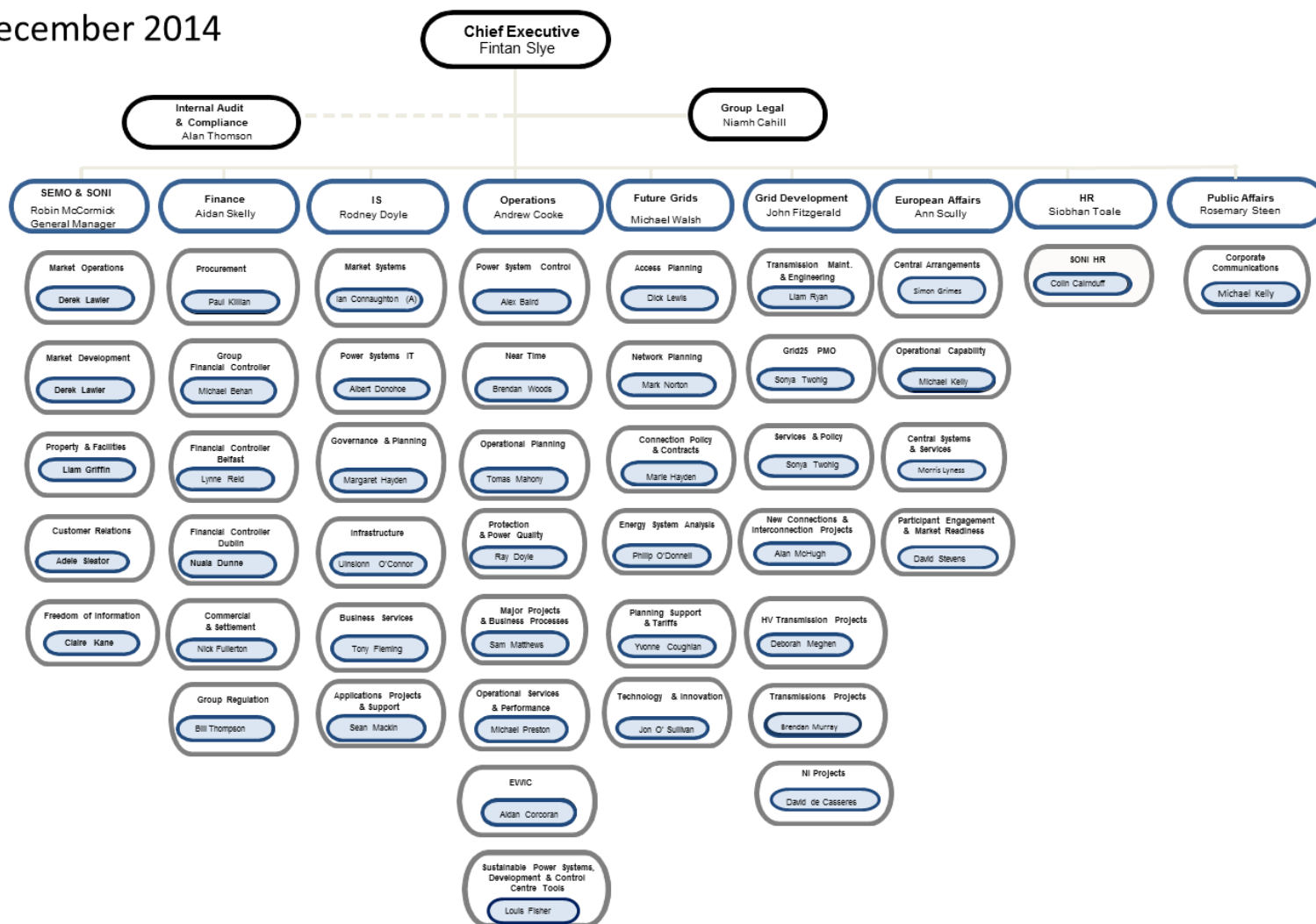


Figure 2.3 : 2014 Organisation Structure

Organisation Structure Effective December 2014



When considering Table 2.2, it is important to note some of the significant changes. The Grid Development and Commercial section in 2010 was split into Grid Development and Corporate Affairs / Planning, which was renamed Future Grids in 2014.

Where the charges are to be apportioned across different business units, the TSO have provided details of the mechanisms used for cross charging purposes. The approaches taken differ in methodology across departments, such as fixed, volume-related, headcount, activity levels etc. These charges are based upon a budgeted charge, with a correction at year end for material changes. All the cross charges seem to be appropriate methods to get the right level of costs to the respective business units.

We are informed that where costs are allocated to capex and the project does not eventually lead to a capital asset being installed, then those costs are transferred back to opex. There is no separate cost line evident for such costs which would contribute to bottom line operating costs against their allowance. EirGrid inform us that these abortive capex costs are minimal in nature.

The TSO has identified a number of activities that they are currently undertaking which they consider were not included at the time of the PR3 settlement. These activities are provided in Table 2.3 below.

Table 2.3 : TSO PR3 Additional Activities

Activity	Additional costs (€m)
DS3 programme	3.0
Innovation and Strategy	1.9
TSO Certification	1.6
Total	6.5

There are other areas of growth which the TSO has identified but do not directly relate to the Operating cost performance in PR3. These activities are provided below in Table 2.4.

Table 2.4 : Additional TSO claimed costs in PR3

Activity	Additional costs (€m)
Interconnector related projects	4.2 – East West readiness – capital 0.3m (Ireland-France investigative works) opex (funded separately to the allowed revenue mechanism)
Planning Consents	Not recorded – Increased stage 1 costs

These activities have been carried out by the TSO. Other than the Ireland-France Interconnector works there does not appear to be any approval for these activities from the CER over and above the PR3 allowances, as such we have taken the view that the TSO has been able to absorb these activities within the allowances that were granted in CER decision paper 10/206.

In terms of resources, in recent discussions with the TSO, they state that they have an holistic approach to resourcing by developing a mix of fixed term recruitment, use of contractors and specialist recruitment where appropriate; thus reducing the professional fees and contractors and increasing the manpower cost but giving an overall cost reduction to the company. However we note that as the staff numbers are significantly above those expected in the allowance and consequently the Staff cost increase (€16.1m) is above the Professional services reduction of (€8.4m), although once the additional recharges are taken into account the staff costs are broadly in line with PR3 allowances.

Table 2.5 provides a summary of employee costs between 2011 and 2015. This data is taken from the submissions from the TSO² as part of the review process. It is assumed that these costs and FTE's are post any allocations to SONI³. It is unclear as to the rationale for an increase in staff of 39 above the expected number of 239 as part of the PR3 settlement. The cost per employee increased slightly from 2011 to 2013 but is forecast to fall in 2014 and 2015. The TSO have indicated that this is due to new recruits being on a lower salary than more experienced staff - this would be expected. The TSO have also implemented a number of initiatives to minimise the financial impact of this increased headcount, such as no cost of living pay rises during periods of positive growth in the macro economic climate, limited time contracts, and performance based rewards. Notwithstanding this, it is noted that the TSO allowances set in 2010 were made prior to the implementation of the more severe aspects of austerity associated with Ireland's recent economic recession (2011 – 2013) and as such the TSO would have been insulated from some of these impacts.

Table 2.5 : Employee Costs

Opex (2009) prices	2011	2012	2013	2014	2015
Payroll €m	23.9	26.1	27.4	26.1	27.1
Headcount	230	248	260	272	278
Cost per FTE €k	104	105	105	96	97

The company have paid consistent high performance related incentives for the 2011-2013 and are forecasting similar performance for 2014-2015. Whilst this is within contracted levels, and at an individual level the maximum performance related pay (PRP) levels are 12-15% which is not unreasonable in itself. However we would expect that if strong incentives/ targets are in place then across the company the average payout would be much less, with some achieving their targets and others failing. Hence a lower level would be paid out at a corporate level. Table 2.6 shows the actual rates of performance-related payments at different grade levels. We have been informed in recent discussions that changes are taking place to the level of PRP payments – but this is not reflected in the forecast expenditure submitted by the TSO. Indeed Jacobs are concerned about the level of transparency which was provided on this issue given a number of requests for access to full details of the performance management system documentation, and the lack of details provided as to the actual key metrics and performance targets.

Table 2.6 : Performance related pay payments

Grade	2011	2012	2013	2014	2015
Executive Director	11.7%	13.6%	0.5%	8.0%	10.2%
Graduate/ support	10.8%	11.6%	12.7%	9.9%	12.6%
Manager	14.7%	15.4%	14.0%	11.6%	14.1%
Professional	13.8%	14.0%	13.8%	10.8%	13.2%
Total	13.8%	14.1%	12.9%	10.7%	13.1%

The TSO have indicated that these payments are achieved on the basis of such items as financial performance, operational performance of the transmissions systems, evaluation of stakeholder engagements and progress on major projects. However little evidence has been provided as to the detailed targets associated with these bonuses, despite requests for clarification. We would have expected a significantly lower overall payment, especially given the economic challenges over the PR3 period, levels in the region of 6%-7% across the company would seem to be more appropriate. From the information received we would consider that €6m-€7m has been paid in excess of what we would consider efficient and effective, as there has been no indication of cost reduction or increased performance details following requests on the actual metrics involved in setting and achievement of performance targets.

² 0159 – Paper 3- PR3 overview and lookback

³ In workshop meetings with the TSO, they stated that the forecast of 30 additional staff from 2012 would only in effect be 17 additional FTEs allocated to the TSO. This would give an average cost of €102k which is only slightly lower than earlier costs however no documentation was provided to support this.

The salary levels within the company have been evaluated within a report from Towers Watson benchmarking the salaries against a range of businesses including financial services and high technology sectors. Our view is that this is not necessarily a representative comparison and generally salaries in utilities are lower than those sectors due to the perceived reduced risk and increased job security involved in the utility industry. Therefore a direct comparison with Utilities would reflect lower salaries than shown. A comparison to the professional public service might be more reflective of the business in general and also take account of the security of employment enjoyed in this sector and the reduced commercial pressure. This is also reflected in the lower staff turnover which the TSO identified as around 2%⁴ during our discussions.

The TSO have claimed in discussions that the PRP is a constituent element of a package designed to attract and retain quality staff, which is a challenge for them. However having seen significant growth in staff numbers and combined with the TSO low staff turnover, we would conclude that the total remuneration package is attractive to the market. We have not seen the mapping that has been used by Towers Watson and how the comparisons have been made across grades of employees. It should also be noted that the bands quoted by TW are $\pm 20\%$ therefore there is a large degree of uncertainty in this bandwidth, and it is difficult to say definitively that the rates being utilised by the TSO are in line with the market place.

2.3 Other Costs

The telecoms costs within the TSO business have increased during the period; the main causes of this are increased functionality and services as well as a 1.2% year on year price increase. In 2013 the increase in services was due to an additional charge for 2012 of €170k along with additional costs for SCADA and bandwidth associated with an expanding network of €350k, also additional costs associated with the E-W interconnector €225k. The 2015 increase is due to additional services to cater for the additional costs associated with the EMS integration project (Black Start Link) of approximately €210k p.a. These costs seem reasonable for the provision of these services based on historic performance. There are also additional SCADA, bandwidth and Energy Maintenance costs of €390k. There are increased costs associated with increased bandwidth in both 2013 and 2015, to avoid excess unused bandwidth prior to need, this seems reasonable.

The TSO has benefitted slightly from reduced premises costs due to market prices falling. In 2007 the company signed a 25 year lease for the Oval premises in Dublin, with a 5 year review of rates, the last one was in 2012 and there is one break clause in the contract after 15 year. The premises have been heavily modified to accommodate the National Control Centre.

2.4 SONI Integration

The SONI integration has provided a significant impact within a number of areas. The TSO has provided a detailed paper on the expected benefits from the integration into EirGrid. The main elements of the overall benefits are:

- CITI Project

The Corporate IT Integration project (CITI) will reduce the complexity of the corporate IT infrastructure and the overall costs of maintaining it due to standardisation and optimisation. Therefore there is an overall saving of €527K over a 5 year life time. This benefit will continue following obsolescence and the further upgrade to new systems as the Group will now be procuring one back-up, Sharepoint, etc. instead of 3. Therefore the benefit is extended out to the lifespan of the NPV analysis.

- Licences

Cost savings will be achieved through the procurement of licences on a group-wide basis. SONI and EirGrid had separate “Converge” and “MV90” licences respectively. When these licences expire (2015), one overall package will be procured leading to cost savings in the order of c. €30k.

⁴ Cited in workshop on 12/03/15

Significant cost savings arise from the Oracle Universal Licence Agreement for the Group Data Integration Project. All savings cannot be attributed to Group Integration therefore a benefit of c. €1.5m was attributed to Group Integration over 4 years.

- Insurance

An estimated 10% saving on SONI insurance due to it now being part of a larger contract is included, this is captured in the recharge mechanism.

- Financing costs for constraints facilities

Estimated saving at 3 yrs on arrangement fees (zero saving on legal fees) plus estimated annual saving on commitment fees on financing costs for constraints facilities.

- Resources

A number of resource efficiencies were identified across the business (HR (efficiency in HR team delivered in 2013), Future Grids (c. 4 efficiencies due to a reduction of 4 teams to 3 in planning, Consolidation of Capacity statement, Tariffing, full utilisation of resources etc), Finance (Axapta efficiencies both in Finance and across the Group) and SEMO.

Resources/Payroll account for a significant percentage of the overall costs of the business and therefore offer considerable savings for the Group as the benefit of resource efficiencies are seen on an annual basis rather than once-off. These resources may be deployed elsewhere in new opportunities/initiatives across the business.

European Network Codes, ENTSO-E, etc: Efficiencies garnered from operating on a group-wide basis (would be significantly more costly if operated on a separate TSO basis). Commitment to Europe for 2013 based on ENTSO-E, NSCOGI teams etc, is significant. A single European Affairs team has been established with an estimated reduction in requirements of c. 4FTEs.

- Miscellaneous

Procurement on a group-wide basis provides EirGrid Group with increased strength in the market. Therefore, savings on hardware (e.g. Laptops, PCs), mobile phone contracts, energy and facilities are anticipated. The consolidation of Grid Code administration in OSP negates the need for additional spend on external legal costs.

- EMS

The EMS platforms are upgraded every five years to replace obsolescent hardware. EirGrid and SONI had intended to independently upgrade their respective EMS platforms in 2014. The cost involved was estimated at €6m. However a joint approach is being adopted which will also achieve all-island integration, functional enhancements and organisational benefits (see benefits analysis – IT and Operations section).

EMS benefits are not realised until the deployment of the EMS system in 2015. The integrated EMS can be managed more efficiently by consolidating the two existing EMS support groups, reducing software licence costs and optimising the hardware infrastructure, resulting in a saving in the region of €150k per annum. Duties can be assigned more efficiently between the control centres at The Oval and Castlereagh House, facilitating the re-deployment of dispatch balancing engineers which will result in a saving in the region of €450k per annum.

- Travel

An initial overall Travel cost of €150,000 per annum is assumed. This figure reduces to €75,000 per annum after 3 years as relationships develop and “business as usual” is adopted and the uptake of new technologies increases (e.g. video-conferencing etc) which reduces the need for travel.

The TSO expectation is that minimum savings in the order of €4.4m can be achieved with an additional €1m in PR3 also identified in a resource saving scenario. As the integration took place during PR3 these saving cover only part of the period. For a full price control period this amounts to €11.3m. It is reasonable to allow that 25%

of these savings would be passed to SONI as their share of the benefit⁵. This gives a TSO full period saving of €8.5m which, based on TSO controllable cost of €213m is a 4% saving. We note that the savings include staff reductions of 22 staff, which when apportioned to the TSO would be 17 staff, a saving of 6% on current staff levels. These numbers would be within the corporate function and not be netted off in the TSO headcount. We consider these conservative and would have expected EirGrid to identify and realise more than minimum savings, in the longer term. To put this in context, whilst not being an absolute comparator vis a vie Transmission v Distribution. As part of the 2013 RIIO business Plan submitted to OFGEM, WPD reported that they had reduced the Operating costs of Central Networks by 20% as a result of the merger of the Central networks businesses into the WPD group within 12 to 18 months. These companies had already been identified as operating efficiently by the regulator in previous price controls, yet the merger still provided additional efficiencies. This was the basis for the ongoing allowance for the WPD group.

The TSO have identified a number of business wide approaches to the reduction of operation costs, these have included such items as a holistic approach to recruitment and skill acquisition, utilisation of third party purchasing power and running the ITC model and constraints studies. The WPDRS activity was ceased at CER instruction as it no longer added value.

⁵ This share is in line with the respective sizes of the organisation and several allocations used within the business.

2.5 Report Findings

The updated TSO allowance was €215.3m; EirGrid are forecasting to spend €207.7m (2009 prices) during the PR3 period. TSO are indicating efficiencies from the integration of SONI of €4.4m with an additional €1m possible. We consider that these are conservative and further efficiencies should be encouraged during PR4 given the synergies in operation, over and above any included in the PR4 submission.

We recognise that the TSO has reduced costs in some areas, however the increase in staff cost over the allowance exceed the savings. The TSO state that they have an holistic approach to resourcing by developing a mix of fixed term recruitment, use of contractors and specialist recruitment where appropriate; thus reducing the professional fees and contractors and increasing the manpower cost but giving an overall cost reduction to the company. However we note that as the staff numbers are significantly above those expected in the allowance and consequently the Staff cost increase (€16.1m) is well above the Professional services reduction of (€8.4m), with the increases in Recharges also taken into account the resource costs are broadly in line with allowances.

Also the approach taken on payment of performance related pay appears to generate consistently high rates year on year across all levels, and although based on performance targets opex cost reductions do not seem to feature significantly. We would expect that targets should be set which are challenging and include operating cost reductions which would make increases over a base level self-financing. We consider that €6m-€7m has been paid in excess of what we would consider efficient and effective, without a corresponding demonstration of managed operating cost reductions or increases in performance elsewhere.

3. Review of PR4 Operating Expenditure

The objective of the CER in setting allowed opex is to ensure that efficiency improvements within the TSO can be made, to the benefit of customers. This should result in setting the companies challenging but realistic and achievable targets and incentives. In this section of the report we review the TSO's proposed opex for the PR4 period and advise on any adjustments that we believe are necessary in order to allow the CER to determine the appropriate opex allowances for the period 2016 to 2020 for an efficient company operating in Ireland.

The data presented, analysed and commented on in this report is based on data provided by the TSO to the CER and Jacobs via:

- The return of Questionnaires issued by the CER in July 2014 and associated information papers and network plans
- Ongoing communications with Jacobs and the CER following the submission of the forecast PR4 data in November 2014.
- Background information from CER on previous price reviews

3.1 General

The TSO have requested in their submissions an increase from €213.8m to €268.2m (€54.4m equivalent to 25%) in their regulated operating cost base compared to the PR3 forecast spend (at 2014 prices)⁶. The main areas of requested increase are, Staff and related costs (€21.0m), Telecoms (€10.8m) and Research (€18.9m) offset by an increase in recharges of €10.6m as shown in the TSO have identified areas of cost increases that they consider are outside the HICP inflation calculations and will impact on their cost base going forward. To support this they have commissioned KPMG to provide an independent report. Our views on this report are as follows.

'The assumption underlying KPMG's forecasts is that macroeconomic forecasts from major institutions are forecasting GDP growth rates in Ireland of c. 3.0% p.a. between 2016 and 2020, with more optimistic forecasts considerably above those levels. This growth will impact productivity and real prices.

KPMG also reviewed the expected evolution of real wages in the relevant labour markets and concluded that increases in real wages of 1.2% p.a. would be expected in addition to non-labour input prices increasing by 0.6%. Based on a 50/50 ratio this would result in an aggregate real price effect of 0.9%. As a result KPMG have concluded that the nominal total cost effect is 2.1%, or the real total cost effect as HICP + 0.6%. These have been reflected in the forecast internal operational costs in the EirGrid questionnaire submission.

However the potential for costs to increase can be countered by the potential to deliver productivity benefits which a company like EirGrid could be expected to achieve. KPMG concluded that a productivity factor of 0.3% was an appropriate assessment for same selecting the higher end of regulatory precedent in the context of higher general services expectations and much lower outputs of calculations based on EU KLEMS data.'

Our view is that the assumptions within this report are very subjective, and any challenge would eliminate any positive effect of the Real Price Effect. The two areas we are concerned with are;

- A productivity increase in the region of 0.3% by EirGrid staff seems remarkably low given the discussion we have had on high performance outputs and performance related pay during PR3.
- The real increase in wages assumed by KPMG we believe was based on a recovery period following historical falls in salaries in many areas of the economy and in the public sector. Given that EirGrid staff were protected from the decreases then attaching a linkage to the recovery for businesses where there have been reductions seems again unrealistic. Given the low turnover and ability to fill positions over the PR3 period and forecast increases in PR4, we would not see this as a business which has to pay over the inflation rate to attract or keep staff. (One other view would be that this increase above the inflation rate

⁶ The PR3 outturn is different from that reported in Section 2 of this report due to a change in price base from 2009 to 2014.

over the next 5 years was a recovery of the income during the wage freeze period, in effect based on this forecast they would recover more than lost during the pay freeze, since inflation was low. Receiving 1.2% per annum above inflation for the next 5 years would appear to be allowing them over the rate of inflation over the combined PR3/4 period).

This report and the outcome from the Towers Watson benchmarking report discussed in section 2.2 have been used to inform our view on the level of costs going forward in PR4 for an efficient and effective company.

Table 3.1. The 'pass through costs' are forecast to increase from €2053.1m to €2307.4m in PR4, an increase of €254.3m or 12%. These costs are included in the TUoS tariff on an as incurred basis and so these have been allowed in their entirety as any changes will automatically be included in the annual TUoS calculations.

The TSO have identified areas of cost increases that they consider are outside the HICP inflation calculations and will impact on their cost base going forward. To support this they have commissioned KPMG to provide an independent report⁷. Our views on this report are as follows.

'The assumption underlying KPMG's forecasts is that macroeconomic forecasts from major institutions are forecasting GDP growth rates in Ireland of c. 3.0% p.a. between 2016 and 2020, with more optimistic forecasts considerably above those levels. This growth will impact productivity and real prices.

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However the potential for costs to increase can be countered by the potential to deliver productivity benefits which a company like EirGrid could be expected to achieve. KPMG concluded that a productivity factor of 0.3% was an appropriate assessment for same selecting the higher end of regulatory precedent in the context of higher general services expectations and much lower outputs of calculations based on EU KLEMS data.'

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- The real increase in wages assumed by KPMG we believe was based on a recovery period following historical falls in salaries in many areas of the economy and in the public sector. Given that EirGrid staff were protected from the decreases then attaching a linkage to the recovery for businesses where there have been reductions seems again unrealistic. Given the low turnover and ability to fill positions over the PR3 period and forecast increases in PR4, we would not see this as a business which has to pay over the inflation rate to attract or keep staff. (One other view would be that this increase above the inflation rate over the next 5 years was a recovery of the income during the wage freeze period, in effect based on this forecast they would recover more than lost during the pay freeze, since inflation was low. Receiving 1.2% per annum above inflation for the next 5 years would appear to be allowing them over the rate of inflation over the combined PR3/4 period).

This report and the outcome from the Towers Watson benchmarking report discussed in section 2.2 have been used to inform our view on the level of costs going forward in PR4 for an efficient and effective company.

⁷ Paper 7 forecast submission KPMG system trends lot 2

Table 3.1 : TSO PR4 forecast operating costs by driver

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
Staff costs	130.3	26.8	29.2	29.8	30.1	30.3	30.3	149.6	19.3	15%
Staff related costs	8.3	1.8	2.0	2.0	2.0	2.0	2.0	10.0	1.7	20%
Contractors	6.9	1.4	2.0	2.0	2.0	2.0	2.0	10.0	3.0	44%
Telecoms	19.9	4.2	5.4	6.1	6.3	6.3	6.5	30.7	10.8	54%
Premises	22.1	4.5	4.6	4.8	5.1	5.1	5.2	24.7	2.6	12%
IT Costs	12.1	2.5	3.0	3.2	3.5	3.6	3.7	17.0	4.9	40%
Insurance and Compensation	1.5	0.2	0.3	0.3	0.3	0.3	0.3	1.5	0.0	0%
Selling and Advertising	0.7	0.2	0.2	0.2	0.2	0.2	0.2	1.2	0.5	65%
Professional Services	13.1	2.2	3.4	3.5	3.3	3.0	3.1	16.3	3.2	25%
Grid Maintenance	5.1	1.0	1.1	1.1	1.1	1.1	1.1	5.6	0.5	9%
Corporate recharges	-13.0	-2.1	-4.7	-4.7	-4.7	-4.8	-4.8	-23.6	-10.6	81%
Provisions	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-100%
Other	2.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	-100%
Research, Development & Dem	0.0	0.0	1.5	2.0	4.1	5.6	5.7	18.9	18.9	-
Operating Costs (excl Depn)	213.8	43.5	49.3	51.6	54.5	56.1	56.6	268.2	54.3	25%
Pass through Costs										
Inter TSO Compensation	5.0	0.4	1.3	1.3	1.3	1.3	1.3	6.5	1.5	31%
TAO Payment	881.5	170.0	202.4	202.4	202.4	202.4	202.4	1011.8	130.3	15%
CORES0 subscription	0.0	0.0	0.0	1.0	1.0	1.0	1.0	4.0	4.0	-
Interconnector services	0.0	0.0	1.0	1.0	1.0	1.0	1.0	5.1	5.1	-
CER Levy	4.8	1.0	1.0	1.0	1.0	1.0	1.0	5.0	0.2	4%
Ongoing service charge	7.2	1.5	1.3	1.3	1.3	1.3	1.3	6.5	-0.7	-10%
DUoS costs	4.4	0.7	1.3	1.3	1.3	1.3	1.3	6.5	2.1	48%
Ancillary Services	230.8	51.7	49.2	49.2	49.2	49.2	49.2	246.1	15.3	7%
PSO	919.5	140.2	203.2	203.2	203.2	203.2	203.2	1015.9	96.4	10%
Total Pass through costs	2053.1	365.6	460.7	461.7	461.7	461.7	461.7	2307.4	254.3	12%
Total TUoS Cost (excl Depn)	2266.9	409.1	510.0	513.2	516.2	517.8	518.3	2575.5	308.6	14%

We have reviewed the information provided by the TSO in terms of the questionnaire and narrative documents supporting the PR4 submission, along with evidence gathered during workshops. We have assessed each of the sections and propose the TSO proposed operating cost allowances are reduced by €50.7m to €217.4m; this is an increase of 2% over expenditure in PR3. The Jacobs proposed TSO PR4 opex changes are detailed below in Table 3.2 and Table 3.3.

Table 3.2 : Jacobs Proposed TSO Operating Costs changes

TSO Proposed Operating Costs											Jacobs Proposed		
Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %	PR4 Changes	PR4 Allowance	Variance to PR3
Staff costs	130.3	26.8	29.2	29.8	30.1	30.3	30.3	149.6	19.3	15%	-19.7	129.9	0%
Staff related costs	8.3	1.8	2.0	2.0	2.0	2.0	2.0	10.0	1.7	20%	0.0	10.0	20%
Contractors	6.9	1.4	2.0	2.0	2.0	2.0	2.0	10.0	3.0	44%	-2.0	8.0	15%
Telecoms	19.9	4.2	5.4	6.1	6.3	6.3	6.5	30.7	10.8	54%	-5.6	25.1	26%
Premises	22.1	4.5	4.6	4.8	5.1	5.1	5.2	24.7	2.6	12%	-1.0	23.7	7%
IT Costs	12.1	2.5	3.0	3.2	3.5	3.6	3.7	17.0	4.9	40%	-2.5	14.5	20%
Insurance and Compensation	1.5	0.2	0.3	0.3	0.3	0.3	0.3	1.5	0.0	0%	-0.5	1.0	-34%
Selling and Advertising	0.7	0.2	0.2	0.2	0.2	0.2	0.2	1.2	0.5	65%	-0.7	0.5	-28%
Professional Services	13.1	2.2	3.4	3.5	3.3	3.0	3.1	16.3	3.2	25%	-1.8	14.5	11%
Grid Maintenance	5.1	1.0	1.1	1.1	1.1	1.1	1.1	5.6	0.5	9%	-0.6	5.0	-2%
Corporate recharges	-13.0	-2.1	-4.7	-4.7	-4.7	-4.8	-4.8	-23.6	-10.6	81%	5.0	-18.6	43%
Provisions	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-100%	0.0	0.0	-100%
Rates	2.4	0.5	0.6	0.6	0.6	0.6	0.6	2.9	0.5	21%	0.0	2.9	21%
Other	2.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	-100%	0.0	0.0	-100%
Promotion of research	2.0	0.2	0.7	0.7	0.7	0.7	0.7	3.5	1.4	70%	-2.5	1.0	-53%
R&D	0.0	0.0	1.5	2.0	4.1	5.6	5.7	18.9	18.9	-	-18.9	0.0	-
Operating Costs (excl Depn)	213.8	43.5	49.3	51.6	54.5	56.1	56.6	268.2	54.3	25%	-50.7	217.4	2%
Jacobs proposed changes			-6.8	-8.9	-11.1	-12.1	-11.8	-50.7	-50.7				
Jacobs proposed Operating Cost allowance	213.8	43.5	42.5	42.6	43.4	44.1	44.8	217.4	3.6	2%			

The table below provides an annual view of the detailed allowances proposed by Jacobs for the TSO operating costs, based on the information received and the discussions held with the TSO.

Table 3.3 : Jacobs Proposed TSO Operating Costs

Jacobs Proposed Operating Costs										
Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
Staff and related costs allowance	138.6	28.7	28.0	28.0	28.0	28.0	28.0	139.9	1.3	1%
Contractors allowance	6.9	1.4	1.6	1.6	1.6	1.6	1.6	8.0	1.0	15%
Telecoms allowance	19.9	4.2	4.3	4.3	4.9	5.4	6.1	25.1	5.2	26%
Premises allowance	22.1	4.5	4.6	4.8	4.8	4.8	4.8	23.7	1.6	7%
IT allowance	12.1	2.5	2.7	2.7	2.9	3.0	3.2	14.5	2.4	20%
Insurance and Compensation allowance	1.5	0.2	0.2	0.2	0.2	0.2	0.2	1.0	-0.5	-34%
Selling and Advertising allowance	0.7	0.2	0.1	0.1	0.1	0.1	0.1	0.5	-0.2	-28%
Professional services allowance	13.1	2.2	2.9	2.9	2.9	2.9	2.9	14.5	1.4	11%
Grid Maintenance allowance	5.1	1.0	1.0	1.0	1.0	1.0	1.0	5.0	-0.1	-2%
Corporate recharges	-13.0	-2.1	-3.7	-3.7	-3.7	-3.8	-3.8	-18.6	-5.6	43%
Provisions allowance	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-100%
Rates allowance	2.4	0.5	0.6	0.6	0.6	0.6	0.6	2.9	0.5	21%
changes			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other allowance	2.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	-100%
Promotion of Research allowance	2.0	0.2	0.2	0.2	0.2	0.2	0.2	1.0	-1.1	-53%
Jacobs proposed Operating Cost allowance	213.8	43.5	42.5	42.6	43.4	44.1	44.8	217.4	3.6	2%

The rationale behind the TSOs proposed allowances and our adjustments to those proposals is provided within each sub-section below.

3.2 Staff and Staff Related Costs

TSO requested €159.6m, recommended changes €-19.7m, Recommended allowance € 139.9m

Table 3.4 presents a year on year comparison between the TSO's proposed opex allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.4 : Staff Costs PR4 Proposed Allowance

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Staff costs	130.3	26.8	29.2	29.8	30.1	30.3	30.3	149.6	19.3	15%
TSO proposed Staff related costs	8.3	1.8	2.0	2.0	2.0	2.0	2.0	10.0	1.7	20%
Jacobs proposed changes			-3.2	-3.8	-4.1	-4.3	-4.3	-19.7	-19.7	
Jacobs proposed Staff and related costs allowance	138.6	28.7	28.0	28.0	28.0	28.0	28.0	139.9	1.3	1%

The TSO has proposed an allowance of €149.6m over the PR4 period with additional €10m staff related costs compared to an outturn of €138.6m in PR3.

Table 3.5 presents the TSO headcount from 2011 to 2020. The TSO has indicated a slight rise in PR4 staff numbers from 293 in 2016 to 299/300 for the rest of the period. However this is a step change from the 272 in 2014 and 278 in 2015. We have some concerns over the rising headcount in the business given that there has been integration with SONI and the TSO indicates that they are continuing to look for efficiencies⁸.

Table 3.5 : Staff Number Profile

Opex (2014 Prices)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Payroll (€m)	25.5	27.4	28.7	28.0	29.1	31.2	31.8	32.0	32.3	32.3
Headcount	230	248	260	272	278	293	300	299	300	299
Cost per FTE (€k)	111	110	110	103	105	106	106	107	108	108

The TSO have identified an average of 17 additional staff over the period for Operations, who currently have an establishment of 63 as at December 2014⁹. This would mean an increase of 27% over the current level due to growth in four areas during PR4. These four areas are:

- Implementation of ISEM
 - The TSO have identified two roles associated with the implementation of I-SEM. A strategy engineer and a balancing engineer. The TSO have also identified that this activity will have a six year implementation period. We note that EirGrid has made a separate submission to the SEM Committee associated with its proposed costs for the I-SEM programme, which is treated outside the remit of this report and so these costs have been excluded from our view of the allowances.
- European Network Code compliance
 - The TSO have indicated that implementation of the European Network codes will require significant changes to current processes given increased legal obligations and ensure ongoing legal compliance. The company have carried out an impact analysis of these process changes.
- Facilitation of renewables
 - In their PR4 submission documentation the TSO highlights a report 'Ensuring a secure, reliable and efficient power system'. This report provides a view of the expected progress that will be made with

⁸ Stated in the workshop on 12-3-15

⁹ TSO.005 HOP Query Response

regard to the integration of renewable energy into the network. At the time, it was expected that all the actions proposed would be delivered within the timescales of PR3 (2011-2013); however for various reasons (some within control of EirGrid and some outside), this has not occurred. Notwithstanding this, EirGrid had a significant number of dedicated resources working on DS3/ facilitation of RES related activities during the PR3 period and expanded these numbers as PR3 progressed.

- Grid 25 and new connections
 - In terms of Grid 25 and new connections, the company has identified that additional resources are required to manage the increased workload as a result of the volume of outages. There are also increased resource requirements due to the expected number of generators wishing to connect to the system before the REFIT scheme closes, in terms of compliance testing, operational certification etc.
 - In the submission, the TSO have also identified additional staff requirements within Information Services of 6 FTEs to address issues such as compliance and cyber security threats as well as Applications support and with 2 staff being utilised for a 2 year period for EMIP parallel running.

We understand that the additional resource requirements are captured in Table 3.6, along with the associated costs. The company has indicated during discussions that there is uncertainty around the actual level of resources required and as a result we have removed any roles that were not required for the duration of PR4 and also taken account of half of their identified resource requirements.

Table 3.6 : Jacobs calculation of the adjustment to the TSO staff costs for PR4

Opex (2014 prices) €m	2016	2017	2018	2019	2020	Total
EIR Grid staff costs forecast	29.2	29.8	30.1	30.3	30.3	149.6
Other staff costs	2.0	2.0	2.0	2.0	2.0	10.0
EirGrid staff and relates costs	31.2	31.8	32.0	32.3	32.3	159.6
PR4 Additional resources (Nos.)	separate submission					
Post I-SEM						
EU Network Code Compliance						
EU project role						
Grid 25						
Metering						
DS3 system services						
IT security						
IT Infrastructure						
IT Application support						
EMIP prallel running						
Total resources (Nos.)						
Costs €m						
2015 forecast outturn	27.1	27.1	27.1	27.1	27.1	135.5
Staff costs based on €75k per person	0.4	0.4	0.4	0.4	0.4	1.9
Bonus forecast reduction	-1.4	-1.4	-1.4	-1.4	-1.4	-7.0
Proposed staff costs	26.1	26.1	26.1	26.1	26.1	130.4
Proposed Other staff costs	1.9	1.9	1.9	1.9	1.9	9.5
Total	28.0	28.0	28.0	28.0	28.0	139.9
Adjustment from EirGrid forecast	-3.2	-3.8	-4.1	-4.3	-4.3	-19.7

The salary levels within the company have been provided within a report from Towers Watson which was discussed in section 2.2 of this report. Given the information provided we have taken the proposed staff numbers as a high level starting point and we have used the EirGrid forecast outturn for 2015 for our analysis of our assessment of additional resource costs for PR4. We have allowed €75k per role, as we consider that this is a reasonable level given the current salary structure within EirGrid. We have assumed that EirGrid would pay

less than their average salary for Professional Managers as identified in their analysis of 2015 forecasts¹⁰ for new starters, and in the roles identified for the increased personnel, as they would be on lower salary levels.

In the PR4 PRP forecasts, the company are proposing payments of 15% across all staff, very much at the upper end of potential awards. We would expect that at a corporate level there would be sufficiently challenging targets that a number of staff would not easily achieve their targets and so it would be reasonable to expect an actual achievement of 7% to be a more realistic target. We have reduced the forecast going forward including our start point of 2015 outturn by €1.4m as we believe that this is a more realistic position for an efficient and effective company.

This consistent high level of achievement of performance-related pay we consider to be a reflection of targets that may not have been sufficiently challenging. In PR4 we suggest that there is an opportunity for step changes, where the PRP should be on more stretching targets. Overall an average of 7% would be more reflective of staff being given challenging targets and will reduce the staff costs by around €7.0m over the period or €1.4m p.a. This reduction has been included as part of the efficiency going forward. This can be used to drive more efficient performance of the company. If the company wish to pay more than this then this should be as a result of increased company performance, a significant part of that should be related to reducing controllable operating costs, which may make any higher payments self-financing. We agree with the TSO that a holistic view should be taken in terms of resourcing with direct staff contractors and professional service providers being used to provide the required outputs, and the salaries should be viewed in that light.

As represented in Table 3.6 Jacobs view is that the allowance for staff costs should be €139.9m, a reduction of €19.7m on the TSO forecast.

3.2.1 Contractors

TSO requested €10.0m, recommended changes €-2.0m, Recommended allowance € 8.0m

Table 3.6 presents a year on year comparison between the TSOs proposed contractor allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.6 : Contractors PR4 Proposed Allowance

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Contractors	6.9	1.4	2.0	2.0	2.0	2.0	2.0	10.0	3.0	44%
Jacobs proposed changes			-0.4	-0.4	-0.4	-0.4	-0.4	-2.0	-2.0	
Jacobs proposed Contractors allowance	6.9	1.4	1.6	1.6	1.6	1.6	1.6	8.0	1.0	15%

The TSO utilise contracts to provide short term support in a number of areas and are requesting an increase in the cost of contractors employed by the business in PR4 compared to PR3. We view opportunities to utilise this resource to supplement the need for fixed direct staff for short term pieces of work and as such we do not consider that there is sufficient evidence to warrant significant allowances over the level of expenditure at the end of PR3.

3.2.2 Telecoms

TSO requested €30.7m, recommended changes €-5.6m, Recommended allowance € 25.1m

Table 3.7 presents a year on year comparison between the TSOs proposed telecoms allowance for PR4 and Jacobs proposed opex allowance for PR4.

¹⁰ Paper 3 Response to PR4Transmission Questionnaire CER (forecasts) tab 3.4

Table 3.7 : Telecoms PR4 Proposed Allowances

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Telecoms	19.9	4.2	5.4	6.1	6.3	6.3	6.5	30.7	10.8	54%
Jacobs proposed changes			-1.1	-1.8	-1.4	-0.9	-0.4	-5.6	-5.6	
Jacobs proposed Telecoms allowance	19.9	4.2	4.3	4.3	4.9	5.4	6.1	25.1	5.2	26%

There is a significant increase in the level of telecom costs forecast for the PR4 period compared to PR3. Most of these costs relate to maintenance of network infrastructure and is a direct function of the increased volume of Telecoms equipment used both on, and to analyse, the network. The Telecoms costs associated with major new investment have been reduced as we believe there is likely to be delays in the delivery based upon historic performance, we consider that a more realistic view of when the costs will be incurred, will result in €5.6m of the expenditure moving into PR5, and therefore be a reduction over the PR4 period.. If the project delivery continues as forecast by the TSO then this is likely to result in an overspend for this category, if the additional expenditure can be demonstrated to be efficient then this should be looked upon favourably at the next periodic review.

3.2.3 Premises

TSO requested €24.7m, recommended changes €-1.0 m, Recommended allowance € 23.7m

Table 3.8 presents a year on year comparison between the TSOs proposed Premises allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.8 : Premises PR4 Proposed Allowances

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Premises	22.1	4.5	4.6	4.8	5.1	5.1	5.2	24.7	2.6	12%
Jacobs proposed changes			0.0	0.0	-0.3	-0.3	-0.4	-1.0	-1.0	
Jacobs proposed Premises allowance	22.1	4.5	4.6	4.8	4.8	4.8	4.8	23.7	1.6	7%

The TSO have forecast an increase in the premises costs over those incurred in PR3 of €2.6m. The TSO has signed a 25 year lease in 2007 for occupation in the Oval in Dublin, this is subject to five year reviews with the next one due in 2017. We have allowed the costs up to 2017 and no further increases beyond those incurred in 2017. We consider the TSO will be in a difficult position going forward as it has invested in the creation of the control centre in the Oval. We consider that the TSO should develop a longer term strategy for its current location in the Oval considering the risk of increases in rental costs in the future and the potential costs of relocation. We would recommend that the TSO consider that increases will not automatically be allowed and therefore would need to cover additional costs through reductions and efficiencies elsewhere.

3.2.4 IT costs

TSO requested €17.0m, recommended changes €-2.5 m, Recommended allowance € 14.5m

Table 3.9 presents a year on year comparison between the TSOs proposed IT opex allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.9 : IT Cost PR4 Proposed Allowance

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed IT Costs	12.1	2.5	3.0	3.2	3.5	3.6	3.7	17.0	4.9	40%
Jacobs proposed changes			-0.3	-0.5	-0.6	-0.6	-0.5	-2.5	-2.5	
Jacobs proposed IT allowance	12.1	2.5	2.7	2.7	2.9	3.0	3.2	14.5	2.4	20%

The TSO has identified¹¹ increasing Capital investment costs for IT Hardware and software over the PR4 period. As a consequence there is increased opex requirements for updates to software systems and licenses etc, which is consistent with good practice of keeping systems fit for purpose, although little evidence has been provided as to how much the company is extending the lifecycle of the IT systems. We have delayed the allowances by 3 years both as an efficiency initiative and as we consider that this is a more likely timescale for the cost to be incurred given the typical track record of IT related capex investment timescales... If the project delivery continues as forecast by the TSO then this is likely to result in an overspend for this category, if the additional expenditure can be demonstrated to be efficient then this should be looked upon favourably at the next review period.

3.2.5 Insurance and compensation

TSO requested €1.5m, recommended changes €-0.5 m, Recommended allowance € 1.0m

Table 3.10 presents a year on year comparison between the TSOs proposed Insurance and Compensation opex allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.10 : Insurance and Compensation PR4 Proposed Allowance

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Insurance and Compensation	1.5	0.2	0.3	0.3	0.3	0.3	0.3	1.5	0.0	0%
Jacobs proposed changes			-0.1	-0.1	-0.1	-0.1	-0.1	-0.5	-0.5	
Jacobs proposed Insurance and Compensation a	1.5	0.2	0.2	0.2	0.2	0.2	0.2	1.0	-0.5	-34%

We believe there are opportunities with the amalgamation with SONI to reduce costs in this area.

3.2.6 Selling and Advertising

TSO requested €1.2m, recommended changes €-0.7 m, Recommended allowance € 0.5m

Table 3.11 presents a year on year comparison between the TSOs proposed Selling and Advertising opex allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.11 : Selling and Advertising PR4 Proposed Allowance

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Selling and Advertising	0.7	0.2	0.2	0.2	0.2	0.2	0.2	1.2	0.5	65%
Jacobs proposed changes			-0.1	-0.1	-0.1	-0.1	-0.1	-0.7	-0.7	
Jacobs proposed Selling and Advertising allowan	0.7	0.2	0.1	0.1	0.1	0.1	0.1	0.5	-0.2	-28%

¹¹ Paper 2 forecast submission pR4 Context and overview

The TSO have provided no indication of the benefits of this expenditure. It is unclear at present what the intension is for this increased budget. A nominal amount of €0.1m per annum has been allowed going forward.

3.2.7 Professional services

TSO requested €16.3m, recommended changes €-1.8 m, Recommended allowance €14.5m

Table 3.12 presents a year on year comparison between the TSOs proposed professional services opex allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.12 : Professional Services PR4 Proposed Allowance

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Professional Services	13.1	2.2	3.4	3.5	3.3	3.0	3.1	16.3	3.2	25%
Jacobs proposed changes			-0.5	-0.6	-0.4	-0.1	-0.2	-1.8	-1.8	
Jacobs proposed Professional services allowance	13.1	2.2	2.9	2.9	2.9	2.9	2.9	14.5	1.4	11%

In the historic submission the TSO placed great emphasis on a holistic approach to the acquisition of the required skills needed by the company. The company have reduced the required support from €2.8m in 2011 down to €2.2m in 2013. In light of the comments on staff costs and contractors, the allowance has been set at the current annual rate for 2014-15 going forward into PR4 providing a total allowance of €14.5m, a reduction of €1.8m from the proposed amount.

3.2.8 Grid Maintenance

TSO requested €5.6m, recommended changes €-0.6 m, Recommended allowance € 5.0m

Table 3.13 presents a year on year comparison between the TSO's proposed grid maintenance opex allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.13 : Grid Maintenance PR4 Proposed Allowance

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Grid Maintenance	5.1	1.0	1.1	1.1	1.1	1.1	1.1	5.6	0.5	9%
Jacobs proposed changes			-0.1	-0.1	-0.1	-0.1	-0.1	-0.6	-0.6	
Jacobs proposed Grid Maintenance allowance	5.1	1.0	1.0	1.0	1.0	1.0	1.0	5.0	-0.1	-2%

The TSO have not provided sufficient support for the increases in Grid Maintenance cost during PR4, therefore the allowance is capped in line with the average spend for 2013-2015 with an allowance of €1.0m p.a.

3.2.9 Corporate recharges

TSO proposed €23.6, recommended changes €5.0 m, Recommended allowance € 18.6m

Table 3.14 presents a year on year comparison between the TSOs proposed corporate charges opex allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.14 : Corporate recharges PR4 Proposed Allowances

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Corporate recharges	-13.0	-2.1	-4.7	-4.7	-4.7	-4.8	-4.8	-23.6	-10.6	81%
Jacobs proposed changes			1.0	1.0	1.0	1.0	1.0	5.0	5.0	
Jacobs proposed Corporate recharges	-13.0	-2.1	-3.7	-3.7	-3.7	-3.8	-3.8	-18.6	-5.6	43%

In the submission the TSO have identified the intercompany charges that are planned during PR4. The changes to the operating costs we are proposing will have an impact on the resultant recharges hence their recharges are expected to change. We have proposed an adjustment of €5.0m. There has been insufficient detail to identify greater savings in this area, although it would be seen as an opportunity to drive further opex reductions.

3.2.10 Provisions

TSO requested €0.0m, recommended changes €-0.0 m, Recommended allowance € 0.0m

Table 3.15 presents a year on year comparison between the TSOs proposed provisions related opex allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.15 : Provisions PR4 Proposed Allowances

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Provisions	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-100%
Jacobs proposed changes		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Jacobs proposed Provisions allowance	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-100%

As one would expect, there is no forecast for provisions for PR4.

3.2.11 Research and Development

TSO requested €22.4m, recommended changes €-21.4 m, Recommended allowance € 1.0m

Table 3.16 presents a year on year comparison between the TSOs proposed R&D related opex allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.16 : Research and Development PR4 Proposed Allowance

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Promotion of research	2.0	0.2	0.7	0.7	0.7	0.7	0.7	3.5	1.4	70%
Jacobs proposed changes			-0.5	-0.5	-0.5	-0.5	-0.5	-2.5	-2.5	
Jacobs proposed Promotion of Research allowance	2.0	0.2	0.2	0.2	0.2	0.2	0.2	1.0	-1.1	-53%

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Research, Development & Demonstration	0.0	0.0	1.5	2.0	4.1	5.6	5.7	18.9	18.9	-
Jacobs proposed changes			-1.5	-2.0	-4.1	-5.6	-5.7	-18.9	-18.9	
Jacobs proposed R&D & Demonstration allowance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

The TSO has identified two areas of research and development costs:

- €3.5m within its direct cost base, which is €1.4m over PR3 expenditure. and
- An additional €18.9 which it has classed as discretionary, but which it recommends is carried out.

We have capped the direct costs to the level incurred in 2013 and should provide sufficient funding to carry out initial investigations to determine if there is any value in carrying the project forward. We also recommend that if there is a valid business case that the CER is minded to allow additional funding going forward where an appropriate business case and governance structure has been provided by the TSO. Whilst recognising that there will need to be some research and development spend, we have considered that €1.0m is a more appropriate level to be included within the PR4 settlement. These costs are in addition to those in the Capex innovation allowance.

The same principle is applied to the 'Discretionary' spend, however we have removed this allowance as we consider that this should also be on a case by case basis. This is not designed to be contradictory to ex ante regulation, but this approach is intended to ensure that R&D is targeted with defined deliverables for the benefit of the consumers.

3.2.12 Other

TSO requested €0.0m, recommended changes €-0.0 m, Recommended allowance € 0.0m

Table 3.17 presents a year on year comparison between the TSOs proposed Other related opex allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.17 : Other PR4 Proposed Allowance

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Other	2.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	-100%
Jacobs proposed changes			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Jacobs proposed Other allowance	2.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	-100%

As one would expect there is no 'Other' expenditure forecast for PR4 forecast

3.2.13 Rates

TSO requested €2.9m, recommended changes €-0.0m, Recommended allowance € 2.9m

Table 3.18 presents a year on year comparison between the TSOs proposed rates related opex allowance for PR4 and Jacobs proposed opex allowance for PR4.

Table 3.18 : Rates PR4 Proposed Allowance

Operating Costs (€m 2014 Prices)	PR3	2013	2016	2017	2018	2019	2020	PR4	Variance PR3-PR4	Variance %
TSO proposed Rates	2.4	0.5	0.6	0.6	0.6	0.6	0.6	2.9	0.5	21%
Jacobs proposed changes			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Jacobs proposed Rates allowance	2.4	0.5	0.6	0.6	0.6	0.6	0.6	2.9	0.5	21%

There has been no adjustment made to the rates allowance. The proposed forecast is in line with PR3 levels and is broadly outside the control of the TSO.

3.3 Report Findings

The TSO have forecast an additional €54.3m over the PR4 period compared with PR3 based primarily on large increases in 3 areas, salaries, telecoms and R&D. There has been an increase in manpower throughout PR3 (from 228 in 2010 to 278 forecast for 2015) and EirGrid are seeking significant increases in PR4 in salary costs. We consider that the TSO have been conservative in what can be achieved with the existing resource considering the headcount increases in PR3 and although there are identified new roles, there appears insufficient evidence of reductions elsewhere where re deployment would cover activities required going forward. The TSO recognise that there is uncertainty over the level of resource required in PR4 and we have reflected that in the approach to the resource allowances. We have therefore proposed €139.9m staff and staff related costs which is €1.3m greater than the PR3 costs, and €19.7m less than the TSO proposed costs. The Telecoms and IT cost increases have been deferred by three years as we consider that this is a more realistic timing of the expenditure. Should the actual delivery of the programmes of work be consistent with the forecasts by the TSO then this may result in an overspend which if demonstrated to be efficient should be looked upon favourably in the next review period. .

The other major change is the disallowance for the promotion of research at €2.5m and the €18.9m R&D budget, for which there was no previous allowance, and is viewed as an area where once appropriate options are developed internally or proposed by external suppliers then there could be an approach to the CER for appropriate funding. The alternate would be the consumer paying suppliers for their R&D which could ultimately benefit non-EirGrid customers. This could be better controlled on a specific case by case basis with a thoroughly reviewed business case when needed. This is not intended to go against the principles of ex-ante regulation but to promote the identification of key deliverables and objectives for the Research and Development expenditure for the benefit of consumers rather than a discretionary pot which would allow significant expenditure without any predetermined deliverables and potential of customer benefit. There are other minor adjustments but in general most areas have been allowed the requested allowances. This has resulted in reductions of €50.7m being proposed providing a total allowance of €217.4m which is 2% higher than expenditure in PR3.

4. Review of PR3 Capital Expenditure

This Section reviews the TSO's projected capital expenditure over the PR3 period 2011 to 2015 compared with the expenditure allowed by CER in the PR3 decision paper. The data for this report has been gathered from the TSO and TAO up to the 27th March 2015. The review has been informed by the company's response to their questionnaire¹² on historic capital expenditure and associated information papers and network plans, together with further data provided by the companies at meetings and from supplementary questions raised by CER and consultants. The review takes into account provisional outturn costs and performance for 2014 and 2015. CER has also provided a significant amount of background information on previous price reviews and updated information.

The purpose of our review is to assess and compare the levels and appropriateness of the TSO capital expenditure against network operational and investment needs and to analyse, comment on and make recommendations on efficient project and asset delivery, including delivery processes, in line with industry best practice. It is **not** associated with confirming the accuracy with respect to monies spent and received as would be undertaken by Independent Auditors in line with normal Company Law and also Regulatory requirements as appropriate.

A further important element of the review of 2011-2015 actual/forecast outturns is a comparison against the original forecast and allowed expenditures and the determination of the reasons behind any significant deviations. This will inform views with respect to the ability of the businesses to forecast expenditure requirements and also to manage the delivery of such expenditure and associated operational efficiencies.

From the TSO, we have been provided; separate to the requested questionnaire, a line by line and year by year capital expenditure submission. We note 2011-13 to be actual costs and 2014 and 2015 to be latest best estimates (LBE). We have reviewed data and the narrative responses provided by the TSO and TAO and requested additional clarifications from the companies to assist in our review and to further explain specific variances.

Transmission capital expenditure variances over regulatory planning periods generally fall into the categorisation of:

- Load related, deferment or acceleration due to demand variance,
- Generation / customer related, delay or deferment of projects due to change in customer plans or requirements,
- Asset replacement, deferment or acceleration of programme/asset replacement,
- Unit costs, delivery efficiency, procurement initiatives, commodity price impacts

We have considered whether the 2014-15 LBE forecast expenditures are realistic, based on the actual capital expenditure incurred to date and have sought further explanation from the TSO to justify these forecasts. We have also sought to make sure that the LBEs include the delivery of commissioned assets and not advance procurement of major assets that will form part of the 2016-2020 programmes. The projects completed and progressed during PR3 have been reviewed along with the assets commissioned to ascertain the extent of TSO plans completed to date as well as providing an indicator of the efficiency of overall PR3 capital expenditure.

As part of the historic capital expenditure review, documentation in the form of internal authorisation scheme papers have been provided by the TSO to support investment decisions relating to specific projects. These have been reviewed to provide a further assessment of TSO transmission planning activities, including the process for identification of required transmission investments as well as internal business approval processes for authorisation of TSO expenditure. A comparison has also been performed of the actual TSO capital expenditure incurred in PR3 against that authorised in the internal scheme papers, to identify significant deviations.

¹² TAO's response to questionnaires was limited

As part of Jacobs support to the Commission for Energy Regulation a review has been performed of the outturn PR3 capital expenditure incurred by EirGrid and ESB Networks in their roles as Transmission System Operator (TSO) and Transmission Asset Owner (TAO) respectively. Specifically, CER required Jacobs to:

- Review and audit the outturn of the network and non-network capital investment undertaken to date by TAO/TSO set out in the 2011-2015 revenue controls. This would also include any work specified in the control but not undertaken, and any work that was not originally specified within the control but which was undertaken under this control period.
- Advise on the efficient level of capital investments required in the TAO and TSO businesses over the period 2016-2020, including capital expenditure on IT

It should be noted that although the outturn assessment of actual network capital expenditure has incorporated a review of specific transmission projects, a definitive list of projects associated with proposed PR3 network capital expenditure was not included within the original PR3 Determination. As such, assessment of individual project capital expenditures, and outturn variances (including timing / delivery) against original PR3 plan, has been performed solely to understand how project requirements, specifications and costs have evolved over the PR3 period and has not been performed to approve expenditures on individual projects.

This report provides an analysis of both network and non-network capital expenditure investments undertaken by the TSO (EirGrid) to date, and including the final estimated 2014 and 2015 expenditures. The objective of this review of historic capital expenditure is to assess the TSO performance in achieving the outputs required by CER during the PR3 period and within the CER allowed costs. The review includes an appraisal of the issues that have affected performance in PR3 and those issues which will require further consideration when reviewing the proposals of the TSO for PR4

The review has been informed primarily by the TSO's response to the questionnaire on historic and forecast capital expenditure¹². Further information has also been received from subsidiary questions raised by CER and consultants. CER has also provided a significant amount of background information on previous price reviews and updated information during the period 2011 to 2015.

This report also accounts for the re-forecasting of the budget which was undertaken by the TSO during PR3.

4.1 Overview of PR3 Network Capital Expenditure

4.1.1 Total Capital Expenditure

A high level summary of the transmission system PR3 capital expenditure, allowed and actual, is presented in Table 4.1¹³, with the original PR3 allowance also shown in Figure 4.1. The Stretched Network Needs scenario was developed by CER and advising consultants during review of the PR3 forecast expenditure submissions by EirGrid. This scenario provides a level of capital expenditure for PR3 sufficient to enable the Irish transmission system to be developed to accommodate the expected significant increase in renewable generation required to meet national 2020 energy targets. The scenario also provides a degree of efficiency challenge to the TSO and TAO businesses in order to develop the required transmission infrastructure in an efficient manner, providing value for money to end customers.

It can be seen from Table 4.1 that there is an overall variance (underspend) of €422.8m between the 2009 PR3 forecast and the latest 2014 look back plan outturns, recognising also that the original CER allowance was itself set somewhat below the transmission businesses PR3 submissions.

¹³ Note that the allowance values for the years 2011 to 2015 – denoted by * – are in 2009 real costs whereas the actual spend numbers are nominal in the year incurred. This is because EirGrid did not complete the requested historic PR3 questionnaire which requested all historic costs be provided in 2009 real values and instead submitted a separate spreadsheet with actual nominal yearly values. The overall impact is however minimal given that inflation has not been a significant factor during PR3 – see Table 4.7.

Table 4.1: Transmission Capital Expenditure 2011-2015

		2011	2012	2013	2014	2015	PR3 Total
CER Allowance* - Stretch Network Needs	EirGrid	€17.9	€21.6	€22.2	€22.5	€26.2	€110.4
	ESB	€188.4	€253.4	€287.0	€303.1	€307.6	€1,339.5
	Total	€206.3	€275.0	€309.2	€325.6	€333.8	€1,449.9
Network Gross	EirGrid	€4.3	€3.1	€5.7	€9.2	€21.7	€44.0
	ESB	€183.3	€182.1	€252.3	€208.9	€266.7	€1,093.3
	Total	€187.6	€185.2	€258.0	€218.1	€288.4	€1,137.3
Interest During Construction (IDC)	ESB	€10.6	€9.5	€11.3	€10.6	€14.1	€56.1
Actual Total (less IDC)	Total	€177.0	€175.7	€246.7	€207.5	€274.3	€1,081.1
	Variance	€29.3	€99.3	€62.5	€118.1	€59.5	€368.8
Customer Contributions (Allowance*)	ESB	€10.5	€6.3	€8.4	€7.8	€1.4	€34.4
Customer Contributions (Actual)	ESB	€5.1	€3.0	-€1.5	€11.4	€36.8	€54.8
	Variance	€5.4	€3.3	€9.9	-€3.6	-€35.4	-€20.4
Community Gain	EirGrid	€0.0	€0.0	€0.1	€0.1	€0.5	€0.7
Network Net Capitalised (Gross less IDC & Cust. Contr. plus Comm. Gain)	EirGrid	€4.3	€3.1	€5.8	€9.4	€22.2	€44.8
	ESB	€167.5	€169.5	€242.5	€186.9	€215.8	€982.3
	Actual Total	€171.9	€172.7	€248.3	€196.2	€238.1	€1,027.1
	Variance	€34.4	€102.3	€60.9	€129.4	€95.7	€422.8
	% Allowance	83.3%	62.8%	80.3%	60.3%	71.3%	70.8%

The actual total presented in Table 4.1 is shown in Figure 4.2, split into the different network development categories, showing also IDC, Customer Contributions and Community Gain Factors.

Figure 4.1 : Breakdown of PR3 Allowance

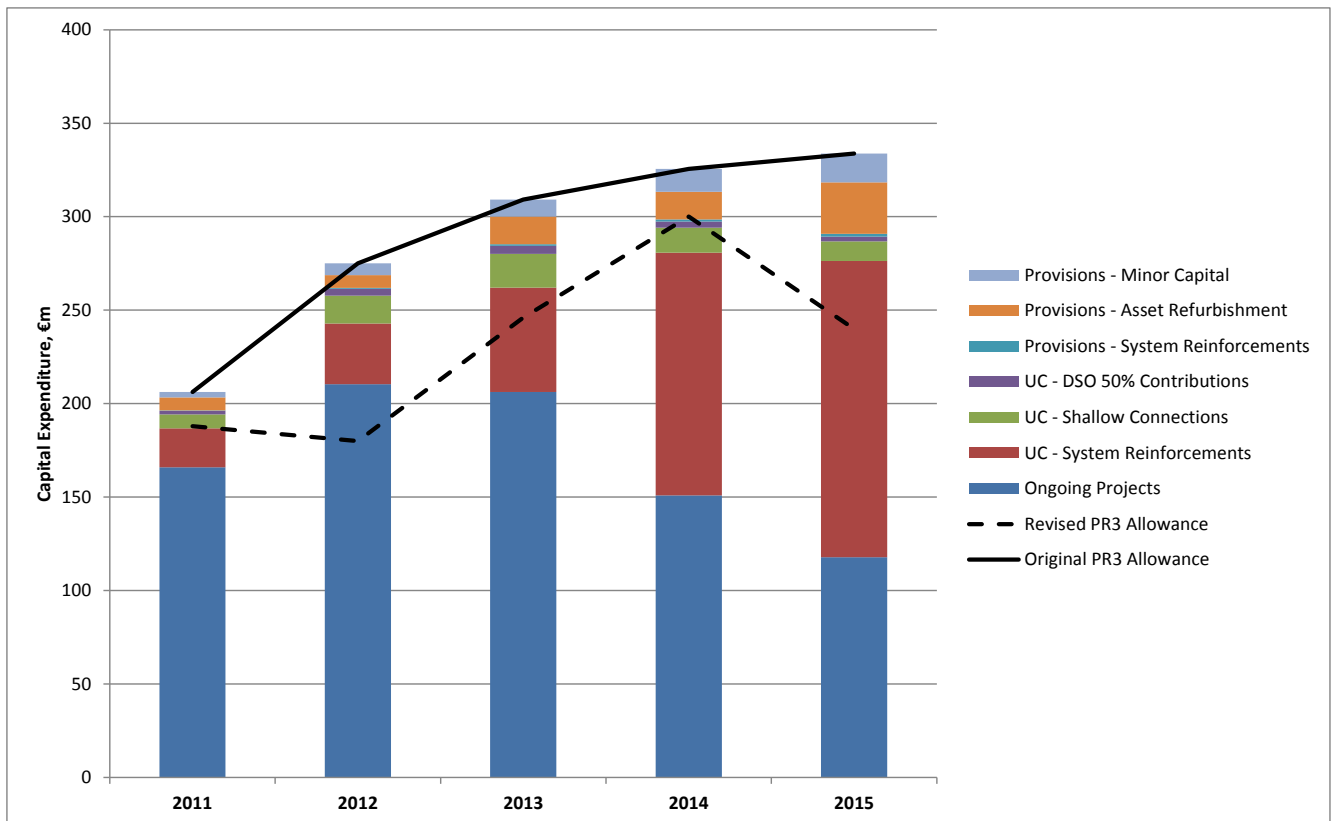
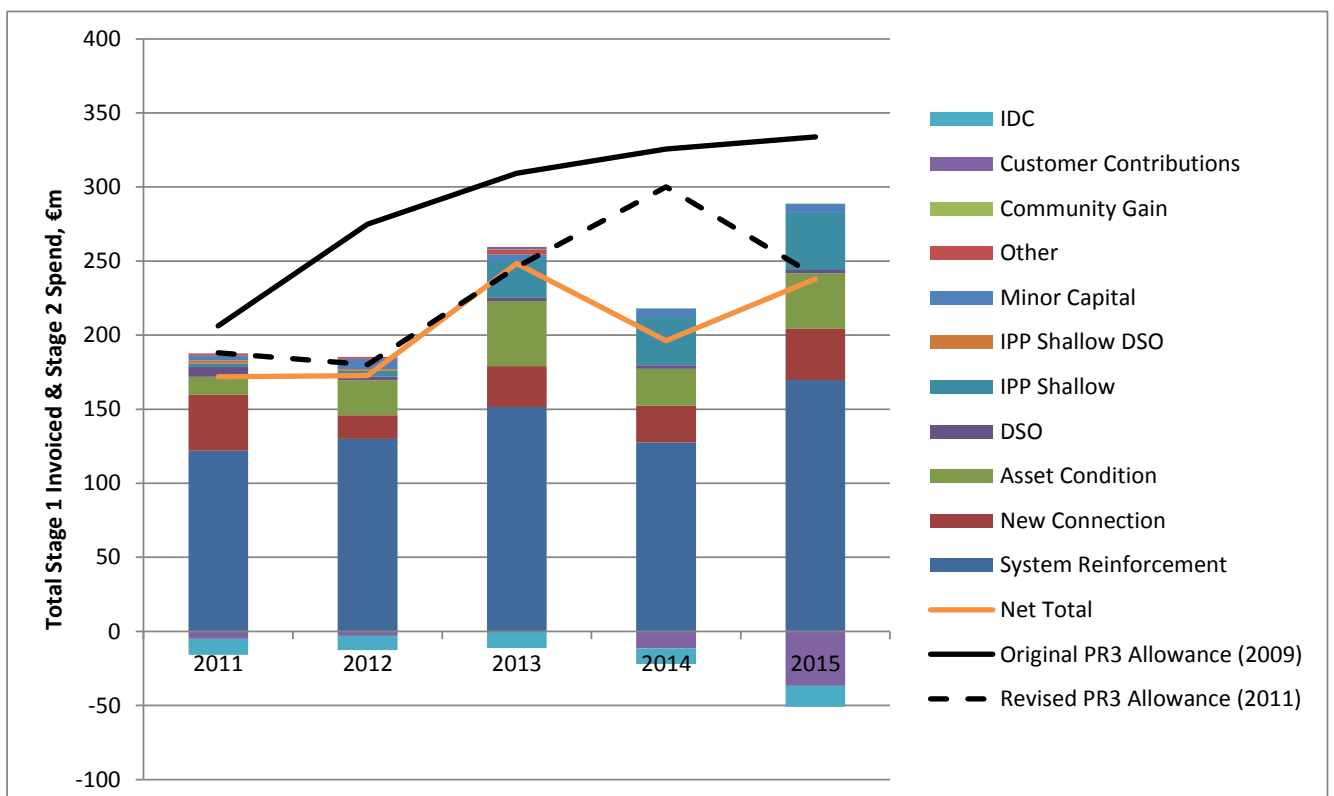


Figure 4.2: Breakdown on Actual Total Expenditure Capitalised During PR3 (Stage 1 Invoice and Stage 2 Spend)



As can be seen from

Figure 4.2, the rate of expenditure on capital projects was below the original PR3 allowance value for each year from 2011 to 2015, with outturn expenditure only matching the revised PR3 allowance in year 2013.

From

Figure 4.2, the IPP Shallow expenditure (included in the “Under Consideration – System reinforcements” category in Figure 4.1) is prominent in the years 2013, 2014 and 2015. Approximately 67% of the total PR3 IPP Shallow expenditure (€103.01m) is a result of three main projects, CP0651¹⁴, CP0731 and CP0608. The yearly itemisation of these project costs has been provided in Table 4.2.

Table 4.2 : PR3 Spend Breakdown for Major Projects within “IPP Shallow”

Project No.	Description	Assets
CP0651	Ballynahulla (East Kerry) 220 kV Station	Single 220kV circuit – 1 new station. 16 bays. 2 transformers 220/110 kV 500 MVA
CP0731	Bellacorick - Castlebar 110 kV Line Uprate - Line Work	Single 110kV circuit – 17 km OHL
CP0608	Trien 110 kV Station works (Station connection works for IPP119 Cloghboola) + Trien BB uprate	Single 110kV circuit - 1 x 110 kV Bay

Project No.	Actual Stage 1 Invoice and Stage 2 Spend (€m)					Actual PR3 Total	Original PR3 Value
	2011	2012	2013	2014	2015		
CP0651	0.00	1.55	11.30	13.75	18.3	44.9	47.4
CP0731	0.00	0.18	5.06	0.81	0.00	6.05	0.03 ¹⁵
CP0608	0.00	0.00	3.21	10.85	3.62	17.68	18.97 ¹⁶
Total (€m)						68.63	66.4

Reforecasting

During 2011 it became evident that as a result of delays in the progression of generation projects under Gate 3, along with a reduction in electricity demand and greater awareness and engagement of the public in relation to transmission network development projects, that the originally envisioned transmission system development expected during PR3 would not materialise as planned. As a result, EirGrid developed a revised PR3 transmission capital expenditure forecast in October 2011 which was provided to CER and ESB¹⁷, including estimates for years 2013 to 2015. The overall PR3 forecast expenditure was expected at that time to reduce by 21% to €1.15 billion, as shown in Table 4.3. No specifics were provided on the projects which were removed or new projects which were included in the PR3 plan at the time of the reforecasting, just generic reasons for the overall reduction including demand reduction / reduced growth, slower renewable generation uptake, use of higher capacity overhead line conductor as an alternative to tower and line rebuilds, as well as “claimed” internal reorganisation and refining of projects.

Table 4.3 : PR3 Reforecasted Transmission Capital Expenditure

Expenditure Year	2011	2012	2013	2014	2015	Total
CER Allowance (CER/10/206)	€206m	€275m	€309m	€326m	€334m	€1.45bn
Revised Forecast (Oct. 2011)	€188m	€103m	€228m	€310m	€318m	€1.15bn

¹⁴ Subsequent information provided by the TSO has noted that this project originally included a second project, CP606, which has been merged. The original PR3 value shown is that of the combined projects.

¹⁵ Project has been advanced ahead of its original PR3 forecast schedule.

¹⁶ Includes generic provision for OHL connections to TSO windfarms (€15.43m) as provided within the PR3 forecast.

¹⁷ Recent information provided by the TAO in their response to an earlier draft of this report indicates that ESB did not effectively “sign-on” to the revised 2011 allowance, stating that “Any realignment in 2011 was carried out by TSO. Any gaps in the rationale behind the revised programming is an issue to be addressed by TSO.”

Final Revised Forecasts	€188m	€180m	€246m	€300m	€240m	€1.15bn
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The annual capital expenditure in the years 2012 to 2014 was further revised during 2012, although the total expected PR3 expenditure remained as per the previously reduced total at €1.15bn. Again, no specific project expenditure variations were itemised.

4.1.2 Load Related Expenditure & Customer Contributions

The original PR3 submission included (at the time) a latest view of the projects that were likely to be developed during the course of PR3. Since this initial view, the actual mix of projects undertaken has varied, with a number of the original projects not going ahead. Additionally, new projects have been added to the PR3 plan. These changes will inevitably result in a discrepancy between the original PR3 forecast budget and the actual outturn expenditure to date. From Table 4.4, gross load related expenditure of €915.5m was found to be €419.8m lower than the original CER allowance of €1,335.3m; this represents 68.6% of the allowed expenditure. Net load related expenditure of €860.7m excluding customer contributions was €440.2m lower than the allowed costs of €1,300.9m; this represents 66.2% of the original PR3 allowance.

There is a €20.4m variance between the gross and net load related expenditure. This is caused by the change in customer contributions which result from the different mix of projects which went forward in PR3. The discrepancy between forecasted and actual customer contributions is evident in 2014 and 2015, in Figure 4.3 – the difference between the red and blue lines.

The load related expenditure considers Ongoing Projects, System Reinforcements which are under consideration, New Connection costs including those associated with IPP Shallow Connections, as well as DSO related costs – 50% contributions. Although there was a reduction in planned transmission capital expenditure across both System Reinforcement and IPP Shallow Connection projects during PR3, reductions in planned System Reinforcement projects were the most significant at €980m (unfactored). Of this, circa €484m was associated with three primary projects¹⁸, many of which involved significant new overhead line infrastructure, with over half (€272m) associated with a reduction in the planned expenditure for the Grid Link 400 kV Project (CP0732) and a further €109.7m for the North South 400 kV Interconnector (CP0466) and €101.7m for the Kingscourt-Woodland 400 kV overhead line (CP0469) projects.

Table 4.4 : Load Related Expenditure Against Original PR3 Allowance (Stage 1 Invoice (EirGrid) and Stage 2 Spend (ESB))

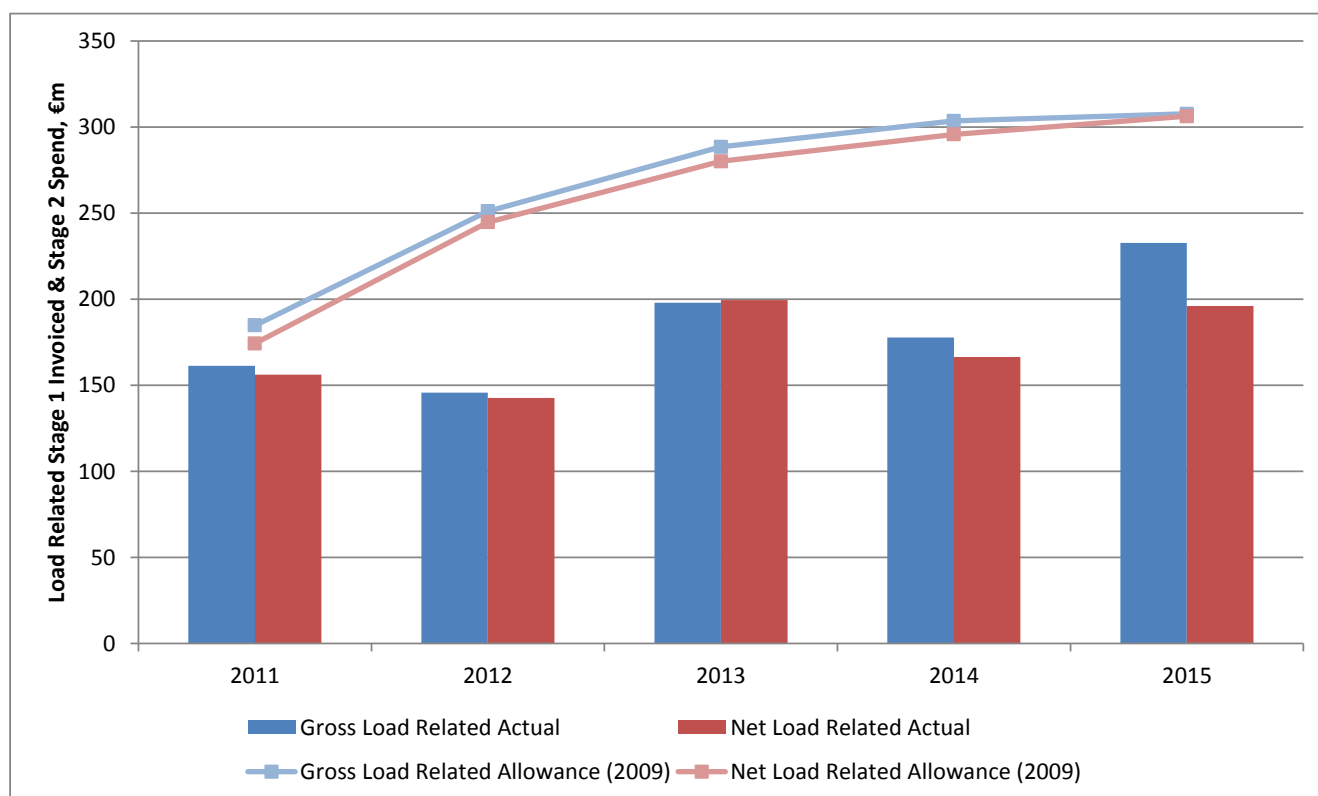
		2011	2012	2013	2014	2015	PR3 Total
(Gross) Load Related Capex Allowance	Total	€184.8	€251.0	€288.4	€303.5	€307.6	€1,335.3
(Gross) Actual Load Related Capex	EirGrid	€4.3	€2.9	€5.5	€8.4	€18.9	€40.0
Actual Inc. Load Related IDC	ESB	€166.7	€150.7	€201.4	€178.7	€226.1	€923.6
Actual Exc. Load Related IDC	ESB	€157.0	€142.8	€192.4	€169.4	€213.9	€875.5
	Total	€161.3	€145.8	€197.9	€177.8	€232.7	€915.5
	Variance	€23.5	€105.2	€90.5	€125.7	€74.9	€419.8
Customer Contributions (Allowance)	ESB	€10.5	€6.3	€8.4	€7.8	€1.4	€34.4
Customer Contributions (Actual)	ESB	€5.1	€3.0	-€1.5	€11.4	€36.8	€54.8
	Variance	€5.4	€3.3	€9.9	-€3.6	-€35.4	-€20.4
(Net) Load Related Capex Allowance	Total	€174.3	€244.7	€280.0	€295.7	€306.2	€1,300.9
(Net) Actual Load Related Capex	EirGrid	€4.3	€2.9	€5.5	€8.4	€18.9	€40.0
	ESB	€151.9	€139.8	€193.9	€158.0	€177.1	€820.7
	Total	€156.2	€142.7	€199.5	€166.4	€196.0	€860.7

¹⁸ Grid Link 400 kV (Cork Dublin) – CP0732 is amalgamated from nine previous projects with a combined forecast expenditure of €272.9m of which no Stage 1 or Stage 2 outturn expenditure is recorded within the PR3 period.

	Variance	€18.1	€102.0	€80.5	€129.3	€110.2	€440.2
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Note: The Gross Allowance figures above do not include Interest During Construction (IDC) which has been taken into account in the overall capital expenditure (Table 3.1).

Figure 4.3: PR3 Gross & Net Load Related Expenditure Against Allowance



On a project basis, the reduction in unfactored forecast PR3 capital expenditure of €980m for System Reinforcement projects (including the three projects representing €484m) was partially offset by increased expenditure in other planned System Reinforcement projects¹⁹, hence, the overall net total PR3 underspend against forecast expenditure on System Reinforcement projects is circa €766.6m. This is further offset by increases in other planned load related expenditure e.g. New Connections (net €29.8m), DSO related projects (net €1.6m), and a decrease in IPP Shallow expenditure (net -€67.4m) hence the underspend against forecast expenditure on all planned load related PR3 capital expenditure projects is circa €802.6m (€766.6m + €67.4m - €29.8m - €1.6m).

Load related projects unknown at the time of the original PR3 forecasting account for a further net addition of €66.7m, of which unknown System Reinforcement projects are €59.8m.

As highlighted in Section 4.1.1, the total PR3 capital expenditure allowance was revised to give a new total of €1.15bn in 2011. At the time of re-forecasting a new load related capital expenditure allowance of circa €960m (gross) and €909m (net) was agreed. In this context the approximate outturn PR3 net underspend against forecast expenditure with respect to load related capital expenditure is around €50m.

¹⁹ Three planned system reinforcement projects have an actual expenditure exceeding the original PR3 forecast by greater than -€10m, including CP0664 Cullenagh – Knockraha 220 kV Line Uprate (-€18.2m), CP0667 Inchicore – Maynooth 1 and 2 220kV line uprate (-€14.8m) and CP0763 Clashavoon – Tarbet 220 kV line uprate (-€13.9m). A further two IPP Shallow projects also meet this criteria, CP0651 Ballynahulla (East Kerry) 220 kV Station (-€39.0m) and CP0608 Trien 110kV Station works (Station connection works for IPP119 Cloghboola) + Trien BB uprate (-€14.1m) in addition to a single New Connection project, CP0650 Ballyvouskil 220 kV Station (-€25.2m).

4.1.3 Non-Load Related Expenditure

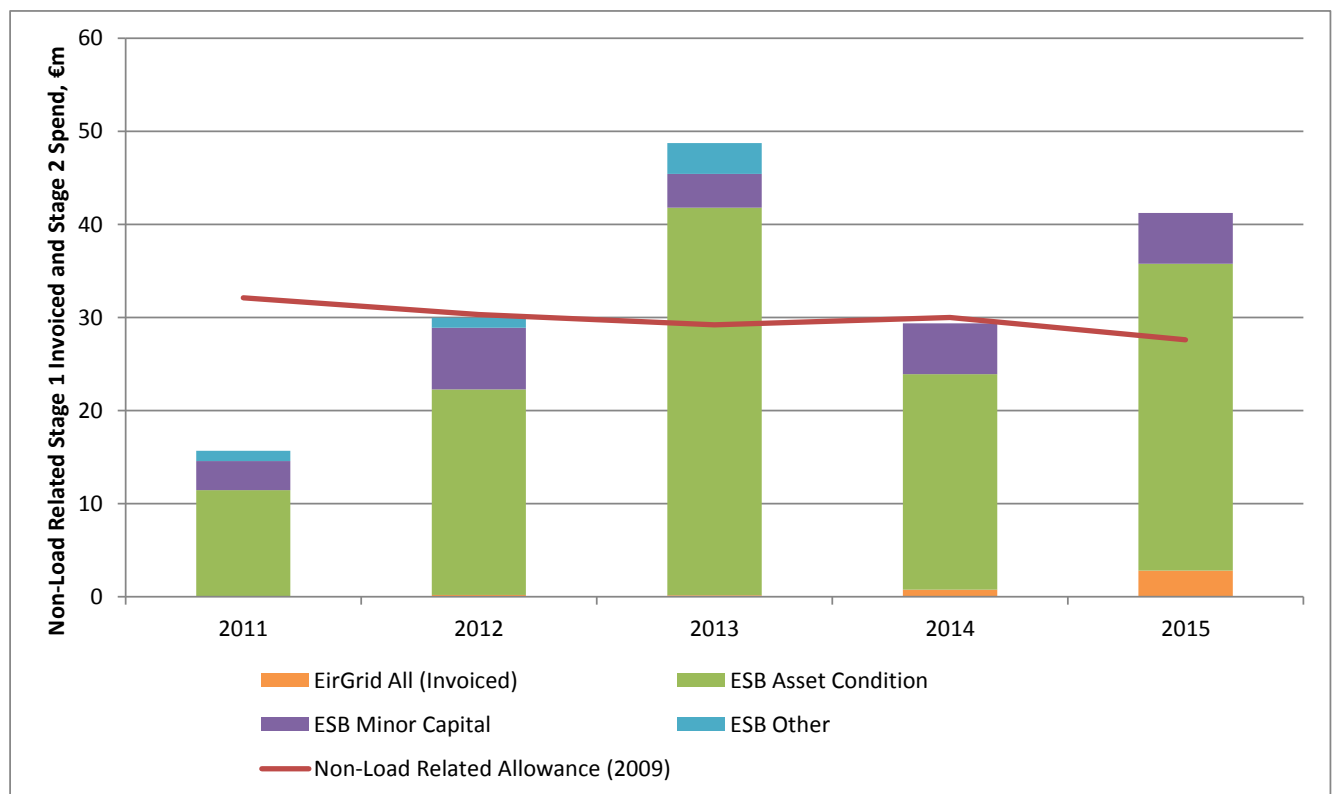
This section relates primarily to the TAO with 97.6% of expenditure related to ESB and 2.4% related to the TSO, EirGrid. However, under statute, the TSO and TAO are involved, where required, across all project phases and non-load related expenditure is therefore relevant, to an extent, to both companies. As with load related expenditure, the TSO is responsible for the determination of non-load related projects to which the TAO advances these projects once transferred at PA. The TSO is also responsible for outage approval and coordination hence has a role to play in facilitating the delivery of non-load related expenditure activities.

A summary of non-load related expenditure incurred during PR3 is presented in Table 4.5 and Figure 4.4 along with the original PR3 allowance. From Table 4.5 it is evident that the outturn non-load related capital expenditure of €165.0m has exceeded the CER allowance of €149.20m by 9.6%.

Table 4.5: Non-Load Related Expenditure²⁰

		2011	2012	2013	2014	2015	PR3 Total
(Gross) Non Load Capex Allowance	Total	€32.1	€30.3	€29.2	€30.0	€27.6	€149.2
(Gross) Actual Non Load Related Capex	EirGrid	€0.04	€0.21	€0.16	€0.76	€2.81	€3.98
Actual Non Load Related Inc. IDC	ESB	€16.6	€31.4	€50.9	€30.2	€40.6	€169.7
Actual Non Load Related Exc. IDC	ESB	€15.7	€29.8	€48.6	€28.6	€38.4	€161.0
	Total	€15.7	€30.0	€48.7	€29.4	€41.2	€165.0
	Variance	€16.4	€0.3	-€19.5	€0.6	-€13.6	-€15.8

Figure 4.4 : Non-load Related Expenditure²⁰



On an unfactored project basis, an underspend against forecast expenditure across all non-load related projects of -€53.4m is seen with some -€44.0m attributed to CP0794 (Aghada 220 kV station busbar reconfiguration)

²⁰ The allowance figures do not include Interest During Construction (IDC) which has been taken into account in the actual outturn expenditure

and CP0799 (Louth 220 kV Station Refurbishment/Upgrade) alone. Actual expenditure over forecast expenditure, on known PR3 projects, are a mixed result of substation and overhead line refurbishments/upgrades with the greatest being €6.5m for the Tarbert 220 kV Station Upgrade (CP0622). Actual expenditure on projects unknown at PR3 is seen as an overspend on forecast expenditure (no forecast given in PR3) and largely relates to minor capital spend such as easements (€3.4m) and accruals/PreCA spend (€4.9m).

Taking account of the agreed revisions to the PR3 capital expenditure allowance developed in 2011, the non-load related capital expenditure allowance was increased to €215m²¹ in agreement between EirGrid (TSO) and CER. The outturn PR3 non-load related expenditure on this basis therefore demonstrates a reduction against the revised allowance of €50m, around 23%.

Consequently, although the outturn PR3 non-load related capital expenditure is expected to have exceeded the original allowance figure at the start of PR3, it is expected to be well within the revised figure agreed in 2011 and hence considered (by the TSO) to be have been delivered efficiently.

4.2 PR3 Transmission System Development

4.2.1 Outline of Current Responsibilities

The Transmission System Operator (TSO) within Ireland is EirGrid, a role that was initiated in 2006. The relationships and responsibilities stated in the Infrastructure Agreement, 2008, between TSO and Transmission Asset Owner (TAO) are summarised in the following table, Table 4.6.

Table 4.6: 2008 Infrastructure Agreement Summary

Activity	TSO	TAO
Identification of Need	X	
Provision of Standard Costs		X
Selection of Optimal Solution	X	
Obtaining Planning Permission	X	
Obtaining Wayleaves	X	
Outage Planning	X	
Detailed Design		X
Procurement of Materials		X
Procurement of Resources		X
Management of Site Works		X
Commissioning		X

During PR3 it was expected that the TAO and TSO roles would be combined into a single company with EirGrid owning and operating transmission system assets. However, the Irish government decided to maintain the current structure and arrangements, and this was subsequently certified by the European Commission in 2013 although subject to a number of qualifying conditions. As a result of maintaining separate transmission system businesses (asset owner and operator) there is a clear need for effective communication and transparent management processes in order to achieve a successful joint venture.

As the TSO, EirGrid are responsible for 'ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity, operating, maintaining and developing under economic conditions secure, reliable and efficient transmission systems with due regard to the environment'. Subsequently, the TSO and TAO investment responsibilities can be summarised as:

²¹ This value was provided by EirGrid as part of commentary on an earlier iteration of this consolidated report.

- EirGrid (TSO) is responsible for planning investments for the Irish transmission system and ensuring that system security and quality of service standards are met.
- ESB (TAO) is responsible for actually implementing the plans developed by EirGrid and is under a legal obligation to do so. In case of delay or default, EirGrid has rapid step in rights to arrange to the work to be undertaken by an approved contractor by direction of the CER.

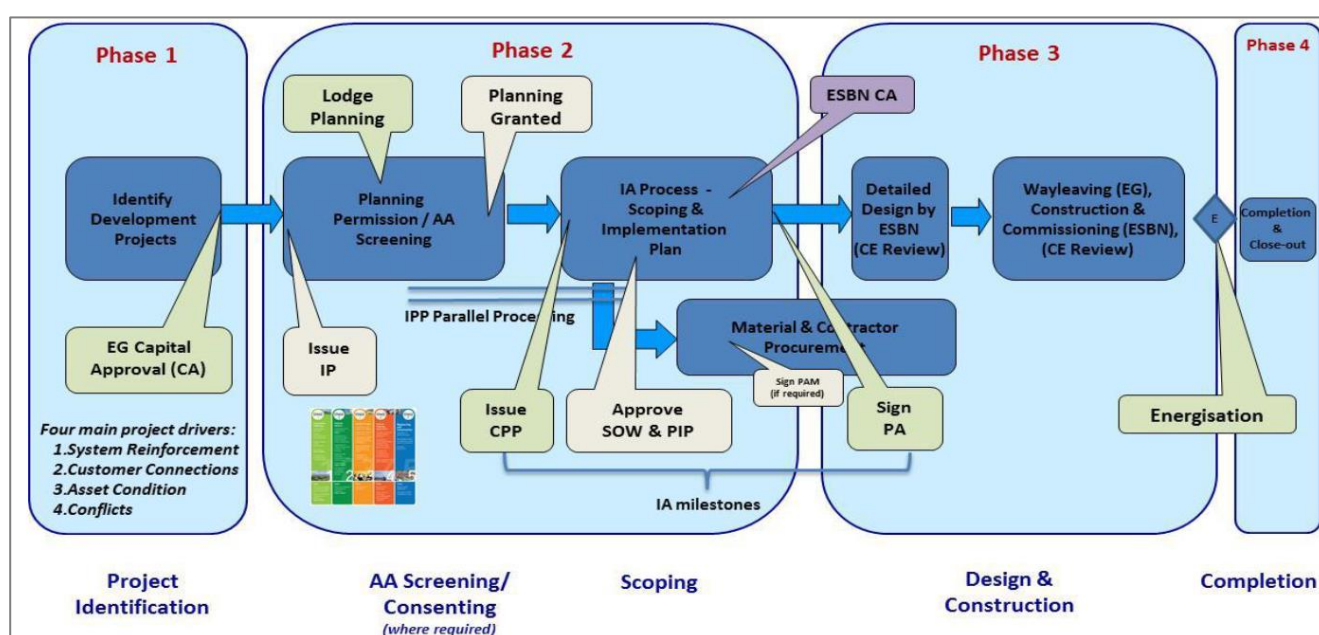
In summary, the Irish Arrangements have the effect of putting EirGrid in charge of most functions of transmission system operation in Ireland and is responsible for the day to day operation of the Irish transmission system. ESB as the TAO has a limited role regarding connections, effectively confined to carrying out the actual necessary work but does not interact with system users. In effect, the CER considers that EirGrid is responsible for the end to end planning and development of the transmission system, with ESB carrying out the role of constructing the development plan of EirGrid.

With this in mind, it should be noted that both companies are expected to work together to provide the most efficient development and delivery of the Irish transmission system.

Initially, the responsibilities outlined have tended to make the network development process overly sequential, however arrangements have been improved following discussions and projects are now progressing more quickly with respect to inter-business responsibilities and early purchase of materials, etc.

Illustrating the current transmission project lifecycle is Figure 4.5²², which highlights how whilst both EirGrid and ESBN have primary roles in specific phases (EirGrid Phase 1 & 2, ESBN in Phase 3), both companies are involved where required across all project phases.

Figure 4.5: Current EirGrid View of Transmission Project Life Cycle



4.2.2 Cost Increases & Land Access Issues

In the previous PR2 regulatory period both the TSO and TAO identified a number of significant cost pressures that impacted on project outturn capital costs. These included increases in basic material and equipment costs as well as labour rates. However, given the European and worldwide recessions resulting from the global financial crisis in 2008, which had a significant impact on Irish growth and country wide economic prospects, cost pressures during the PR3 period have been significantly reduced in comparison with PR2.

²² Obtained from EirGrid Historic PR3 Submission, Paper 5 "Network Development in PR3.pdf"

As a result, neither the TAO nor TSO has indicated that undue significant cost pressures have been experienced to date or are expected during the remainder of the PR3 regulatory period and will adversely impact on transmission project capital expenditure. This is supported by review of the actual Harmonised Index of Consumer Prices (HICP) experienced during the PR3 period, as shown in Table 4.7, which indicates that average prices have only grown by around 2.4% from the end of 2009 (start of PR3) until 2014.

Whilst it is recognised that the HICP adjustment factors can only be considered a proxy for escalation rates associated with electrical network equipment, it is nonetheless considered sufficiently representative of the general cost trends within the electricity supply industry. A further point worth noting is that the original PR3 allowances were provided in 2009 costs, and hence did not include any prospective increase in consumer / commodity price inflation over the period 2011 to 2015. As a result, since actual outturn consumer price inflation has been relatively low during PR3, there is in effect little need to “correct” the original PR3 allowance values to match the outturn inflation values as any such variances would be expected to be relatively small.

Table 4.7: Annual HICP Rates during PR3²³

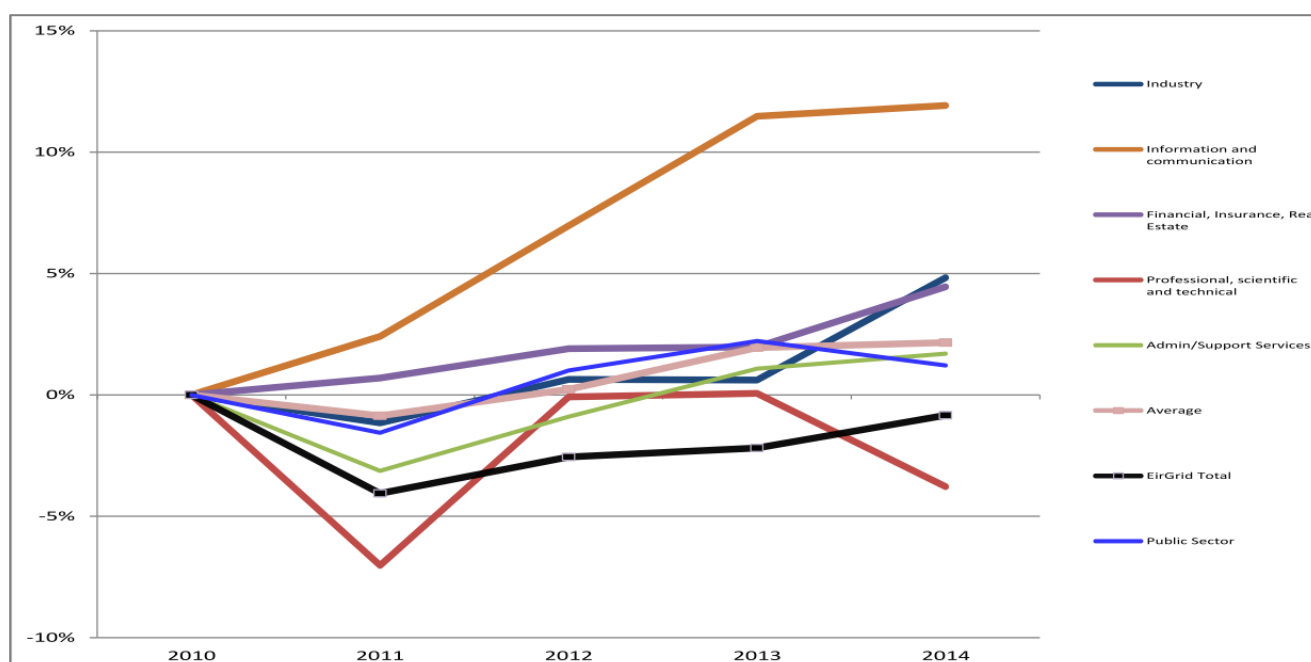
	2009	2010	2011	2012	2013	2014
HICP Annual Rate, %	-	-1.57	1.17	1.93	0.53	0.40
HICP Cumulative Rate, %	1	0.984	0.996	1.015	1.02	1.024

Further supporting the HICP data is reference to Earning and Labour costs in Ireland during PR3, as shown in Figure 4.6. This chart was originally obtained from the EirGrid Paper 3 – PR3 Overview and Look back narrative document provided with the historic submission and subsequently updated with average Public Sector costs.

Review of Figure 4.6 illustrates that average EirGrid labour costs and earnings in years 2011 to date (2014) has been lower than in 2010 as a result of a number of introduced initiatives including wage cuts and introduction of performance based and ‘at risk’ pay components for staff. Additionally, EirGrid have provided comparisons with other Irish industries sectors, demonstrating that with the exception of Information and Communication Technologies (ICT), 2014 labour costs and earnings across a range of disciplines are less than 5% higher than in 2010, with the average only around 2-3% higher, broadly in line with the above HICP index.

²³ Figures obtained from https://www.ecb.europa.eu/stats/prices/hicp/html/hicp_coicop_anr_IE_2010.en.html, with an average figure derived by averaging the twelve months in each year.

Figure 4.6: Irish Earnings & Labour Costs Data During PR3



A further cause of increased project costs during the PR2 period was found to be opposition from landowners to new constructions, particularly of overhead lines. In a number of projects this resulted in the contractors being forced to stop work. The subsequent delays during the resolution of access problems led to contractors withdrawing completely and moving on to other work with associated cost impacts relating to the closure of the work site, transport and storage of materials and security, together with the costs of re-establishing the project at a later date.

In relation to the PR3 regulatory period, EirGrid have stated that they always seek to balance the rights of land owners as well as end customers funding network development works however despite this approach land access remains an ongoing issue with respect to transmission project development. Having reviewed the information provided by EirGrid as part of their PR3 submission, plus supporting material and commentary on earlier versions of this report, we accept that obtaining land access and agreements to enable projects to proceed has added delays and costs to projects in some cases. However, in terms of the subsequent review of variations in outturn project requirements and costs (Section 4.3), little in the way of project specific information has been provided as part of the PR3 submission material. Where such information has been presented, and is relevant to specific PR3 projects, this has however been reviewed and considered within our assessment.

4.3 PR3 Project Status

4.3.1 Current Status of PR3 Projects

Of the total 419 projects in PR3 (including known and unknown at the 2009 forecast) a total of 191 were classed as completed within the PR3 period²⁴. Of the remaining projects, 40 were still at the design concept stage and a further 53 had the project agreement (PA) signed. The remaining 135 projects were at various stages of development. Figure 4.7 presents a full overview of the current project status and the associated outturn total expenditure for these projects.

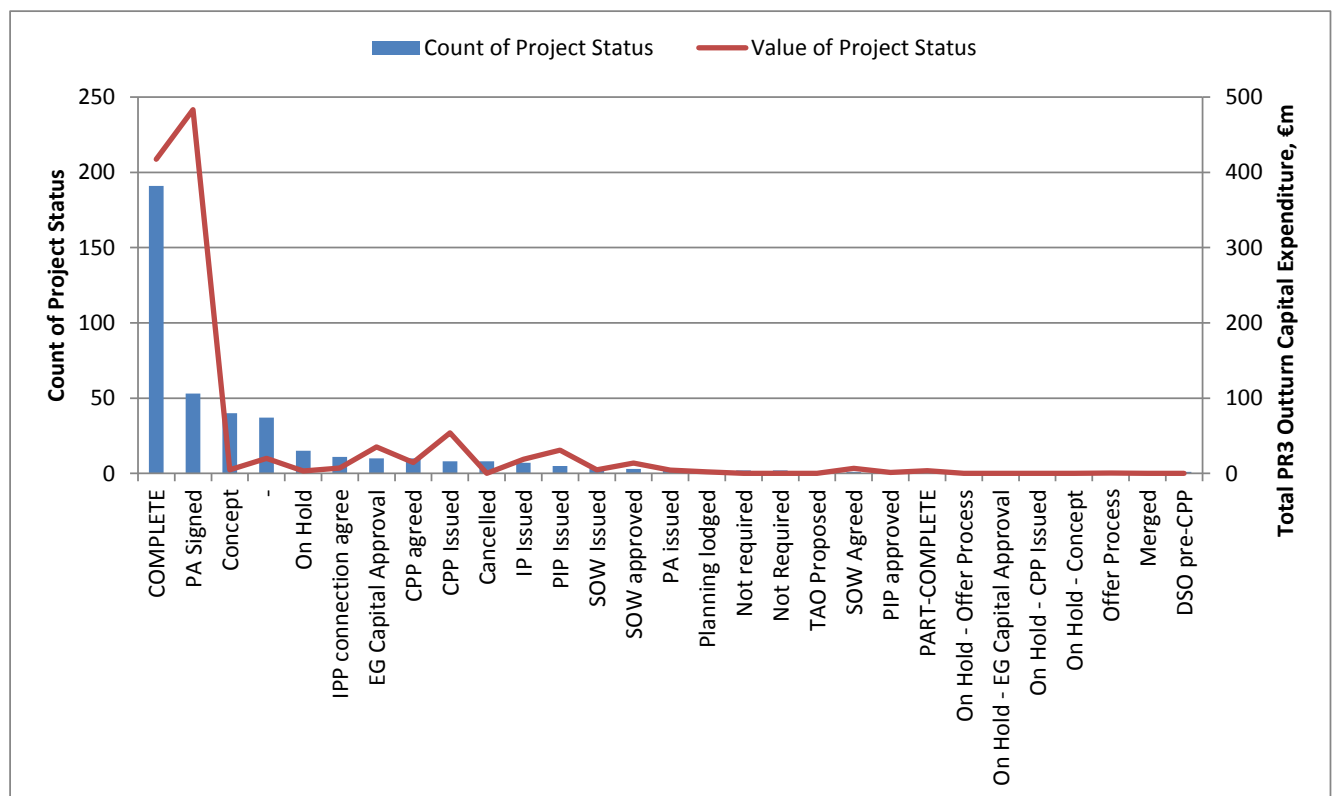
It can be seen that completed projects represent the greatest volume of projects (191 - almost half of all projects recognised at this time) with a significant proportion of the capital expenditure. Project Agreement (PA)

²⁴ Of the acronym terms used in Figure 4.7, CPP is Committed Project Parameters and is the committed project parameters and design at the end of Stage 1 activities, EG is EirGrid, IP is Indicative Programme, PA is Project Agreement, PIP is Pre-Implementation Plan and SOW is Statement of Work

represents the next greatest volume of projects (53), however with the greatest capital expenditure, approaching €500m, in the PR3 period. Further inspection illustrates that a number of new or refurbished substations represent the majority of this expenditure.

The remaining categories decrease significantly in terms of both count and value per category.

Figure 4.7: Project Status & Related Costs



4.3.2 TSO Known Projects Completed During PR3

Out of the 241 original projects forecasted (in 2009) and progressed (in the 2014 look back view), 169 have been (will be) completed within the PR3 period. The majority (88 projects) were system reinforcement projects, with a significant amount of asset condition work (48 projects) being undertaken also. It can be seen in Table 4.8 that the actual expenditure has exceeded forecast expenditure on all categories, although this has been largely offset by cost savings on two system reinforcement projects. Hence, the overall 2014 view of PR3 expenditure for the 169 completed projects is outturn expenditure 3% greater than the 2009 projected cost. Brief reasoning for variances is provided within Table 4.8.

Table 4.8 : 169 Projects Completed During PR3 and Known in Original 2009 Forecast

Driver Type	No. of Projects	2009 Cost, €m	Forecast Outturn end PR3, €m	Variance	Variance Reasoning
Asset Condition	48	48.3	64.0	32%	Diverse range of projects
DSO	12	8.3	10.8	30%	Additional costs on three projects
IPP Shallow	16	20.8	37.3	79%	Inclusive of Generic provisions
New Connection	5	34.8	40.0	15%	Additional costs on two projects
System Reinforcement	88	374.6	350.4	-6%	Cost savings on two projects

Total	169	486.9	502.5	3%	
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4.3.3 TSO Known Projects Progressed but Not Yet Complete During PR3

A similar composition of driver types for the remaining 72 projects which were forecasted (in 2009) and where some EirGrid Stage 1 activity has occurred within the PR3 period but are not completed, was observed. Table 4.9 provides details of these projects which are considered as “progressed”, to differentiate from other projects that were forecast prior to the start of PR3 which have “not progressed” i.e. have either been cancelled, or deferred or subsumed within other projects.

Note, for clarity, the term “progressed” does not relate to the issue of TSO capitalisation as discussed in Section 5.3.3, it is solely related to projects that have, or do not have, recorded capital expenditure attributed to them in the PR3 datasheets provided by the TSO for review.

Table 4.9 : 72 Projects Progressed During PR3 and Known in Original 2009 Forecast but Not Yet Complete

Driver Type	No. of Projects	2009 Cost, €m	Forecast Outturn End PR3, €m	Variance	Variance Reasoning
Asset Condition	19	124.2	70.6	-43%	Project delays and underspends
DSO	4	8.7	2.7	-69%	Project on hold
IPP Shallow	17	125.2	60.8	-51%	Inclusive of Generic provisions
New Connection	2	76.1	99.9	31%	Does not include Ballyvouskill transformer
System Reinforcement	30	904.7	281.4	-69%	Project delays
Total	72	1,238.9	515.4	-58%	

A large number of these projects (30) are system reinforcements followed by 19 asset condition related projects and 17 IPP shallow connections. These projects are not yet completed but were part of the 2009 forecast and have progressed within the PR3 period. Overall though, an underspend against the forecast expenditure of 58% (€723.5m) is seen, with significant underruns on all categories with the exception of ‘New Connections’ where a 31% increase in outturn expenditure is recorded. Reasoning for the overall significant variance (underspend) is broadly as a result of project delays and deferrals meaning completion dates have slipped in comparison with the original forecast.

4.3.4 Project Expenditure Variance

Table 4.10 details the top project variances (both under and over-spend) against original PR3 forecast. For projects that have progressed within PR3 (and were forecasted in 2009) but have an underspend against forecast, the majority are due to the project not being completed as expected. These projects are delayed or deferred and further expenditure will thus be required in the PR4 period to finalise the projects.

For projects with overspend against original forecast there are a number of reasons provided by EirGrid, including merging / deferring of original projects or implementing different projects from that originally planned. As an example, for CP0667 explanations provided by EirGrid to explain the apparent overspend are that the original 2009 forecast figure was based on an under consideration project “Inchicore – Finstown 220 kV”. Since the original forecast the actual project scope of works has resulted in a different project being implemented, “Inchicore – Maynooth”, which has a much longer overhead line route length and also includes the original project as a subset of total works along with some refurbishment works. Although the two projects (original and latest advanced) are not in essence the same, comparison and understanding of the reasons behind the variation in forecast and outturn PR3 capital expenditure is still considered relevant. This demonstrates how EirGrid have managed and evolved network development requirements over the PR3 period and further allows a degree of examination and challenge of outturn costs as a means by which to review outturn planning activity

efficiency. This is particularly useful for less straightforward projects, which are likely to have the most scope for incurring inefficient project costs given the evolving nature of the project works.

Table 4.10 : PR3 Projects with Highest Cost Variance

Project No. & Name	2009 Forecast, €m	Forecast Outturn End PR3, €m	Variance €m	Explanations Provided by EirGrid
CP0651 – Ballynahulla (East Kerry) 220 kV Station	5.9	44.9	39.0	Outturn costs include a related project CP0606 (Knockacummer Wind Farm) which had a 2009 forecast of €41.48m, but for which no actual outturn costs have been recorded directly to CP0606. Hence, apparent significant overspend against forecast is not correct view.
CP0650 – Ballyvouskil 220 kV Station	24.9	50.1	25.2	An additional project for a 400 / 220 kV transformer was included in the original PR3 submission with a total cost of €41.4m. This did not progress but it appears that elements of the work have been included under CP0650, hence the original 2009 forecast should be significantly higher although this is currently still unclear.
CP0667 – Inchicore – Maynooth 1 and 2 220 kV Line Uprate	0.9	15.7	14.8	Change in actual project advanced - as per text above.
CP0763 – Clashavoon – Tarbet 220 kV Line Uprate	5.7	19.6	13.9	Outturn costs include a related project CP0726 (Moneypoint – Knockraha reinforcement) which had a 2009 forecast of €62.11m. Total outturn costs for CP0726 at end of PR3 are forecast as €10.2m, hence both projects are well within CA approved budget (€5.67m + €62.11m = €67.78m). Hence, apparent significant overspend against forecast is not correct view.
CP0799 – Louth 220 kV Station Refurbishment/Upgrade	25.3	3.0	-22.3	Project timelines have changed. EirGrid Capital Approval obtained for this project in Sept. 2013. Only Stage 1 costs have been incurred to date. Project has obtained planning consent and Project Agreement (end of Stage 1) is expected at end of 2015. Construction is due to commence in 2016. Majority of costs will now be spent in PR4.
CP0597 - Ennis-Booltiagh-Tullabrack T Moneypoint 110kV line uprate (Reinforcement of the Ardnacrusha & Ennis area)	48.7	14.4	-34.3	Project timelines have changed due to outage constraints, hence majority of cannot commence until after connection of the new Moneypoint 220 kV & 110 kV GIS substations (CP0688), currently under construction and due to be completed in 2015. Majority of costs for CP0597 will be incurred from 2016 onwards, during PR4.
CP0399 - Moneypoint-Tarbert 220kV Cable - New Cable	51.0	3.0	-48.0	Project timelines have changed due to uncertainty over generator connections in the south west region. The majority of costs will now

Project No. & Name	2009 Forecast, €m	Forecast Outturn End PR3, €m	Variance €m	Explanations Provided by EirGrid
				be spent during PR4.
CP0585 - Loughteeog 400kV Station – New Station & Associated Lines & Station Works	70.3	14.9	-55.4	<p>Project timelines have changed as planning consent took longer than expected due to public opposition and need for wider public engagement. The planning authority (ABP) requested further information following submission of the initial planning application which led to a delay in obtaining planning consent. Following the grant of planning consent, local opposition groups appealed the decision of ABP which led to a judicial review.</p> <p>The judicial review has now been held and the decision to grant planning was upheld.</p> <p>Construction due to begin in 2015 and majority of costs will now be spent in PR4.</p>

4.3.5 TSO and TAO Known Projects Status

The prior analysis has been on the basis of the total Stage 1 invoice and Stage 2 spend total expenditures. The following analysis breaks this assessment down into the TSO and TAO expenditures. The annual breakdown of Stage 1 invoiced and Stage 2 incurred costs for the 169 projects which were known at the start of PR3 and (will be) completed within 2011-2015 are shown below in Table 4.11. Note that the 2009 costs were the original PR3 forecast costs and the 2014 costs are the latest view from the 2014 look back spreadsheet.

Table 4.11: Annual Breakdown of Costs for 169 Known PR3 Projects to be Completed within PR3

	Cost (€m)	2011	2012	2013	2014	2015	Total
TSO	2009 Stage 1 Invoice costs	€2.0	€0.3	€3.7	€1.3	€0.2	€7.6
	2014 Stage 1 Invoice costs	€4.1	€1.7	€1.0	€2.7	€1.0	€10.5
TAO	2009 Stage 2 Spend costs	€182.1	€155.3	€76.1	€32.6	€33.1	€479.3
	2014 Stage 2 Spend costs	€142.4	€134.5	€131.7	€58.0	€25.4	€492.0
TSO & TAO	2009 Total	€184.1	€155.6	€79.8	€34.0	€33.3	€486.9
	2014 Total	€146.5	€136.2	€132.7	€60.7	€26.5	€502.5

It is evident from Table 4.11 that 2014 actual Stage 1 invoicing exceeded 2009 forecast Stage 1 invoicing for completed projects, the majority of which was spent in 2011. A similar trend to that seen in Table 4.8 is illustrated whereby for known projects completed within PR3 (typically short duration), there has been a notable overspend on forecast expenditure, typically as a result of increased project costs previously unforeseen.

For the 72 projects known at the start of PR3 and progressed but not completed (see Table 4.11 for completed project breakdown) the outturn expenditure by TSO and TAO during PR3 is shown in Table 4.12.

Table 4.12: Annual Breakdown of Costs for 72 Known PR3 Projects Progressed but not Completed within PR3

	Cost (€m)	2011	2012	2013	2014	2015	Total
TSO	2009 Stage 1 Invoice costs	€24.8	€13.5	€52.8	€44.9	€8.0	€144.0
	2014 Stage 1 Invoice costs	€0.0	€1.4	€4.5	€6.3	€16.3	€28.6
TAO	2009 Stage 2 Spend costs	€76.4	€225.1	€294.1	€286.6	€212.7	€1,094.9
	2014 Stage 2 Spend costs	€4.4	€27.0	€97.8	€136.3	€221.2	€486.8
TSO &	2009 Total	€101.2	€238.6	€346.9	€331.5	€220.7	€1,238.9

TAO	2014 Total	€4.4	€28.5	€102.4	€142.6	€237.5	€515.4
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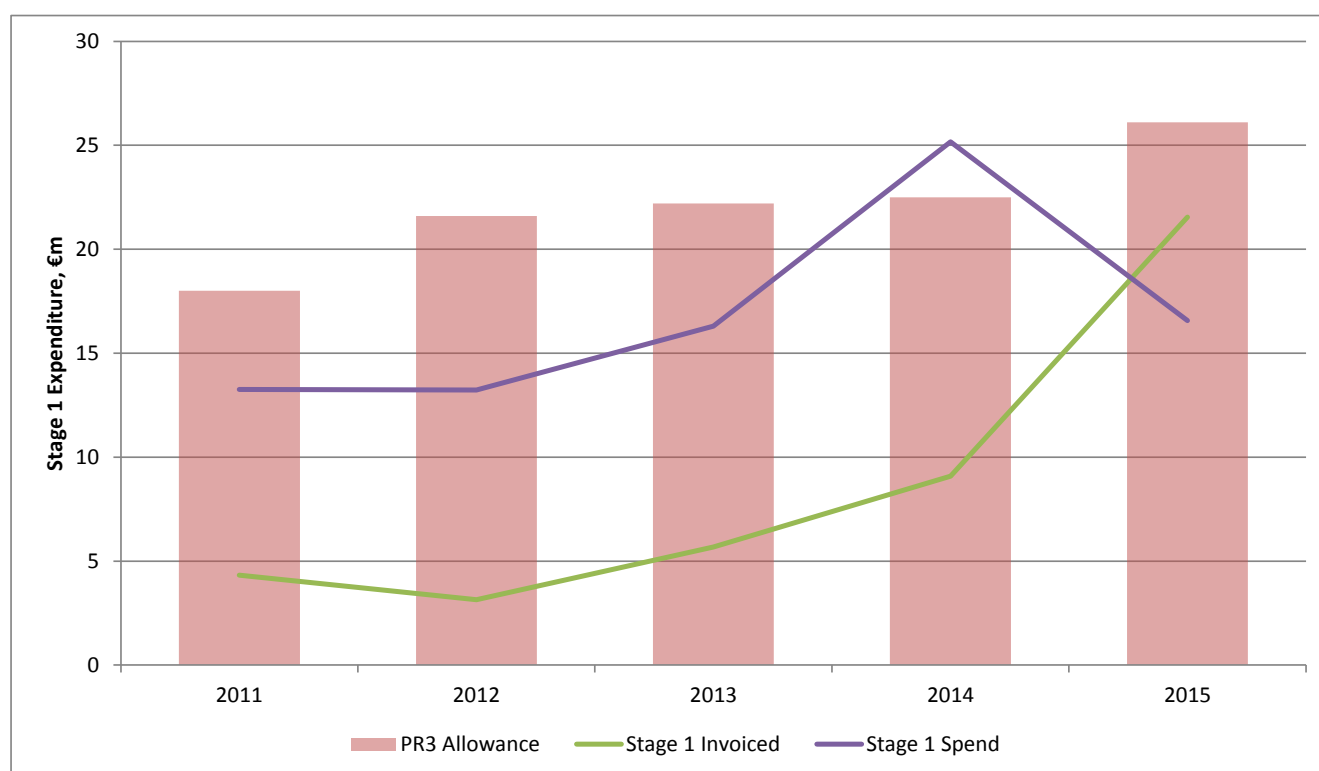
For projects which were known at the PR3 forecast and progressed but not completed, it can be seen that actual expenditure is significantly lower than the forecast expenditure for both Stage 1 invoice and Stage 2 costs, to a point where no Stage 1 invoicing in 2011 for this category of project was conducted. A level of underrun would be expected as the projects are not yet completed; however the significant variation between the forecast and outturn indicates that these projects have been significantly delayed within the PR3 period. Subsequently, it can be anticipated that the notable remaining workload of these projects will continue into the PR4 period.

4.3.6 Project Delivery Efficiency

4.3.6.1 TSO Capital Forecasting – Overall Expenditure

In order to provide further context in relation to the commentary on Stage 1 EirGrid PR3 capital expenditure, the Stage 1 invoiced expenditure during the PR3 has been considered for known projects (excludes projects unknown at the start of PR3) as shown in Figure 4.8.

Figure 4.8: Stage 1 Project Capital Expenditure During PR3



It is clear that the outturn level of invoiced expenditure is far less than forecasted in the original allowance with exception to year 2015, illustrated by the exponential rise in cumulative invoiced expenditure. This aligns closely with the number of projects which have not been progressed in the PR3 period, reflecting the deferral/delay of a large number of projects; particularly those with high levels of forecasted expenditure. Subsequently, there will be a resulting push into the PR4 period as delayed projects are progressed to appropriate project milestones as per the Infrastructure Agreement and hence invoiced to the TAO.

For reference, the outturn Stage 1 spend across the PR3 period has been included (purple line) which illustrates a closer correlation to the magnitude of forecast Stage 1 invoiced expenditure but with a broad trend matching the outturn Stage 1 invoice. What this suggests is that high levels of Stage 1 spend have occurred in PR3 as project work has progressed. However, this work has not yet reached appropriate milestones for individual projects to allow these to be invoiced which is likely to be a feature associated with the large scale, long term

projects where timescales to meet Infrastructure Agreement milestones are prolonged. The subsequent pickup in invoicing seen beyond the PR3 period and the impact of this delay between spend and invoice for the TSO is discussed further within the forecast capital expenditure report.

From the above it would appear that the EirGrid approach for project capital expenditure forecasting has been impacted by the delay/deferral of a number of large scale projects within the PR3 period resulting in outturn Stage1 invoicing costs being far lower than forecasted expenditure. This analysis aligns with the TSO underspend seen against the CER allowance as detailed in Table 4.1.

4.3.6.2 TSO Capital Forecasting – Project Variance

A total of 27 projects experience a variation larger than €0.5m in planned and forecast outturn EirGrid Stage 1 invoiced capital expenditure during PR3, of these projects only 1 was not originally included in the forecast allowance. An overview of these project variances larger than €0.5m is shown in Figure 4.9.

Further commentary in relation to the greatest variation in planned and forecast outturn EirGrid Stage 1 capital expenditure during PR3, along with EirGrid's explanation for the cost variations, are detailed in Table 4.13.

Figure 4.9: Variance of EirGrid (Stage 1) Invoiced Costs Over €0.5m

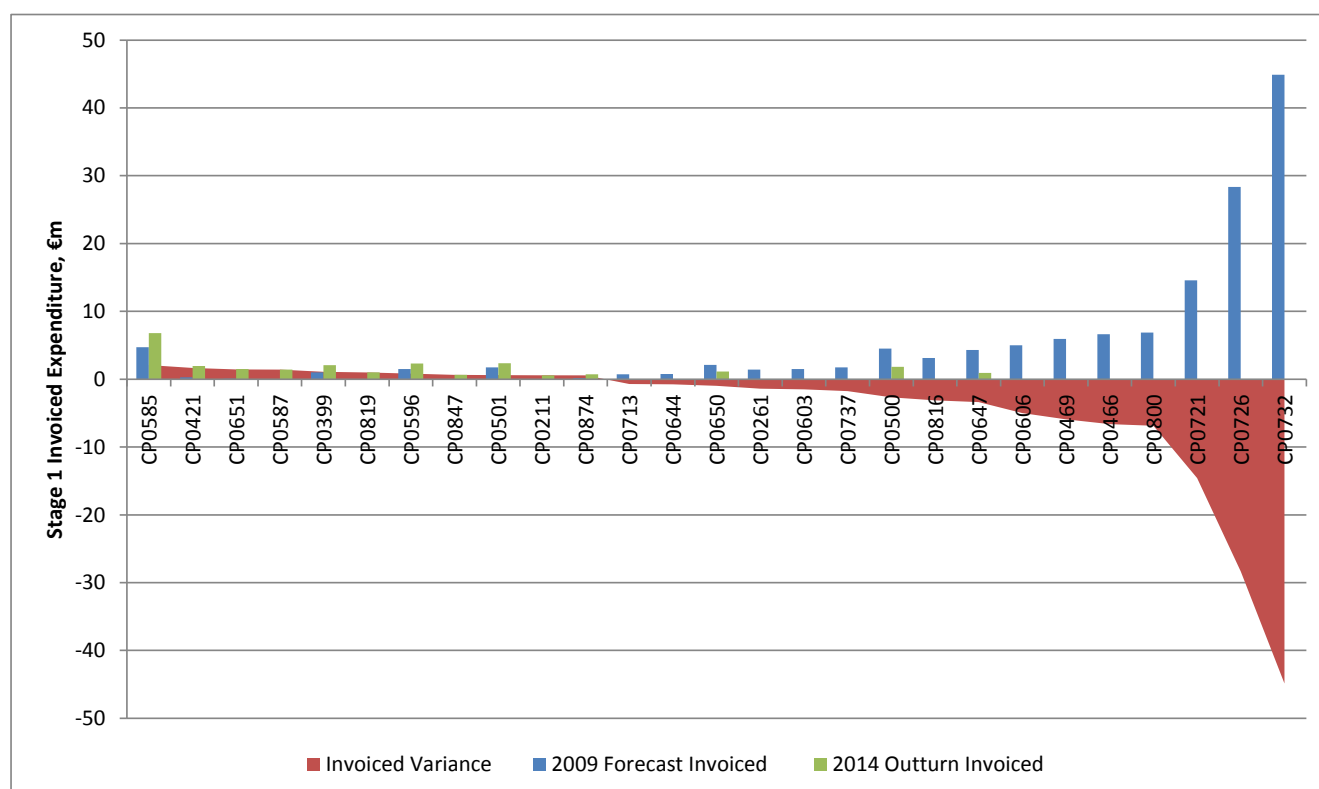


Table 4.13: Commentary on PR3 Capital Expenditure for Selected Projects

Project Number	2009 Forecast Invoiced Cost (€m)	2014 Outturn Spend (€m)	2014 Outturn Invoiced Cost (€m)	EirGrid Explanation for Variance (Provided March 2015)
CP0466 & CP0469	12.55	17.22	-	The North South Interconnector originally consisted of two separate projects CP0466 and CP0469, which have now been combined into one. The 2009 combined forecast stage 1 invoice cost for CP0466 and CP0469 was €12.55M. The project has experienced a number of delays due to requirement to resubmit the planning application, independent government review of project and ongoing discussions with An Bord Pleanála (ABP) on the draft application requirements

Project Number	2009 Forecast Invoiced Cost (€m)	2014 Outturn Spend (€m)	2014 Outturn Invoiced Cost (€m)	EirGrid Explanation for Variance (Provided March 2015)
				<p>following the designation of this project as a PCI. CER have been kept informed of these delays via the Quarterly CAPEX Monitoring Process,</p> <p>It was originally predicted that the majority of the project spend would be invoiced (capitalised) within the PR3 period, the project cost of €28.3m to date is now expected to be capitalised within the PR4 period.</p>
CP0732	44.9	15.60	-	<p>CP0732 (Grid Link) project timelines have changed due to independent government review of the project by the IEP, which has led to an 'underspend' vs. the PR3 forecast.</p> <p>It was originally predicted that the majority of the project spend would be invoiced (capitalised) within the PR3 period however the project has not yet reached the PA milestone at which EirGrid can invoice costs to ESBN.</p>
CP0800	6.9	5.80	-	<p>CP0800 (North West Project) has been delayed due to uncertainty over generation connection development, which has led to an underspend vs. the PR3 forecast.</p> <p>It was originally predicted that the majority of the project spend would be invoiced (capitalised) within the PR3 period however the project has not yet reached the PA milestone at which EirGrid can invoice costs to ESBN.</p>
CP0726	28.4	2.80	-	<p>CP0726 (Moneypoint Knocknure 220 kV Cable) – This project was originally a 400 kV overhead line project between Moneypoint and Knockraha (circa 150 km) which was optimised into a 26 km 220 kV cable due to reductions in demand and generation connections. This has led to a large underspend (circa €25m) in Stage 1 costs vs. the PR3 forecast.</p> <p>It was originally predicted that the majority of the project spend would be invoiced (capitalised) within the PR3 period however the project has not yet reached the PA milestone at which EirGrid can invoice costs to ESBN.</p>
CP0721	14.6	9.34	-	<p>CP0721 Grid West – The project timelines have changed due to independent government review of the project by the IEP, which has led to an underspend vs. the PR3 forecast.</p> <p>It was originally predicted that the majority of the project spend would be invoiced (capitalised) within the PR3 period however the project has not yet reached the PA milestone at which EirGrid can invoice costs to ESBN.</p>
CP0501	1.76	1.26	2.40	<p>CP0501 Clashavoon Dunmanway – EirGrid's original Capital Approval (€1.76m) in 2006 was for Stage 1 costs only. An uplift of €600k was approved in February 2013, bringing the CA total to €2.4m.</p> <p>€1.26m has been spent on the project to date, however by the end of 2015 (end of PR3 period) we expect to spend and invoice the full CA amount of €2.4m.</p>

Based on the EirGrid commentary provided in Table 4.13 the following conclusions can be made:

- Planning consent will continue to cause issues for project scheduling, measures must be carried out to alleviate these issues for new projects in the PR4 period.
- Public consultation is likely to result in changes to the project scope, this feedback will require additional planning studies to be undertaken costing both time and money. This should be accounted for when planning new projects in the PR4 period.
- Given EirGrid's current view of timeline project development, which appear optimistic on the basis of outturn experience to date where a significant amount of projects suffer from planning and consent delays, the accuracy of future project development timelines must be improved. Although unavoidable in some cases, these delays must be factored into the project planning timeline in order to work with a realistic expectation of project development and capital expenditure delivery.

- Ongoing expenditure as a result of planning and consenting activities is noted, however without suitable invoicing milestones (part of the existing Infrastructure Agreement), this expenditure is not being capitalised in a sufficient time. Significant project underspends against the forecast expenditure within this period with regard to invoicing are therefore being indicated, however expected capitalisation (invoicing) in future regulatory periods (e.g. PR4) is expected to be significantly above actual outturn expenditure, essentially skewing this assessment.

4.3.6.3 TAO Asset Delivery

It is appreciated that the outturn expenditure and subsequent asset delivery has differed significantly from the forecast primarily as a result of project delays and deferrals. Therefore, to provide a view on asset delivery efficiency it would be necessary to compare the assets forecast to be delivered against those actually delivered to provide a comparable view of expenditure against asset delivery, even if the projects have differed significantly.

Unfortunately, no asset list has been provided from the 2009 forecast and subsequently there is no basis on which to compare the volume/type assets forecast to be delivered against those actually delivered and the relevant expenditures. Consequently, based on the information provided, it is not possible to provide substantiated conclusions on asset delivery efficiency with regard to assets delivered for value.

Furthermore, the data provided is incomplete with respect to forecast and actual PA and energisation dates with a significant number of projects reflecting a blank assessment. The magnitude of incomplete data is summarised in Table 4.14 with reasoning provided by EirGrid.

Table 4.14 : Incomplete PA and Energisation Forecast and Actual Data

Missing Records	2009 Forecast	2014 Lookback	EirGrid Explanation for Missing Records (Provided March 2015)
Project Approval (PA)	154	67	109 of the 154 projects in 2009 with missing PA dates were either a) provisions, b) projects under consideration or c) projects unknown at the time of PR3. It was therefore not possible for us to forecast PA dates for these projects at the time. Several of these projects were under review at the time due to reductions in system demand and uncertainty over generation connections which made it very difficult to forecast PA dates. Of the 67 projects with missing PA dates in the 2014 lookback, 20 are DSO/IPP projects which are difficult to forecast due to the uncertainty around new connections. 19 are Minor Capitals/Grouped Projects with more than one PA date. The 28 remaining projects should have had PA dates included.
Energisation	31	65	4 of the 31 projects were either a) provisions, or b) projects unknown at the time of PR3. The remaining 27 projects should have had an Energisation date included. Several of these projects were under review at the time due to reductions in system demand and uncertainty over generation connections which made it very difficult to forecast dates. Of the 65 projects with missing energisation dates in the 2014 lookback, 18 are DSO/IPP projects which are difficult to forecast due to the uncertainty around new connections. 21 are Minor Capitals/Grouped Projects with more than one PA date. The 26 remaining projects should have had energisation dates included.

The level of incomplete data prevents the ability to conduct a substantiated project progression review across all projects²⁵, limiting any conclusions that can be drawn with respect to overall project delays attributed primarily to the TSO (time to project approval) or TAO (time to energisation).

²⁵ Where data has been available, comparisons have been drawn as seen in Section 4.3.2 and Section 4.3.8.2 (Data derived from Grid25 documentation), however an overall assessment is limited.

4.3.6.4 TAO Asset Unit Costs

As part of the TSO forecast PR4 submission, unit cost data for PR3 has been provided for a range of transmission equipment. Included is the 2011 (year 1 view) on Stage 2 PR3 costs along with the latest 2014 (year 4 view) on Stage 2 costs. Many of the assets unit costs have remained unchanged however a number have changed in the latest 2014 view. These are shown in Table 4.15.

Note that no costs are shown in Table 4.15 for Stage 1 (EirGrid) costs in 2014 as these remain unchanged from the earlier 2011 values.

Table 4.15: TAO Stage 2 Unit Costs

Equipment	2011, €m	2014, €m	Variance
220/110 kV 250MVA Transformer	6.00	4.60	-23.3%
400/220 kV 500MVA Transformer	9.04	7.45	-17.6%
400/110 kV 500MVA Transformer	8.64*	7.10	-17.8%
220/11 kV Substation Double Bus	26.16	25.93	-0.9%
400 kV Circuit Bay	1.83	1.71	-6.6%
110 kV Circuit Bay	0.68	0.98	+44.1%
110 kV 200 mm ² ACSR Line Uprate to HTLS	0.14	0.12	-14.3%
110 kV 200 / 300 mm ² ACSR Uprate to 425 mm ² ACSR	0.25	0.28	+12.0%
400 kV 2 x 600 mm ² ACSR Line New Build	1.53	1.76	+15.0%
220 kV XLPE Cable	2.24	2.04	-8.9%
2 x 110 kV XLPE Cable Circuits	1.62	1.35	-16.7%

* 250 MVA transformer cost

From review of Table 4.15 it is evident that the majority of equipment types where unit costs have changed between 2011 and 2014 have experienced a reduction in cost with only two overhead line types in addition to 110 kV circuit breaker bays experiencing any positive increase. Furthermore, although it is not entirely clear, it appears as though the significant increase in 110 kV circuit bay costs (+44%) is because the 2011 quoted value is for a single busbar circuit design whereas the 2014 value is for a double busbar circuit design. If the questionable 110 kV circuit breaker bay cost is excluded from the total, the average cost change over the other ten equipment items is circa 8%.

Recognising that the actual project work undertaken in PR3 will include a mix of the above equipment plus other equipment where no equipment unit cost changes have been reported, it is nonetheless considered that overall Stage 2 project costs are likely to have dropped around 5% over the PR3 period. It remains unclear whether this reduction in asset unit cost is a genuine efficiency saving obtained through enhanced asset procurement strategies or indeed through more efficient project management and delivery.

4.3.7 Review of Project Scheme Paper Forecasting

As part of the historic capital expenditure submission, EirGrid provided a range of internal scheme papers authorising expenditure for Stage 1 planning activities. These scheme papers have been reviewed for a total of thirteen projects. Six projects included only Stage 1 costs, which have been compared with the 2014 look back plan expected invoiced costs for PR3, as shown in Table 4.16.

Note that Table 4.16 shows the outturn actual invoicing costs up to the end of PR3 regardless of regulatory period incurred i.e. not just in PR3.

Table 4.16: TSO Stage 1 Cost Comparison with Scheme Papers

Project No.	Project Name	Scheme Paper	2014 Latest Best Total Stage 1 Estimate	2014 Latest Best Estimate of Stage 1 Costs at End of PR3	2014 LB Total Stage 1 Estimate and Scheme Paper Variance	
		Forecast (€m)	Total (€m)	(€m)	(€m)	%
CP0721	Grid West	15.30	15.50	9.34	0.20	1.31
CP0726	MP – Knockanure Cable	5.70	5.80	2.82	0.10	1.75
CP0796	Knockraha Station Refurb.	0.58	0.58	0.34	0.00	0.00
CP0054	Ardnacrusha Station Refurb.	0.44	0.22	0.22	-0.22	-50.00
CP0794	Aghada 220 kV Station Busbar Reconfig.	0.21	0.22	0.07	0.01	2.38
CP0686	Replace CBs Wexford 110 kV Station	0.02	0.003567	0.003567	-0.0019	-85.00

The variance from the initial project cost as predicted in the scheme papers and the Stage 1 invoice costs are reasonably minimal with the exception of CP0054 where 50% of costs have been incurred in the PR3 period (or forecast beyond the period) and CP0686 where only 15% of the forecasted expenditure has been (or is currently forecasted to be) capitalised. Each of these projects have now been complete or reached PA and no additional Stage 1 expenditure will be incurred. The underspend on forecast expenditure is as a result of the original project scope being much more complex than the actual outcome.

In addition to the reviewed project scheme papers that contained only Stage 1 planning costs, seven other scheme papers were provided that contained forecasted cost data for both the Stage 1 (TSO) and Stage 2 (TAO) costs as shown in Table 4.17 .

Table 4.17: TSO & TAO Stage 1 & 2 Cost Comparison with Scheme Papers

Project No.	Project Name	Scheme Paper Forecast (€m)	2014 Latest Best Total Stage 1 & 2 Estimate (€m)	2014 Total Stage 1 Invoiced and Stage 2 Spend at end of PR3 (€m)
CP0732	Grid Link	547.00	547.00	0.00
CP0800	North West	182.00	198.54	0.00
CP0816	North Connaught 110 kV Project	27.50	31.00	0.00
CP0872	West Dublin 220/110 kV Station	91.70	91.65	0.00
CP0624	Killonan 220 kV Station	32.90	33.41	10.32
CP0799	Louth 220 kV Station Refurb/Upgrade	29.70	29.88	2.97
CP0772	Sligo 110 kV Station Busbar Upgrade	1.75	2.10	2.10

It is evident that the bulk of the Stage 1 invoice and Stage 2 spend for these projects is expected to occur after PR3. This is particularly evident for projects CP0732 (Grid Link), CP0800 (North West Project RIDP Phase 1), CP0816 (North Connaught Line) and CP0872 (West Dublin 220/110 kV Station) where no Stage 1 capitalisation or Stage 2 spend has occurred, and provides further demonstration of the lengthy time period required to develop the largest capital transmission projects. Expenditure greater than the scheme paper forecast is seen for CP0772 with reasoning given that costs increased as a result of planning applications being required for this development which were not originally anticipated.

4.3.8 Variations in Project Delivery Timescales

4.3.8.1 Commentary on PR3 Delivery Environment

Reviewing the narrative documentation provided by EirGrid as part of the PR3 Historic submission as well as other supporting documentation has highlighted how a large part of the discrepancy between the 2009 PR3 forecast project list and capital spend profile and the 2014 PR3 look back plan is a result of changes in planned projects and delays against the forecasted timeline. EirGrid has identified a range of contributing factors which are claimed to have caused delays in project development and implementation which were not foreseen in the original 2009 PR3 forecast. These include:

- Changes in project drivers – includes reduction in system demand, uncertainty over generation connection development
- Changes in statutory frame work – including designation of EirGrid as a “Public Authority” responsible for Appropriate Assessment impact of new projects on wildlife and habitats, requirement to follow Section 4 Planning and Development Act for certain overhead line uprating schemes
- Changes in environment – including requirement for wider public engagement with transmission infrastructure developments
- Changes in solutions – this includes re-visiting proposed transmission project solutions through the Stage 1 process if underlying project drivers change, in order to ensure that the optimum solution can be implemented although this may introduce delays.

Of the above factors cited by EirGrid in relation to variations to the planned and outturn transmission project portfolio during PR3, changes in system demand and generation uptake are clearly external factors that are beyond the control of EirGrid. The other cited factors are also responsible for delays in project development and resultant changes in the outturn PR3 project mix although they are, to some extent, able to be influenced by EirGrid activities i.e. proactive stakeholder engagement and communication with respect to network development projects may facilitate subsequent planning consenting and project approvals. However, it is currently unclear how the above factors (excluding demand and generation uptake) have been influenced by EirGrid activities to date in order to progress project developments further during PR3, and ultimately whether a different outcome could have been achieved if different actions and initiatives had been implemented.

It has also been identified that the most significant factor causing the divergence in the outturn capitalised spend from the revised forecast is the advancement of the North South Interconnector Project (Project CP0466 & CP0469). It was originally predicted that the majority of the project spend would be invoiced (capitalised) within the PR3 period, the TSO expected project cost of €28.3m is now expected to be capitalised within the PR4 period. Delays have resulted due to EirGrid withdrawing the original planning application due to errors associated with the overhead line tower heights in 2010. This was followed then by a period of internal replanning and drafting of a new application, while more recently discussions between EirGrid and An Bord Pleanála (ABP) on the draft application requirements following the designation of this project as a PCI and the requirements therein, have also contributed to delays. It is expected that the final application will be submitted by EirGrid in the second half of 2015. The cumulative impact however is a greater than four years delay in this project (on top of delays experienced in the PR2 period) as well as the cost impact associated with these delays and the requirement to develop and submit a new application. Given that Jacob’s understands that one of the key drivers for this project is to resolve an ongoing transmission network constraint which is costing customers in Ireland €10m’s per annum, then the overall costs of the delays in this project are significant. Accordingly it is appropriate that EirGrid should share some of these cost impacts, rather than expecting the customer to pay for this inefficiency.

As part of the engagement process through this PR3 review, EirGrid have been asked to provide further details with respect to re-working costs associated with North-South Project planning application re-submission. Specific details have not however been forthcoming and EirGrid have stated that it is up to CER to “consider and assess whether project expenditure is efficiently or inefficiently incurred”. As EirGrid have not provided their own view as to the magnitude of re-working costs in relation to the North-South Project planning application, a proportion of the incurred costs following the original planning application withdrawal has been deemed inefficient investment associated with reworking and resubmission and hence disallowed.

Reviewing the EirGrid Stage 1 planning costs incurred over the PR3 period it is evident that actual costs incurred on the project (CP0466 & CP0469) are as follows:

- 2011: €4.847m
- 2012: €2.128m
- 2013: €3.421m
- 2014: €4.923m*
- 2015: €1.904m*

* Estimated values included in 2014 Lookback Spreadsheet provided by EirGrid




Based on the above, the additional Stage 1 project costs expected by EirGrid to be incurred over the period 2011 to 2015 on the North-South project total €17.223m. Whilst it is accepted that not all of the additional costs incurred over this period will be as a result of reworking of the original planning application e.g. some additional costs have been incurred as a result of the project PCI designation, inevitably there has been some unnecessary costs incurred that would have been avoided had the first planning application not been withdrawn in 2010. Given that based on the latest data provided in the 2014 PR3 Lookback spreadsheet, costs for 2014 and 2015 remain as estimates, a proportion (50%) of the incurred costs in years 2012 and 2013 has been deemed as inefficient investment (€2.755m) and hence disallowed. This totals around 16% of the expected total 2011-2015 project costs presented in the 2014 Lookback PR3 view.

4.3.8.2 Project Design and Implementation

In relation to the general transmission project lifecycle, two main delays can occur; the delay between the initial expected project completion date at the start of EirGrid planning studies (Stage 1) and the point at which agreement on a project has been reached and the project handed over to ESBN (as TAO) at Stage 2; and the second is the delay from project handover (from TSO) to project completion, including through the construction stage.

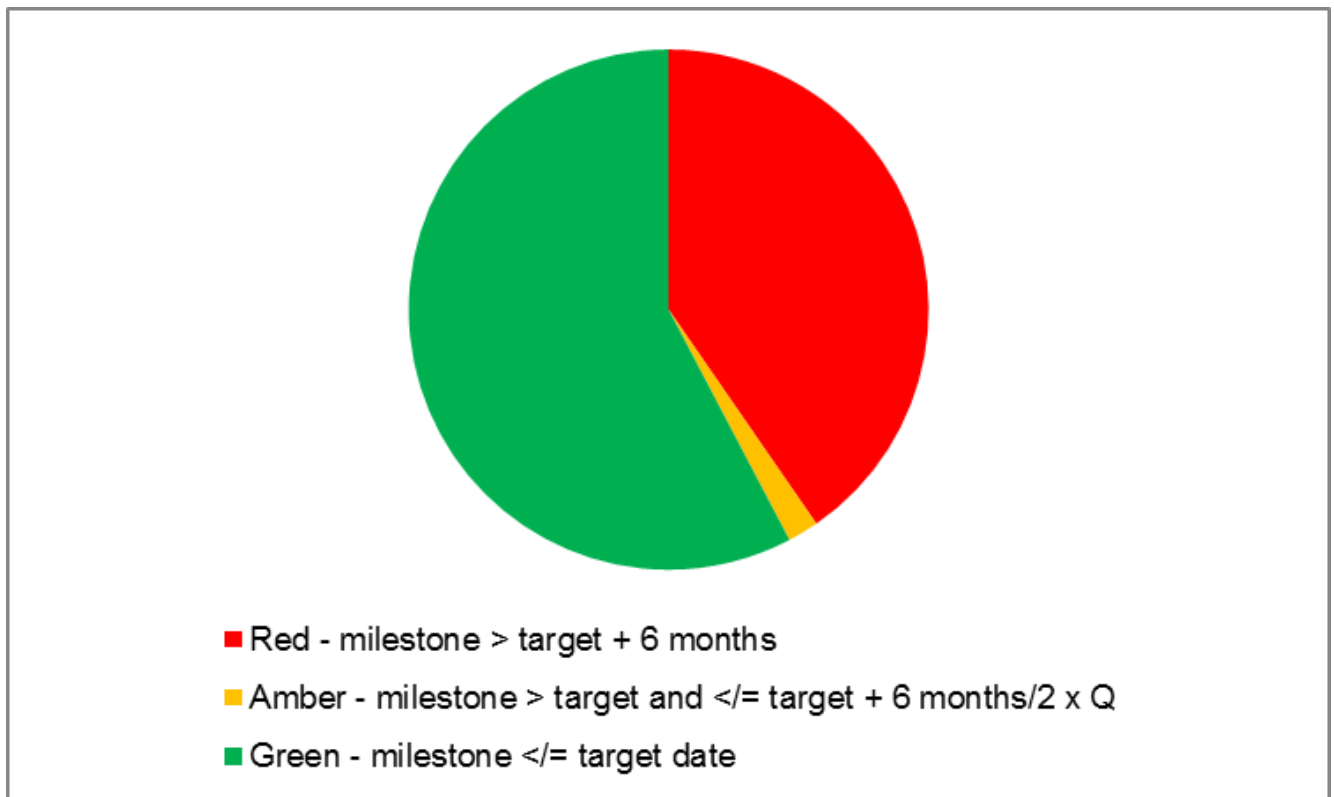
In order to identify the extent of the actual delays that have affected transmission project development during PR3, the status of all transmission projects with a total capital expenditure over €10m has been extracted from the "Grid25 Capex Monitoring Report Q3-14" for review. EirGrid use this data to provide a summary view of determining whether a transmission development project is on time with regards to key delivery milestones, known as the RAG (Red, Amber, Green) rules as shown in Table 4.18.

Table 4.18: RAG Status Rules

Schedule - RAG Status Rules	
When milestone \leq target date	
When milestone $>$ target and \leq target + 6 months/2xQ	
When milestone $>$ target + 6 months/2xQ	

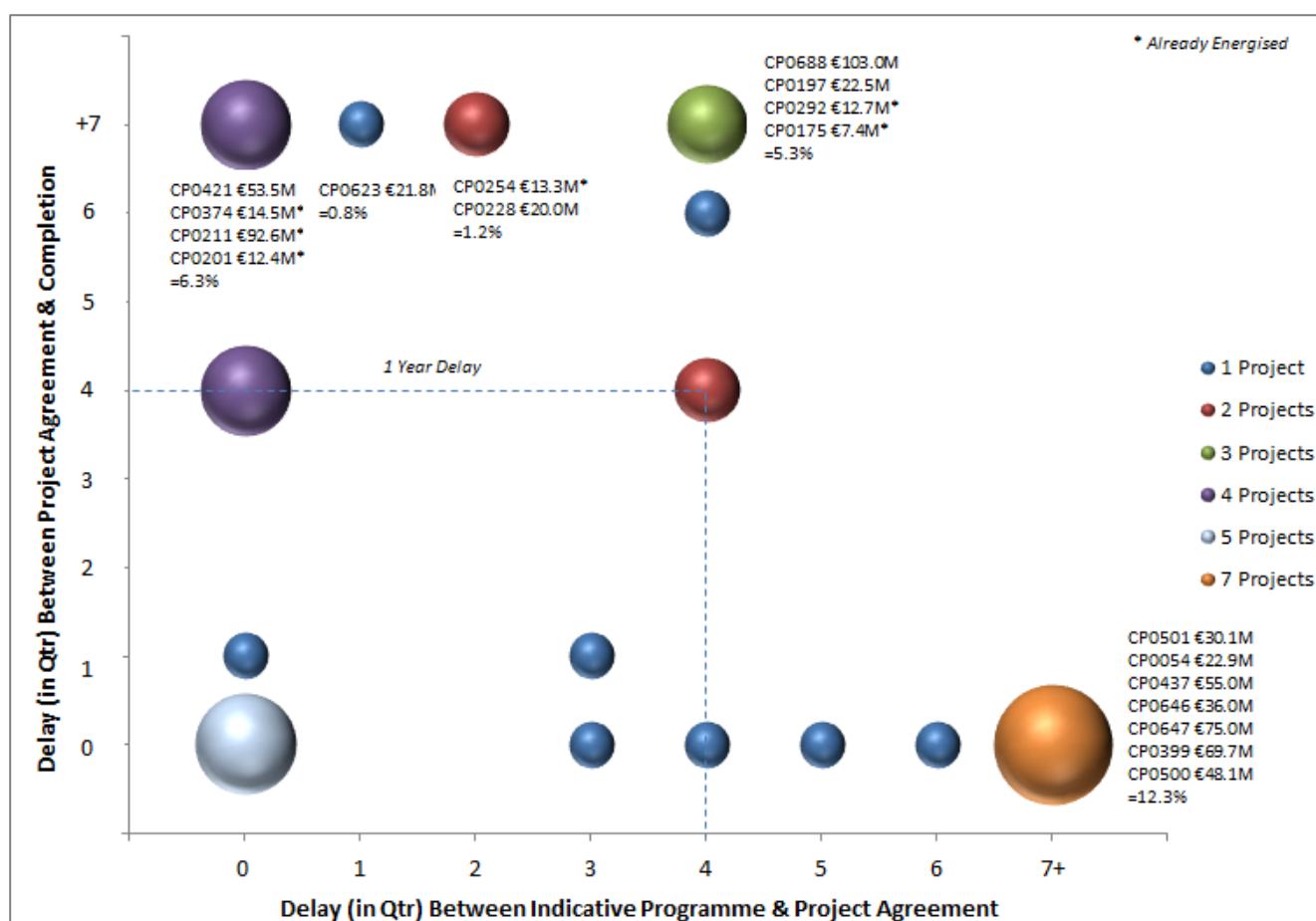
Out of the 52 projects which are detailed in the "Grid25 Capex Monitoring Report Q3-14" document, over half of the projects milestones are within the scheduled target date, as shown in Figure 4.10, although 21 projects are more than 6 months behind schedule.

Figure 4.10: RAG Schedule Status from Q3 2013 Capex Monitoring Report



However, whilst the EirGrid RAG status provides a regulatory compliance based view of project delivery schedule and status, this method allows the projects to be seen as more efficient with regards to the project delivery schedule. As a result, we have reviewed the underlying data contained within the “Grid25 Capex Monitoring Report Q3-14” to ascertain the delay in quarters between those major transmission projects with both an Indicative Programme and Project Agreement in place, as these milestone tasks cover both the EirGrid and ESBN (as TAO) activities over the project development period. The results are shown in Figure 4.11 and identify the delay in the estimated completion date (in quarters) between project inception and the time of Project Agreement with ESBN (X-axis) and similarly, the delay in estimated completion date between Project Agreement and final forecast completion date (Y-axis).

Figure 4.11: Delays in PR3 Transmission Projects Development



It is evident from Figure 4.11 that of the 35 considered major transmission projects, the majority (27 – 77%) of projects shown have experienced a delay longer than one year in final expected project completion date associated with either project progression to the Project Agreement stage, or from Project Agreement to actual forecast completion. Indeed, only five projects are expected to proceed from initial project inception to final project delivery and completion on time, an on time delivery rate of 14%.

Additionally, some projects were found to progress through the initial planning submission phase without delay but suffer from a prolonged delivery and construction phase such as CP0421 (Binbane – Letterkenny 110 kV OHL) and CP0211 (Srananagh 220 kV substation). Conversely, some projects undergo a lengthy project inception and planning phase but proceed to completion quickly once appropriate approvals and consents are in place such as projects CP0054 (Ardnacrusha 110 kV substation development), CP0647 (Kilpaddoge 220/110 kV substation) and CP0399 (Kilpaddoge – Moneypoint 220kV cable). Finally, some projects may experience delays in both the project inception and planning stage as well as the project delivery and construction phase such as CP0688 (Moneypoint redevelopment – dependent on generation outages), and hence results in a final completion date which is significantly later than the initial forecast.

It therefore appears that of the 35 ongoing projects assessed as part of Figure 4.11, the majority suffer from significant delays at some stage in the project identification, planning, agreement and delivery process, even accepting that some of the issues with the outlined projects may not have been foreseeable. This raises questions over the underlying project needs case and justification of project timelines included in internal approval cost papers as well as the previous PR3 price control submission material. It is appreciated that these projects represent those forecast with a capital cost in excess of €10m and are therefore by their nature the larger and more complex projects. Subsequently, inefficiencies as a result of delays to these projects are likely to have a greater financial impact on final delivery cost (e.g. unit cost increases, further consultations required etc.) and close monitoring and cost control of these projects is particularly important.

As a result, given the track record to date it is considered that the TSO / TAO should demonstrate that the lessons learnt from transmission system development in PR3 have been incorporated, or otherwise specific actions undertaken to improve processes, in order to present a more realistic network development during PR4. This will necessitate both businesses providing detailed supporting evidence to support their actions and demonstrate that appropriate internal activities have been undertaken to facilitate the continued and timely delivery of projects as far as possible within their capabilities. Appropriate incentives may also need to be considered for both TSO and TAO during PR4 in order to elicit improved outcomes for future projects and provide an element of project risk and cost sharing between the businesses and end consumers.

4.4 Review of Non-Network Capital Expenditure

When EirGrid submitted its capital expenditure forecast in 2009, the full scope of the potential synergies between SONI and EirGrid were still to be identified, which would have included expenditure on non-network capital equipment. Additionally, we are of the view that prudent investment during the current price review period, above and beyond that foreseeable in 2009, may also deliver operating cost savings and a lower capital expenditure requirement in the subsequent regulatory period depending on the nature of the expenditure.

On corporate system integration, EirGrid state that a review identified that substantial operating cost savings will be achieved by consolidating EirGrid and SONI systems into a single system across both businesses. However, due to the timing of these projects, the majority of these cost savings or efficiency benefits will not be realised until the start of PR4. EirGrid stated that they have included for all such efficiencies in their PR4 submission and this has been reviewed as discussed in Section 5.3.4.

Table 4.19 below shows the actual Non-Network capital expenditure over the PR3 period year on year and the forecast expenditure as submitted by EirGrid prior to the start of PR3. The review in 2009 recommended allowing the EirGrid forecast less a 2% efficiency target.

Table 4.19: Outturn TSO Non-Network Capital Expenditure During PR3

IT Category:	PR3 Allowance 2009	PR3 Allowance Indexed	Actual Spending Out-turn (2013 prices)					Total
			2011 €m	2012 €m	2013 €m	2014 €m	2015 €m	
Fundamental ICT Infrastructure								
Telecoms								
SCADA/Metering Connections and Hardware			1.7	2.8	2.3	2.1	2.1	
Telephony								
IP Migration Implementation Projects								
Power Systems Replacement								
Sub Total Telecoms	16.1	16.3	1.7	2.8	2.3	2.1	2.1	11.0
IT								
IT Hardware			2.1	0.3	0.1	1.3	1.1	
IT Security and Network								
Standard Desk Top Environment								
Data Centres								
General Upgrades								
Operational IT Software				0.2		0.4		
Provision for Unknown Projects								
Additional CER Allowance IDT €0.6m 2012								
Sub Total IT	4.2	4.3	2.1	0.6	0.1	1.7	1.1	5.6
Transmission Control Systems								
Control Centre Systems			0.1	0.4	2.7	1.4	1.5	
Economic Dispatch & Unit Commitment					0.1	0.5		
TSO Interconnector Integration								
Additional CER Allowance EMS Priority Dispatch €0.2m 2013								
Sub Total Transmission Control Systems	3.6	3.6	0.1	0.4	2.8	1.9	1.5	6.6
Applications								
TSO Business Applications			0.2	0.9	1.3	1.7	0.4	
Project Management & Support							0.1	
General Applications				1.5	0.7		0.7	
IS Applications / Other								
Unknown Projects								
Additional CER Allowance IDT €0.6m 2012								
Sub Total Applications	6.2	6.3	0.2	2.4	2.0	1.7	1.2	7.5
Additional Allowances during PR3								
TOTAL IS CAPEX	30.1	30.5	4.1	6.2	7.2	7.4	5.8	30.7
Total less Telecoms		14.2						19.7

The overall outturn PR3 capital expenditure across all categories broadly equates to the allowed revenue. However, variations are evident in the telecoms costs over €5.5m below forecast due to a reduction in the anticipated level of connections and changes to the SCADA metering and connections hardware. Facilities expenditure was €1m below forecast, due to not carrying out works on fitting out additional office space.

The reductions are offset by a 40% increase in the forecast IT expenditure with an outturn of €19.7m against a forecast of €14.2m. The expenditure has been across all areas of general hardware, control systems, and TSO business applications. EirGrid have noted that this additional expenditure was due to a number of factors including investing in the network to manage increasing renewable wind generation, accommodating European policy and legislative requirements as well as standardising solutions. Further discussions with EirGrid have revealed that the view is such that this expenditure would have been required, regardless of the reduced expenditure against the forecast for telecoms resulting in total expenditure broadly aligning with the forecast. Reference is made to PR3 Decision Paper (CER/10/206) which noted that the PR3 period posed considerable uncertainties due to the quickly evolving IT environment and possible further harmonisation with SONI.

Furthermore, there was an appreciation that the allocation for unidentified projects within the PR3 forecast was low.

It is therefore appreciated that expenditure above the forecast in these areas has occurred as a result of evolving requirements not previously known in the PR3 forecast. However, EirGrid state that the organisation has made significant savings by combining the buying power of EirGrid TSO, SONI TSO and SEMO (Market Operator) for software licensing and its recent hardware tender. Future operational expenditure savings would therefore be expected in the forthcoming PR4 period following this harmonisation.

4.5 Conclusion from Historic PR3 Review

Having reviewed the information provided by the TSO (and TAO) in the previous sections of this report, a set of conclusions and findings are now presented to summarise the overall position in relation to the historic PR3 submission. The findings are based on the information provided by the TSO (and TAO) as part of the historic submission plus supplementary information provided in response to questions during the review process as well as commentary and discussions relating to earlier draft versions of this report.

4.5.1 General Observations

The purpose of this review of historic TSO PR3 capital expenditure has been to assess and compare the levels of incurred expenditure against network operational and investment needs over the PR3 period and to analyse, comment on and make recommendations on efficient project and asset delivery in line with industry best practice. In order to undertake this exercise and produce meaningful conclusions, the data and information provided by the TSO (and TAO) needs to provide sufficient justifications for actual project capital expenditure incurred to date, including documentation and explanation of significant variations and changes as a result of both internal and external influences.

It is inevitable throughout a price control period that there will be variations in actual projects, and project capital expenditure against original plans. As such, it is essential that any utility working under such a regulatory environment has a well-defined and documented change management process in order to demonstrate to stakeholders that actual incurred capital expenditure has been incurred as efficiently as possible. Throughout the review of the historic PR3 regulatory period it is evident that there has been a significant variation in the requirement for, specification of, and final outturn capital expenditure incurred on many of the projects progressed in PR3. Some of the reasons behind these variations have been documented by the TSO and have further been explained through discussion and engagement with the TSO through this PR3 review process. It is further evident that new initiatives and activities are now being undertaken by the TSO as part of continually evolving and improving planning activities, including further engagement with CER and ESBN, which would be expected to improve transparency and justification for outturn capital project variations in the future.

However, at present, and based on the current status of the historic PR3 review, whilst we accept that overall outturn TSO capital expenditure is within the revised PR3 allowance, there are still questions over how efficient the actual expenditure incurred on some projects during PR3 has been. This includes major transmission projects such as the North-South Project as well as other major projects developed during PR3 such as those reviewed as part of the Grid 25 Capex Monitoring Reports where there have been delays in expected project completion moving between Indicative Programme and Project Agreement stage gates. Although we accept that not all of the associated delays in these projects will have been as a result of EirGrid planning activities, or for that matter within EirGrid's control, nonetheless there are still questions in relation to how efficient and successful TSO activities have been and ultimately, whether different outcomes (including further project advancements) could have been obtained through different activities and initiatives. This is an aspect that requires further consideration for PR4.

Similarly, many of the projects developed during PR3 have different outturn capital expenditure, significantly in some cases, from the original TSO Stage 1 and TAO Stage 2 expenditure planned prior to PR3. Again, it is inevitable during a price control period that some projects will experience a change in specification, timing or unforeseen costs may arise during detailed design / implementation work. As stated, whilst the aim of this review is not to authorise or approve individual transmission projects, it is not considered unreasonable that where such variations in project scope, timing or cost have occurred that explanation is provided by the

respective party to explain such deviations. In the case of the historic PR3 review such explanations were limited, at least initially, although supplementary information has now been provided to support outturn cost variations for the key projects requested. As a result, we are satisfied that in all of the projects examined as part of this historic PR3 review, justifiable explanations have been able to be provided by TSO to explain outturn cost variances and demonstrate actions and initiatives undertaken to control costs.

4.5.2 Specific Findings

A number of specific findings are now outlined with respect to historic PR3 capital expenditure.

- Final outturn transmission (TSO & TAO) capital expenditure is anticipated to be €422.8m lower than the forecast expenditure (approximately 71% of the original allowance (€1.45bn)) and around 89% (€1.02bn) of the revised allowance (€1.15bn). Final PR3 TSO capital expenditure is anticipated to be circa €44m, around 40% of the original PR3 allowance.

Additional expenditure, not yet capitalised, has also been incurred by the TSO through PR3 amounting to a further circa €54m. This will be invoiced (capitalised) in PR4 when the appropriate project milestones have been reached as part of the Infrastructure Agreement.

- Load related expenditure is underspent by €440.2m on the original allowance. However, there has been a significant cut in previously planned projects (€802.6m - unfactored) with savings used to fund other new projects which were unknown at the time of the original PR3 forecast (€66.7m - unfactored) in addition to other planned load related expenditure. It is appreciated that changes in demand growth and generator connections occurred, however the quantity of projects amended, not progressed, removed and added is significant and there is still a general lack of transparency in relation to justifications for these, at least beyond the specific projects that have been assessed as part of this review.
- Although a reduction in overall (TSO & TAO) transmission capital expenditure is forecasted to have occurred through PR3 to €1,027.1m, circa 71% of the original €1,450m PR3 allowance, it is unclear if the outturn volume of asset delivery over PR3 is matched to a similar level. Again, there is a notable lack of data to demonstrate what expected final PR3 asset numbers are relative to the original (and revised) forecast allowance. Whilst it is accepted that a percentage reduction in capital expenditure will not necessarily result in the same percentage reduction in outturn asset volumes, it would be expected that there should be some broad correlation between outturn PR3 asset installation rates and final expected expenditure. This is considered a reasonable metric indicating a notional measure of efficient asset planning, development and installation. It is understood that the original PR3 Determination did not include reference to a specific project or asset list that was expected to be delivered over PR3, hence this aspect is something that should be considered for the forthcoming PR4 period in order to improve transparency and auditability of future network capital expenditure.
- Review of project delivery has shown a number of projects which were found to progress through the initial planning submission phase (TSO Stage 1) without delay but suffer from a prolonged delivery and construction phase (TAO Stage 2). Conversely, there is evidence of projects undergoing a long project planning phase (TSO Stage 1) with associated delays but proceed to completion quickly (TAO Stage 2) once appropriate approvals and consents are in place. Furthermore, some projects experienced a delay in all stages of development, TSO Stage 1 and TAO Stage 2.

To provide supporting information, a review has been performed of 35 projects from the latest provided quarterly Grid 25 CAPEX Monitoring Report (Q3 2014) on expected project energisation (completion) dates. This identified that the majority had experienced some change in completion date such that only 14% are expected to be delivered on time (against original forecast energisation date). Whilst some explanations have been provided on reasons for delays, it is still unclear if the extended project development durations are essentially a result of poor original forecasting and further whether such delays have been minimised as far as practically possible by the TSO (and TAO) or whether reductions in delays could have been achieved through further efficient TSO (and TAO) actions and initiatives.

- With regard to abortive projects, further information provided by the TSO has indicated that costs and associated works are typically subsumed into other projects where suitable, or if the project has not reached Project Agreement and is not transferred, the mechanics of the recovery of costs is set out in the Infrastructure Agreement. This process is overseen by the EirGrid Transmission Investment Committee (TIC). Where projects are delayed or deferred, little information has been provided as to how the expenditure of the project is managed to ensure future re-working is minimised, although it is assumed a similar process is conducted, again with overview from the TIC.

As an example, we are aware that there have been issues with certain transmission development projects throughout PR3 associated with TSO Stage 1 activities e.g. delays in progressing the North South Interconnector Project as a result of resubmission of the planning application due to incorrect statutory data supplied by a third party²⁶, which will have resulted in additional, inefficient project costs being incurred. Additional information provided by the TSO for the North-South Project has indicated that “the current project expenditure and total project costs are inclusive of all monies incurred on the project” with reasoning that a considerable volume of the work conducted remains applicable to the current planning application and further incremental costs have been driven by additional public consultation requirements. This is appreciated, however at the end of the day there is undoubtedly a level of inefficient expenditure associated with this project which it is also not reasonable for end customers to fund. Consequently, a proportion of the incurred costs to date (€2.755m) following the original planning application withdrawal is recommended to CER to be considered as inefficient investment associated with reworking and resubmission, and hence disallowed.

- As part of the original PR3 Determination in developing the “Stretched Network Needs” allowance scenario, explicit consideration was given to adoption of alternative network development measures, including the use of new technologies as alternatives to traditional network reinforcement solution options. This included technologies such as high tension low sag (HTLS) overhead line conductors and dynamic line rating (DLR) schemes.

Documentation provided by EirGrid as part of the PR3 review noted that although a successful trial of DLR was conducted, the benefits of the technology were limited in terms of application and were not suited to wholesale consideration within the planning ‘toolbox’. This is questionable given the positive assessment undertaken previously and the potential benefits identified in specific cases. However, alternative technologies such as HTLS²⁷ and special protection schemes (SPS) have been successfully employed in a number of reinforcement projects within the PR3 period and further are expected going forward into the PR4 period and hence represent use of new technologies to minimise new reinforcement costs where possible.

- A review of TSO internal project approval papers for a sample of projects indicates that where projects proceed as planned throughout Stage 1 activities, then the forecast Stage 1 expenditure detailed and authorised in the original approval paper is reasonably accurate. For projects that experience a delay or change in project timing or scope, the outturn costs are sometimes significantly different from the originally authorised value. Evidence of re-submission for board level approval for continued work on projects where TSO (and TAO) costs are expected to be higher than original authorised on account of material changes has been demonstrated by the TSO.
- Review of the non-network capital expenditure undertaken by the TSO during PR3 has identified that whilst the outturn expenditure is similar to the original PR3 allowance, there has been a significant change in the actual project activities within this category completed within PR3. IT expenditure has increased by around €6.7m (52%) against forecast with reasoning given that this additional expenditure would be required, regardless of savings made in other non-network capital expenditure areas such as telecoms costs, as a result of European policy requirements and greater management of renewable generation. It is expected that efficiencies through the standardisation of solutions within the EirGrid Group should be achievable within the PR4 period as a result of this additional capital expenditure.

²⁶ [Circumstances leading to the withdrawal of the Planning Application for Meath Tyrone 400 kV Project](#)

²⁷ HTLS overhead conductors are not a new technology per se, and have been utilised previously in other jurisdictions around the world. However, their usage as a standard solution option within transmission system planning activities is new, at least in the context of Ireland, and so has been commented on within New Technologies in the PR3 historic review.

4.5.3 Considerations for PR4

Following the analysis completed during the historic PR3 transmission capital expenditure review it is evident that whilst overall PR3 expenditure is anticipated to be notably below the original PR3 allowance, significant changes to the projects and expenditure profiles have taken place since the original PR3 forecast was developed. Whilst the changes in the forecast type of projects undertaken as well as outturn specification and costs over a given regulatory period are not unexpected, depending on the level of documentation compiled and tracking of project variations, including projects merged, sub-divided, cancelled / put on hold as well as newly identified, it can present difficulties to gauge how efficient the outturn transmission network developments and costs that have taken place during the period actually are, particularly with respect to physical outputs or assets delivered. Ultimately this may also lead to questions with respect to whether all of the capital expenditure incurred throughout the regulatory period has been efficient and justifiable, effectively the concerns and observations discussed above.

With respect to the PR3 historic transmission capital expenditure review, one comment that the TSO has made on numerous occasions is that the original Determination made by CER prior to the commencement of PR3 did not include an ascribed list of specific projects or assets expected to be delivered through PR3 in relation to the Determination Allowance given to the TSO and TAO businesses. Thus, although the TSO has provided a view of potential transmission system development projects as of 2009 as part of their outturn PR3 review submission, this list cannot be considered as a target list of deliverables or outputs. Whilst we accept the statement on face value and agree that no defined list of projects or assets was associated with the original PR3 Determination, we consider that had such a list actually been developed and agreed between CER, EirGrid and ESBN at the commencement of PR3, and this list subsequently tracked, monitored and major changes recorded, then the subsequent outturn review of PR3 capital expenditure could have been made considerably simpler. Such output driven reporting would also have provided greater transparency and auditability on major changes and variations with respect to planned network developments over the PR3 period and would have allowed greater visibility and challenge by CER and other stakeholders on the expected outturn PR3 assets and projects at appropriate reporting or PR3 stage gates. Report of such outputs would also have provided benefits to the TSO, and effectively lessened the burden of providing the substantive volume of information sought through this review.

The usage of output driven reporting metrics is also something that has been incorporated in the latest RIIO (Revenue = Incentives & Innovation & Outputs) regulatory model adopted by Ofgem in GB, with the latter aspect focussing on delivering outputs that reflect what consumers want from energy networks i.e. network performance, reliability, integration of renewables and adoption of new technologies. This is a move away from the more traditional retail price index related regulation mechanism that is tied to an overall allowance, under which any underspend is notionally deemed as efficient – essentially the current PR3 regulation mechanism in place in Ireland.

Thus, for PR4 it is proposed that as part of setting a revised regulation and monitoring regime it is vital to also develop and forecast a specific set of projects and outputs to be aligned to the PR4 regulatory Determination allowance that can be tracked and monitored through PR4 at appropriate review points i.e. annual or PR4 mid-point. By enabling an output based regulation regime, although not necessarily to the extent seen under RIIO, with appropriate reporting and status update stages this will place the onus on the TSO (and TAO) to demonstrate that overall capital expenditure incurred is efficiently delivered and that quantifiable and measurable outputs can be obtained by end customers. This approach will also make transparent any significant project changes and variations against original plan, which will require to be fully explained and justifiable and in turn where costs vary significantly from plan, or between review stages, that efficient project delivery is maintained. Ultimately, the resulting outputs obtained by customers at the end of PR4 should, whilst not expected to be exactly the same as the view at the commencement, be at least broadly comparable after taking account of major project changes, revisions and outturn expenditure variations.

An appropriate incentive mechanism is also suggested to be implemented for PR4 in order to incentivise efficient combined TSO & TAO project planning. Whilst the Stage 1 TSO project planning phase is clearly important in defining the requirement for transmission network investment as well as the nature of the solution options and associated capital costs, as part of reviewing the outputs actually delivered by network development projects, greater feedback of outturn cost variations and engagement within the overall delivery

process (including TAO) would be expected to demonstrated. This would show that outturn learnings from completed projects (and associated outputs obtained) to date are actually being used to positively inform decisions on future and ongoing projects through the PR4 period, that is the success and relevance of actual achieved projects and associated outputs is being fed back into the Stage 1 planning cycle to usefully inform improvements and learnings on future projects. We understand that such feedback from the TAO, back into the TSO Stage 1 planning activities, could be improved over the present level of feedback generally provided.

Finally, as part of the PR3 historic capital expenditure review it has been found that a significant proportion of projects due for completion within the PR3 period have now been delayed to be undertaken and / or completed within the PR4 period. It has been noted that initiatives have been implemented throughout the PR3 period such as the EirGrid five-stage Project Development and Consultation Roadmap which appear to successfully reduce delays in gaining consenting and planning permission for major network projects, although the outcome is that most projects are still expected to exceed the 5 year review period which EirGrid employ. Similar issues were experienced within the PR2 capital expenditure review period hence it may be beneficial for EirGrid to extend the review period for longer than 5 years to allow improved forecasting and control of costs.

As an aside, it has become apparent within this review that the timeframe between TSO spend and invoicing (capitalisation) can skew the view as to the TSO's efficiency within a single price control period, particularly where the very large network development projects are concerned e.g. Grid Link, Grid West, which will span two or even three price review periods from initial planning work to project delivery and completion. Within PR3 it is seen that although the TSO's capitalised costs in PR3 will be (well) below the original allowance, the actual expenditure within the period will be far greater albeit with associated capitalisation not expected until PR4. The delays between spend and capitalisation for the TSO highlight a broader limitation of the five year price control periods and is an issue discussed further within the forecast capital expenditure Section 5.3.6.

5. Review of PR4 Capital Expenditure

This Section reviews the forecast TSO (and TAO) capital expenditure over the PR4 period 2016 to 2020 including comparison with the historic expenditure seen in the previous PR3 period. The review has been informed by the TSO's response to the original questionnaire on forecast capital expenditure and associated information papers and network plans, together with further data provided by both the TSO and TAO at meetings and from supplementary questions raised by CER and consultants. CER has also provided a significant amount of background information on previous price reviews and updated information.

From the TSO, we have been provided separate to the requested questionnaire, a line by line and year by year forecast capital expenditure submission for the years 2016 to 2020 with costs detailed as latest best estimates (LBE). We have considered whether the 2016-20 LBE forecast expenditures presented by the TSO are realistic, based on historic capital expenditure trends and forecast network development requirements. These trends are considered on the basis of the primary expenditure categories of:

- Ongoing projects from the PR3 period (and earlier if applicable)
- Non-load related projects (including asset refurbishment, minor capital and protection, telecoms and substation security)
- New system reinforcements as a result of forecast network needs
- Application of new technologies

5.1 Review Objectives

As part of Jacobs support to the Commission for Energy Regulation, a review has been performed of the forecast PR4 capital expenditure proposed by EirGrid in their role as Transmission System Operator (TSO) and overall body responsible for transmission planning and development in Ireland²⁸. Specifically, CER required Jacobs to:

- Review and audit the forecast network and non-network capital investment proposed by the TAO/TSO set out in the 2016-2020 period. This would also include consideration for forecasted demand growth and new connections.
- Advise on the efficient level of capital investments proposed to be required in the TAO and TSO businesses over the period 2016-2020 and subsequent CER allowances.

This report provides an analysis of both network and non-network capital expenditure investments forecasted by the TSO (EirGrid) in the 2016-2020 period. The objective of this review of forecast capital expenditure is to assess the TSO proposed efficiency in achieving the required outputs during the PR4 period and advising on allowances to be provided for the upcoming period. The review includes an appraisal of the forecasted issues that may drive the development of projects in the PR4 period.

5.2 PR4 Philosophy

Before detailing the specific activities and analysis undertaken as part of the PR4 capital expenditure review it is worth considering some of the challenges associated with assessing outturn efficiency of the TSO and TAO businesses during the PR3 period. This can provide a useful input to guide not only the underlying recommendations with respect to PR4 capital expenditure but also the approval governance and framework mechanism that overarches regulation of the businesses during the forthcoming regulatory period. Such challenges identified during the PR3 outturn review included:

²⁸ EirGrid is certified as TSO in Ireland and accordingly has responsibilities for the functions of a TSO, one of which is EC (Directive 2009/72/ec): Each transmission system operator shall be responsible for, in addition to a range of other responsibilities "ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity, operating, maintaining and developing under economic conditions secure, reliable and efficient transmission systems with due regard to the environment"

- 1) Consideration by the transmission businesses of the agreed PR3 allowance as something of a guide, and to be used at a high level only, with no expectation that this would be reviewed in detail at a project level at the end of PR3 in order to make determinations of outturn efficiency
- 2) Difficulty in providing data (at the end of PR3) relating to project costs and requirements at the start of the PR3 period to assist with outturn evaluations.
- 3) No specific detailed outputs or metrics (e.g. number of projects, volume of equipment, generation capacity / connections to be connected, etc.) were set at the start of the PR3 period to enable expected end PR3 transmission projects and capital expenditure to be measured against.
- 4) Lack of transparency and limited documentation detailing reasons behind projects being removed / added during PR3, or adequate explanations for project delays and significant cost variations.
- 5) No sign-on by the TAO to the revised capital expenditure allowance developed during 2011, despite the TSO agreeing this with CER.
- 6) A presumption of efficiency “by default”, with no onus on the businesses to demonstrate that they have efficiently incurred capital expenditure.
- 7) Limited demonstration of the benefits being obtained from RD&D activities and new technologies within ongoing business practices, particular the decision making process for how such new / recently trialled technologies are evaluated against traditional network development solutions.

Collectively the above, plus other observations developed during the course of the PR3 review, are sufficient to suggest that in order to balance network development risks, associated costs and financial impacts more evenly between both the transmission businesses and end consumers, some revision to the overarching PR4 regulatory review process is required. Such revisions are recommended to include some form of periodic reporting (suggested as annually) and evaluation of TSO (and TAO) overall business activities in order to review progress against key output and deliverability metrics *within* PR4. In relation to the latter, it is recommended to CER that a set of key output and performance metrics should be agreed between the CER and transmission businesses at the start of PR4 to enable monitoring and progression, including capital expenditure tracking, throughout PR4.

These envisaged reporting activities would provide an opportunity for the TSO and TAO to document and explain variations in anticipated project / key metric outturns over the PR4 period and allow an element of external challenge from the CER and stakeholders of ongoing business performance. At the time of reporting against variations over the last periodic reporting period an updated forecast could be provided for expected outturn PR4 transmission development metrics, which could also allow the businesses to submit requests for potential increases in project funding for specific areas, particularly those that had some element of uncertainty at the start of PR4. The price review business questionnaire, submitted as a response for this price review activity, could be utilised as a basis for these improved reporting activities on an annual basis and will allow an update on project progression and latest forecasts, throughout the PR4 period.

It is expected that any further funding requests within the period would be supported by detailed capital expenditure proposals, including supporting business cases documenting fully the needs case for specific investments, including costs and risks, potential available investment options, detailed financial analysis including lifetime costing and operation expenditure impacts as appropriate.

Furthermore, for the largest projects of national importance that typically span multiple price control periods and are complex in nature, a process similar to the Strategic Wider Works (SWW) as utilised by Ofgem is suggested to be adopted by CER to allow closer interaction between the TAO, TSO and CER to manage and monitor the efficient development of these projects. Such an approach would again allow the specific needs case and investment drivers underpinning such projects to be critically appraised whilst also allowing external challenge of proposed development options, costs, benefits and risks, including the establishment of more appropriate project development stage gates. The latter could be of particular benefit to the TSO, to effectively close the gap between project invoicing (capitalisation) and actual capital spend, aspects which have to date provided a distorted view of true capital expenditure incurred in PR3 and forecast for PR4. Further details are provided in Section 5.3.3.2.

Whilst the above approach may appear to present an additional burden on the transmission businesses, it would allow them collectively to develop the transmission system in Ireland in a manner that enables them to respond to new challenges and variations in underlying project development drivers on an ongoing basis. It would also mean that where new projects are identified or significant increases in project complexity and capital expenditure may be necessary that were not originally forecast, additional funding / timescales could be granted subject to such projects variations being deemed necessary and incremental capital costs being considered efficient.

5.3 Overview of TSO PR4 Forecast Capital Expenditure

5.3.1 Total Forecast Capital Expenditure (2016-2020)

In response to the Price Review Questionnaire, EirGrid submitted two capital expenditure projections in spreadsheet format noted as Scenario 1 and Scenario 2. Scenario 1 assumes all network developments are made using AC overhead line circuits with Scenario 2 employing alternative undergrounded solutions for new circuits not yet in development (nine identified projects). The total factored capital expenditure in the PR4 period associated with each of these scenarios (TSO and TAO) are summarised in Table 5.1 and Table 5.2.

Table 5.1 : Forecast Capex Scenario 1

Scenario 1 - €1161.2 Million		PR4 Period					Total in the PR4 period
€ million		2016	2017	2018	2019	2020	
<u>Ongoing projects</u>	EirGrid	€29.3	€13.5	€2.8	€11.7	€19.6	€76.9
	ESB	€192.3	€156.2	€145.5	€115.4	€105.2	€714.7
	Total	€221.7	€169.7	€148.3	€127.1	€124.8	€791.6
<u>Under Consideration/Provisions - System Reinforcements</u>	EirGrid	€1.7	€1.1	€1.1	€8.1	€1.1	€13.1
	ESB	€21.2	€35.2	€34.5	€56.8	€55.8	€203.5
	Total	€22.9	€36.3	€35.6	€64.9	€56.9	€216.6
<u>Under Consideration/Provisions - Shallow Connection</u>	EirGrid	€2.4	€1.0	€1.2	€0.1	€0.0	€4.7
	ESB	€14.1	€5.7	€7.5	€3.6	€2.6	€33.5
	Total	€16.4	€6.7	€8.7	€3.7	€2.6	€38.2
<u>Under Consideration/Provisions - Asset Refurbishment</u>	EirGrid	€0.2	€0.7	€0.3	€0.3	€0.0	€1.5
	ESB	€33.7	€38.9	€48.9	€45.2	€32.8	€199.6
	Total	€33.9	€39.7	€49.2	€45.5	€32.8	€201.1
<u>Provisions - Minor Capital & Conflicts</u>	EirGrid	€0.1	€0.1	€0.1	€0.1	€0.0	€0.3
	ESB	€2.9	€5.9	€5.9	€5.0	€3.5	€23.1
	Total	€3.0	€5.9	€5.9	€5.0	€3.6	€23.4
<u>Under Consideration - DSO</u>	EirGrid	€0.0	€0.0	€0.0	€0.0	€0.0	€0.1
	ESB	€2.5	€5.8	€3.6	€0.7	€0.0	€12.6
	Total	€2.5	€5.8	€3.6	€0.7	€0.0	€12.6
<u>Under Consideration/Provisions - Protection, Telecoms & Station Security</u>	EirGrid	€0.2	€0.2	€0.2	€0.2	€0.2	€1.0
	ESB	€3.8	€8.4	€7.3	€10.8	€7.1	€37.4
	Total	€4.0	€8.6	€7.5	€11.0	€7.3	€38.4
Sub-Total	EirGrid	€33.8	€16.6	€5.7	€20.5	€20.9	€97.6
	ESB	€270.5	€256.1	€253.2	€237.4	€207.0	€1,224.3
	Total	€304.4	€272.8	€258.9	€258.0	€227.9	€1,321.9
Customer Contributions (Factored)	EirGrid	-€2.2	-€0.9	-€0.8	-€0.2	€0.0	-€4.0
	ESB	-€68.7	-€42.6	-€8.3	-€1.1	-€0.3	-€121.0
	Total	-€70.9	-€43.5	-€9.1	-€1.3	-€0.3	-€125.0
Interest During Construction	EirGrid	€0.0	€0.0	€0.0	€0.0	€0.0	€0.0
	ESB	-€14.2	-€13.6	-€12.9	-€12.9	-€11.4	-€65.1
	Total	-€14.2	-€13.6	-€12.9	-€12.9	-€11.4	-€65.1
Community Gain (Factored)	EirGrid	€0.5	€0.4	€0.0	€11.7	€9.4	€22.1
	ESB	€0.0	€0.0	€0.0	€0.0	€0.0	€0.0
	Total	€0.5	€0.4	€0.0	€11.7	€9.4	€22.1
Client Engineering Capex	EirGrid	€1.5	€1.5	€1.5	€1.5	€1.5	€7.3
	ESB	€0.0	€0.0	€0.0	€0.0	€0.0	€0.0
	Total	€1.5	€1.5	€1.5	€1.5	€1.5	€7.3
Total	EirGrid	€33.6	€17.7	€6.4	€33.5	€31.8	€123.0
	ESB	€187.6	€199.9	€231.9	€223.4	€195.4	€1,038.2
	Total	€221.2	€217.6	€238.3	€256.9	€227.2	€1,161.2
		PR4 Total					€1,161 Million

Table 5.2 : Forecast Capex Scenario 2

Scenario 2 - €1389.3 Million		PR4 Period					Total in the PR4 period
€ million		2016	2017	2018	2019	2020	
<u>Ongoing projects</u>	EirGrid	€29.3	€13.5	€2.8	€11.7	€19.6	€76.9
	ESB	€192.3	€182.9	€199.9	€173.6	€205.6	€954.4
	Total	€221.7	€196.4	€202.7	€185.3	€225.2	€1,031.3
<u>Under Consideration/Provisions - System Reinforcements</u>	EirGrid	€1.7	€1.1	€1.1	€8.1	€1.1	€13.1
	ESB	€21.2	€35.2	€34.5	€60.0	€60.2	€211.2
	Total	€22.9	€36.3	€35.6	€68.2	€61.3	€224.2
<u>Under Consideration/Provisions - Shallow Connection</u>	EirGrid	€2.4	€1.0	€1.2	€0.1	€0.0	€4.7
	ESB	€14.1	€5.7	€7.5	€3.6	€2.6	€33.5
	Total	€16.4	€6.7	€8.7	€3.7	€2.6	€38.2
<u>Under Consideration/Provisions - Asset Refurbishment</u>	EirGrid	€0.2	€0.7	€0.3	€0.3	€0.0	€1.5
	ESB	€33.7	€38.9	€48.9	€45.2	€32.8	€199.6
	Total	€33.9	€39.7	€49.2	€45.5	€32.8	€201.1
<u>Provisions - Minor Capital & Conflicts</u>	EirGrid	€0.1	€0.1	€0.1	€0.1	€0.0	€0.3
	ESB	€2.9	€5.9	€5.9	€5.0	€3.5	€23.1
	Total	€3.0	€5.9	€5.9	€5.0	€3.6	€23.4
<u>Under Consideration - DSO</u>	EirGrid	€0.0	€0.0	€0.0	€0.0	€0.0	€0.1
	ESB	€2.5	€5.8	€3.6	€0.7	€0.0	€12.6
	Total	€2.5	€5.8	€3.6	€0.7	€0.0	€12.6
<u>Under Consideration/Provisions - Protection, Telecoms & Station Security</u>	EirGrid	€0.2	€0.2	€0.2	€0.2	€0.2	€1.0
	ESB	€3.8	€8.4	€7.3	€10.8	€7.1	€37.4
	Total	€4.0	€8.6	€7.5	€11.0	€7.3	€38.4
Sub-Total	EirGrid	€33.8	€16.6	€5.7	€20.5	€20.9	€97.6
	ESB	€270.5	€282.8	€307.6	€299.0	€311.8	€1,471.7
	Total	€304.4	€299.5	€313.3	€319.5	€332.7	€1,569.3
Customer Contributions (Factored)	EirGrid	-€2.2	-€0.9	-€0.8	-€0.2	€0.0	-€4.0
	ESB	-€68.7	-€42.6	-€8.3	-€1.1	-€0.3	-€121.0
	Total	-€70.9	-€43.5	-€9.1	-€1.3	-€0.3	-€125.0
Interest During Construction	EirGrid	€0.0	€0.0	€0.0	€0.0	€0.0	€0.0
	ESB	-€14.2	-€15.0	-€15.7	-€16.0	-€16.6	-€77.5
	Total	-€14.2	-€15.0	-€15.7	-€16.0	-€16.6	-€77.5
Community Gain (Factored)	EirGrid	€0.5	€0.4	€0.0	€11.7	€2.6	€15.2
	ESB	€0.0	€0.0	€0.0	€0.0	€0.0	€0.0
	Total	€0.5	€0.4	€0.0	€11.7	€2.6	€15.2
Client Engineering Capex	EirGrid	€1.5	€1.5	€1.5	€1.5	€1.5	€7.3
	ESB	€0.0	€0.0	€0.0	€0.0	€0.0	€0.0
	Total	€1.5	€1.5	€1.5	€1.5	€1.5	€7.3
Total	EirGrid	€33.6	€17.7	€6.4	€33.5	€24.9	€116.1
	ESB	€187.6	€225.2	€283.6	€281.9	€294.9	€1,273.2
	Total	€221.2	€242.9	€290.0	€315.4	€319.8	€1,389.3
		PR4 Total					€1,389 Million

The two network development scenarios are described in EirGrid's Forecast Submission Document Paper 10 – Network Requirements 2016-2020. Both scenarios have been developed utilising a factored approach which considers the project status, project type, outage availability and overall deliverability in assessing the likelihood of the project proceeding and/or completing during the PR4 period. The factored approach undertaken by EirGrid recognises that not all of the projects identified within the period will be fully developed/constructed (with all associated costs) within that period. Greater certainty of expenditure is given for those projects which are to be developed in the near term or are most likely to advance and the majority of the projected capital expenditure will be assigned. For projects with less certainty of advancing, a factor of the total expenditure will be applied to reflect this uncertainty. The factored approach gives a more practical view of the deliverability and uncertainty of project development within the period; however it is expected that as project needs evolve over the period, the factored level of expenditure for individual projects will likely change.

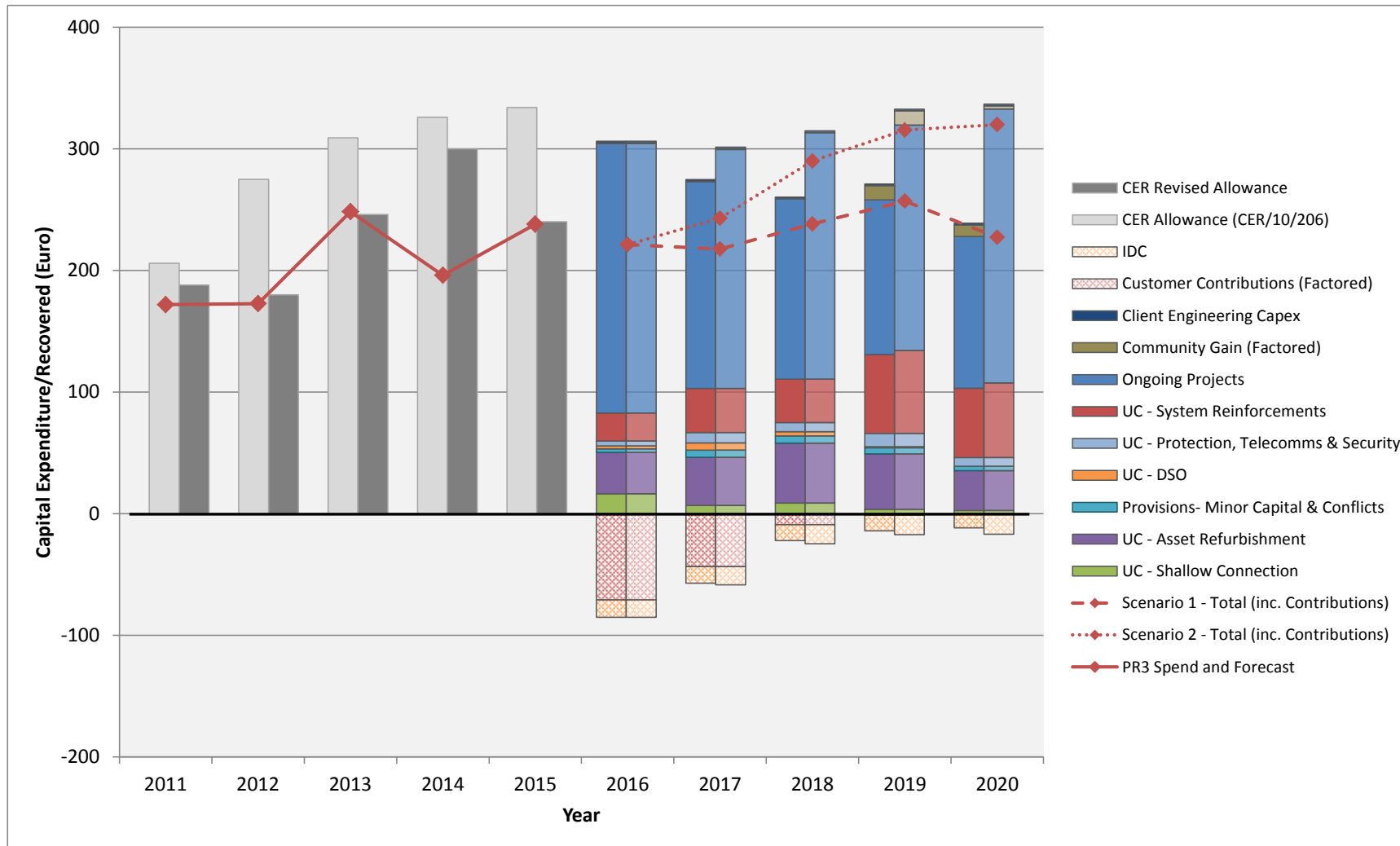
Note that this approach was also adopted by EirGrid during PR3 capital expenditure scenario development. However, no final "factored" scenario corresponding to the allowed Stretched Network Needs scenario was created at the start of PR3, making evaluation of outturn transmission system project development efficiency and associated costs at the end of the corresponding regulatory period challenging.

It is appreciated that the two scenarios currently reflect two approaches in the development of infrastructure through the use of either all overhead line or a proportion of overhead line and cable circuits for new projects. It is likely that a mixture of the two installation types will be utilised to varying degrees on different projects, taking account of technical considerations and locational concerns and to provide a balance between overall project capital and operational cost and consenting risk. Subsequently, EirGrid's current best estimate of expenditure requirements is between the two scenarios, at a value of €1.25bn – €1.35bn.

Jacobs is conscious of the ongoing work of the Government appointed Independent Expert Group (IEP) with regard to the development of large scale projects and this price review is being conducted against a background of considerable uncertainty over the approach to be taken in developing the network. Jacobs is also conscious that EirGrid has not made decisions on the technology type or the approach to be taken to those projects which are part of the scope of the work being undertaken by the IEP. EirGrid's standard approach to project planning and development is to examine a range of technology types, options and routes available in order to develop the solution which best meets the key project drivers (e.g. constraints, renewable facilitation, security of supply) and considers the range of views expressed during the public consultation process. Notwithstanding this, Jacobs review of the forecast capex scenarios is focused on determining whether the approach to forecasting required capital expenditure for the 2016 – 2020 period will deliver the necessary infrastructure at the most efficient and optimal cost for consumers, taking account of the industry model for transmission and remaining conscious of the difficulties associated with delivery of large scale network infrastructure.

Figure 5.1 provides an overview of the annual forecast expenditure for both Scenario 1 and Scenario 2 in the PR4 period in addition to a look back at the PR3 period (including latest 2014/15 forecast and original and revised CER allowance). The chart includes interest during construction (IDC) and customer contributions – factored, which provides a credit to the overall forecast as a function of contributions. Subsequently, the overlaid line charts illustrate the PR3 spend and subsequent PR4 forecast for Scenario 1 and Scenario 2.

Figure 5.1 : Overview of Historic and Forecast Expenditure



It is evident that Scenario 1 TSO/TAO forecast expenditure is broadly aligned with historical PR3 expenditure, with Scenario 2 increasing to over €300m in the latter years of PR4, reflecting the increased capital cost of cable installations for projects which have not yet been scoped. Further inspection of Figure 5.1 shows that the majority of forecasted expenditure is in relation to projects which are ongoing from PR3 with a low percentage of new system reinforcement projects. Asset refurbishment projects are typically consistent year on year.

This analysis has provided a brief overview of the headline TSO and TAO forecast expenditure in the PR4 period (in relation to historic spend in the PR3 period). The following sections further inspect the breakdown of this forecast.

5.3.2 Scenario 1 and Scenario 2

As stated previously, Scenario 1 has been developed on the basis of utilising overhead line exclusively²⁹, whilst Scenario 2 includes the partial use of cable for new projects³⁰. Only a small number of projects are impacted by Scenario 2 and relate to significant large scale, long term projects as summarised in Table 5.3. While it is noted that environmental and technical constraints can be experienced on any project, the likelihood is increased for the larger scale, linear, new infrastructure projects.

Table 5.3 : Projects, Status and Cable Lengths included within Scenario 2

Project Title	Status	Cable Length [km]
Grid West Electricity Transmission Scheme 400kV	Ongoing	130
Grid Link 400kV (Cork Dublin)	Ongoing	264
North West Project - RIDP Phase 1 - 220kV circuit from Srananagh 220kV station to Clogher (South Donegal)	Ongoing	83
North Connaught Line (Castlebar - Moy 110kV Line - New Line)	Ongoing	40
Clougher (South Donegal) Omagh South (ROI only) - New line	New	12.5
Coolkeeragh-Trillick Add Coolkeeragh-Trillick 110 (223/187)	New	15
Ballyragget Lisheen Add Ballyragget Lisheen 110 (223/187)	New	35

**North-South Interconnector has not been included by EirGrid within Scenario 2*

It is appreciated that it may be unavoidable for some of these projects to utilise cable sections to address environmental concerns and mitigate lengthy project delivery timeframes. Notwithstanding this, in the absence of formal decisions to utilise cable sections within projects, the TSO and TAO allowances are suggested to be provided on a least cost technically acceptable basis at this time to minimise final cost to the customer. Therefore, it is proposed that for the projects identified within Scenario 2 where the use of overhead line throughout the project may be prohibitive, the TSO and TAO should request an amendment to the allowance to accommodate this variation in design. This should be conducted once all avenues to pursue the least cost solution have been exhausted and supporting evidence including detailed business cases outlining available options, costs, risks and benefits should be required to be provided to justify the requirement to utilise cable sections and incur additional project costs.

Considering the relatively small number of projects affected by the Scenario 2 assessment, this approach is considered a manageable solution through the PR4 period, providing allowance for the projects on an overhead line basis whilst initiating a mechanism to amend the allowance should cable sections be required following ongoing and further investigation.

It is noted that within TAO's submission, only Scenario 1 is considered as the base case for estimating PR4 funding requirements and for resource planning on the basis that major projects identified have been priced, at this time, as an overhead line scenario rather than cable. This should not, however, be interpreted that the TAO

²⁹ For new projects. This does not include ongoing projects which are being developed partly or exclusively with cable.

³⁰ The use of cable may be deemed preferable following a thorough techno-economic and environmental assessment of the project requirements.

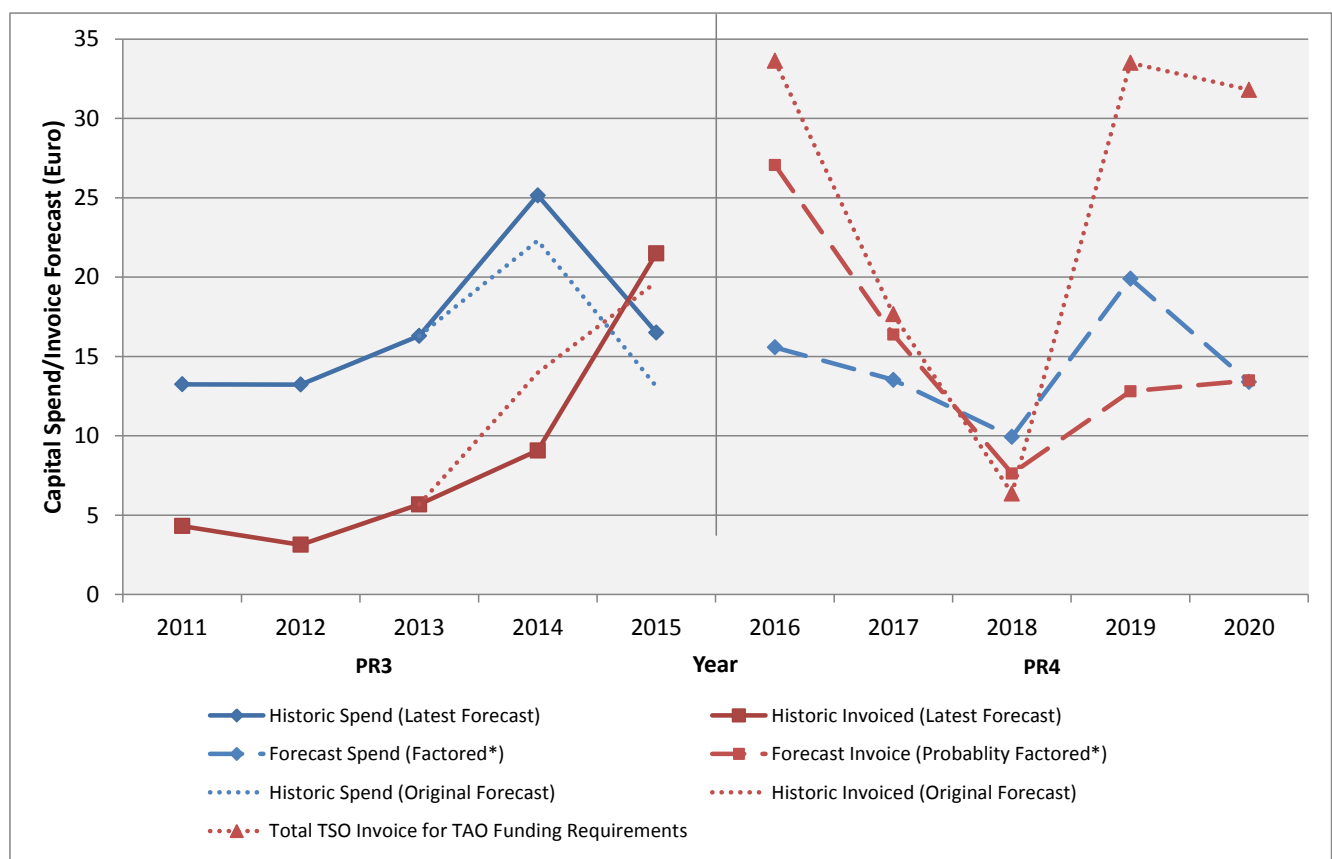
or TSO believes that all of the major projects can be implemented solely using overhead line. Rather, given the uncertainty over which projects may ultimately require some underground cable installation in order to proceed to development as well as the extent (and cost) of such cable, no definitive stance on expected outturn PR4 cable costs and project scope can be made at this time.

Subsequently, Scenario 1 only has been considered as part of the allowance allocation.

5.3.3 TSO Capitalised Expenditure and Ongoing Projects

EirGrid have provided information as part of their PR4 forecast submission illustrating the proposed actual capital expenditure incurred (spend) as well as that to be invoiced in the period. This information has been presented alongside the PR3 actual spend and invoiced values in Figure 5.2.

Figure 5.2 : TSO Historic and Capitalised Expenditure



*Excluding customer contributions deduction

The blue lines within Figure 5.2 indicate the actual and forecasted spend in the PR3 and PR4 periods respectively. It can be seen that the PR4 factored forecast spend (excluding customer contributions deductions) is broadly aligned with that seen in PR3. Inspection of the invoicing trends (red lines) shows that invoicing within the PR3 period was significantly lower than spend, with exception to forecast 2015 values. Conversely, when reviewing PR4 total forecast invoicing (TSO invoice for TAO funding requirements)³¹, this is significantly greater than the forecast spend within the period, particularly within 2016, 2019 and 2020. Reference to

³¹ Net Scenario 1 TSO Capex submission values taking into consideration customer contributions, IDC, community gain (significant in 2019 and 2020) and client engineering capex.

probability factored³² forecast invoicing also shows a greater level of invoicing than spend in the first two years of the period.

This misalignment between spend and invoicing is as a result of project milestones that must be reached before the TSO can capitalise its expenditure. For large scale complex projects, these milestones may not be reached for numerous years, spanning multiple price review periods. Subsequently, the timing of the invoicing makes the actual level of TSO expenditure within a single period unclear. This is shown in Figure 5.2 whereby high spend in PR3 (with low invoicing) is not capitalised (and subsequently seen) until the PR4 period where invoicing is high and spend is low.

Figure 5.3 presents an overview of the forecast factored annual spend (excluding customer contributions) and total TSO invoiced value (as summarised in Figure 5.2, year on year within the PR4 period, broken down by spend category for Scenario 1.

Figure 5.3 : Scenario 1 Forecast Annual Factored Spend and Total Invoice

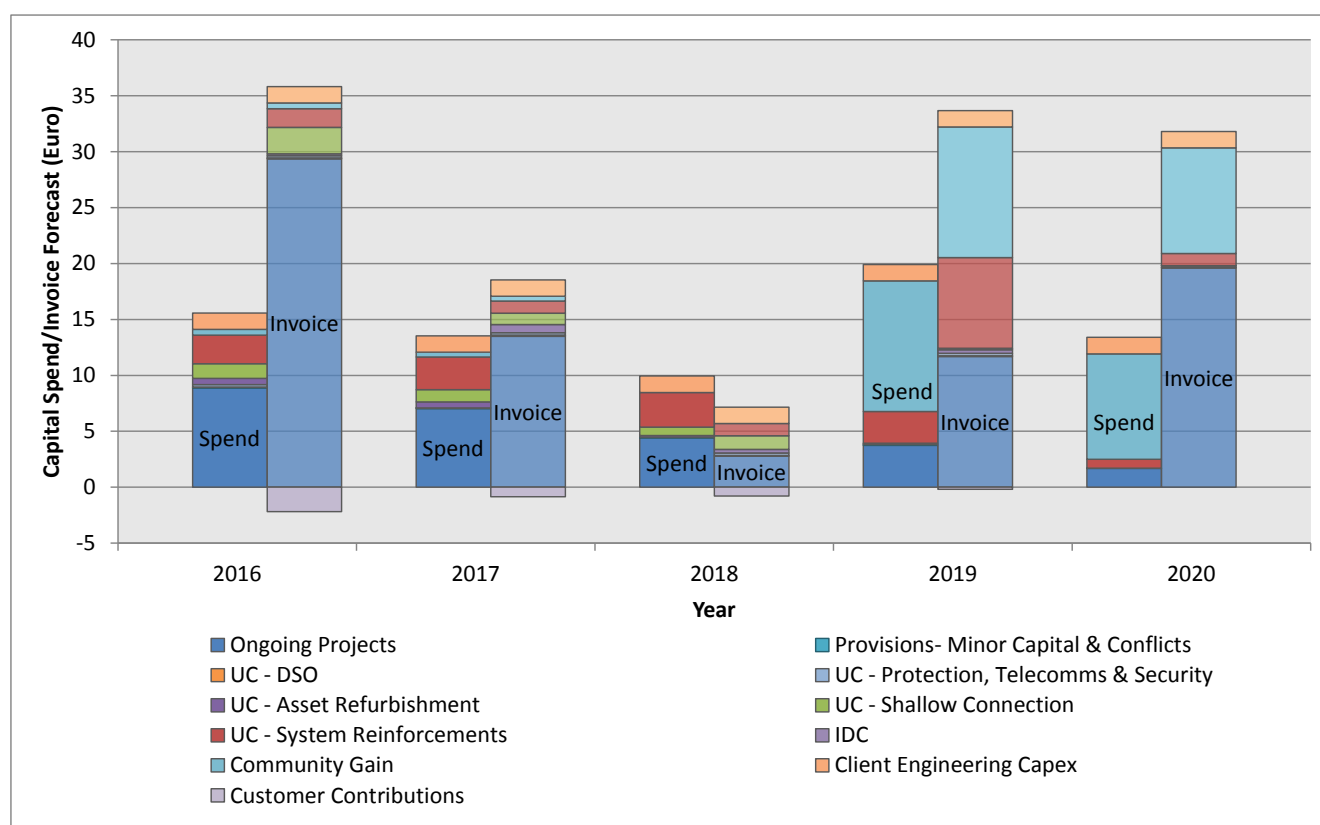


Figure 5.3 highlights the high level of invoicing, particularly for ongoing projects (of which there are 127) which are seen to be the primary cost in PR4 with a low level of under consideration projects. In 2016 alone, it is evident that nearly €30m of invoicing is forecast for ongoing projects only, with a spend of less than €10m. This disparity is shown in the extreme in 2020 where invoicing levels for ongoing projects are in the region of €20m with spend in the order of €1m. Subsequently, the invoicing level for projects that have been ongoing from PR3 (and possibly PR2) at the end of the PR4 period is significant and again highlights the misalignment from spend to invoice significantly.

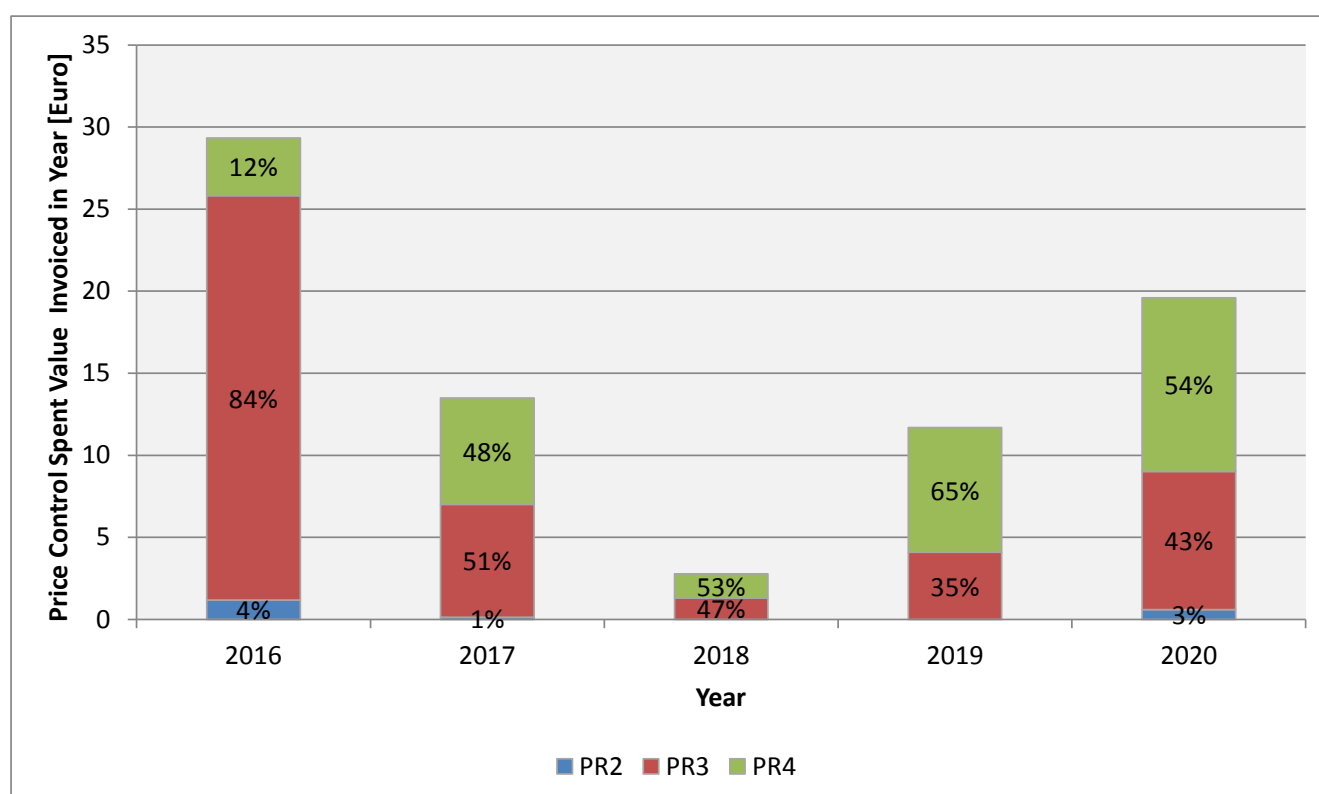
Further investigation in the high levels of invoicing for ongoing projects in the PR4 period has been conducted and is illustrated in Figure 5.4. This chart illustrates the breakdown of forecast PR4 invoicing (seen in Figure

³² Probability factored invoice figures are provided based on the gross spend with a probability of invoicing factor applied to account for delays reaching project agreement within the period. Probability of invoicing factors of 80%, 70%, 60%, 50% and 40% for 2016, 2017, 2018, 2019 and 2020 respectively have been applied by the TSO.

5.3) based on when TSO spend on a project was initiated (be it PR2, PR3 or PR4) and is still ongoing within the PR4 period.

In 2016, 2017 and 2020 it can be seen that small percentages of the forecast invoicing are related to projects that are still ongoing from the PR2 period, highlighting the expenditure period approaching 10 years for some of the largest, most complex projects. For other years, a broad trend of 50% invoicing related to spend in PR3 and 50% to spend in PR4 is seen with exception to 2016. This is expected as in 2016, the majority of invoicing will be for previous spend in PR3, and to some extent PR2, as the level of workload conducted in the first year of PR4 (and invoiceable) will be limited.

Figure 5.4 : Ongoing Projects Forecast Invoice against PR Period of Initial Project Spend



Such spend and invoicing trends seen in Figure 5.2, Figure 5.3 and Figure 5.4 suggest that the Scenario 1 allowance presented by the TSO in PR4 (€123.0m) far exceeds the actual PR3 outturn (€44.8m) to accommodate the high levels of invoicing required for previous expenditure on ongoing projects.

In summary, some €50m of expenditure in PR3 is required to be capitalised (invoiced) in the PR4 period. This arrangement highlights the limitations of the existing price control review process and the ability of the TSO / TAO to manage and demonstrate efficiency of large scale, long term projects which span multiple periods. This is an aspect for further consideration as to the suitability of the process looking forward through PR4.

5.3.3.1 Ongoing Projects

Based on the above, although the majority of the TSO PR4 allowance request is to allow invoicing of spend previously conducted for ongoing projects, it is anticipated that some inefficiencies will exist in relation to ongoing project costs due to the prolonged nature of the planning works (project needs and designs will evolve, potentially significantly, over a prolonged period) and there is still scope to incentivise remaining efficient project progression and delivery of ongoing projects, particularly for the TAO where the majority of overall project capital expenditure is spent. It is expected that this efficiency can be achieved through a number of initiatives including co-ordinated planning and proactive engagement with suppliers and planning bodies on the future

network development programme, refinement of project / contract management and implementation, plus potential advanced purchases of material and equipment to avoid manufacturing delays.

It is appreciated that the analysis conducted is on the basis of a 'factored' project expenditure which EirGrid employs to allow consideration of the likelihood of projects progressing, ability for the TAO to deliver numerous projects in parallel and other considerations. This is a suitable approach which we agree provides a more practical reflection of the expenditure in the PR4 period. However, considering the above comments regarding the scope to incentivise continued efficient project progression and delivery, a 7.5% efficiency target is recommended to be applied to the gross requested funding in PR4 for ongoing projects to provide a degree of efficiency challenge to the businesses in developing these projects. Considering an average factor value of 0.77 for all ongoing projects between 2016-2020, this relates to an effective 5.77% efficiency target³³ applied to the factored Scenario 1 requested funding in PR4 for ongoing projects. For ongoing projects, this results in a reduction in the factored TSO request from €76.9m to €72.5m.

5.3.3.2 Strategic Wider Works

The implication of this disparity between spend and invoice is that assessing projects across multiple periods, when only capitalised expenditure is recorded, is difficult to ascertain the efficiency of the expenditure and track delayed or cancelled projects. The delay between spend and invoice is less of an issue for small scale projects where the two aspects are likely to be completed within the same period or in a close timeframe. Therefore, to improve the clarity of TSO expenditure efficiency during PR4, one approach that could be adopted is where large projects are anticipated to extend over a five year period, additional project milestones be introduced to more closely match development work and which will allow more frequent capitalisation of completed activities for the TSO. This will improve TSO cashflow for these projects and improve monitoring of the efficiency of expenditure. It may even be desirable to remove the largest projects from the PR4 allowance altogether and deal with project needs, option appraisal, capital approval and final project construction and development efficiency and incentivisation on a individual project basis, similar to the approach adopted by Ofgem in GB in relation to Strategic Wider Works (SWW) projects. As part of the RIIO T1 price control settlement funding was not provided for SWW projects as the needs case, available options plus transparency on full expected efficient project costs was not developed to a suitably robust stage prior to the start of RIIO T1. This approach effectively balances the risks to end consumers who are ultimately paying for the projects plus provides the transmission businesses with time to develop and refine their project plans and allows subsequent challenge and enables an appropriate view to be taken on efficient project development costs to incentivise delivery.

It may be however that such a new approach for large capital projects can only be applied for new projects identified from PR4 onwards, given the otherwise difficulty in unwinding project capital expenditure incurred during PR3 (and potentially PR2), part of which has already been capitalised. However, at this time, it would be proposed that the North South 400 kV interconnector, Grid West Electricity Transmission Scheme, Grid Link and North West Project be considered within this additional regime, owing to their significance. The specific requirements and framework of this scheme is an aspect that will require further discussion and requirement agreement between the CER, TSO and TAO following the price review period which will outline the inclusion criteria (for ongoing and any new projects that appear over the period) and reporting criteria. For clarity, the projects will remain within the price control process at this time (currently classified as ongoing projects) with the additional scheme requirements being utilised to aid the development of these large scale projects, including any requests for additional allowances following suitable justification.

³³ 7.5% efficiency target is applied to the gross value of ongoing project expenditure. Each project is then factored to account for deliverability, certainty of expenditure and timeframes. The average factored value is 0.77. Subsequently, the 7.5% efficiency target is factored down to 5.77% to be applied to the submitted Scenario 1 requests as detailed in Table 5.1.

5.3.4 Total Non-Load Related Expenditure

This section relates primarily to the TAO as 99% of the proposed PR4 non-load capital expenditure is related to ESB with only 1% related to the TSO, EirGrid. However, under statute²⁸, the TSO is responsible for non-load related projects, just as with load related expenditure, and is therefore responsible for the determination of non-load related projects which the TAO advances once transferred at PA. The TSO is also responsible for outage approval and coordination hence has a notable role to play in facilitating the delivery of non-load related expenditure activities.

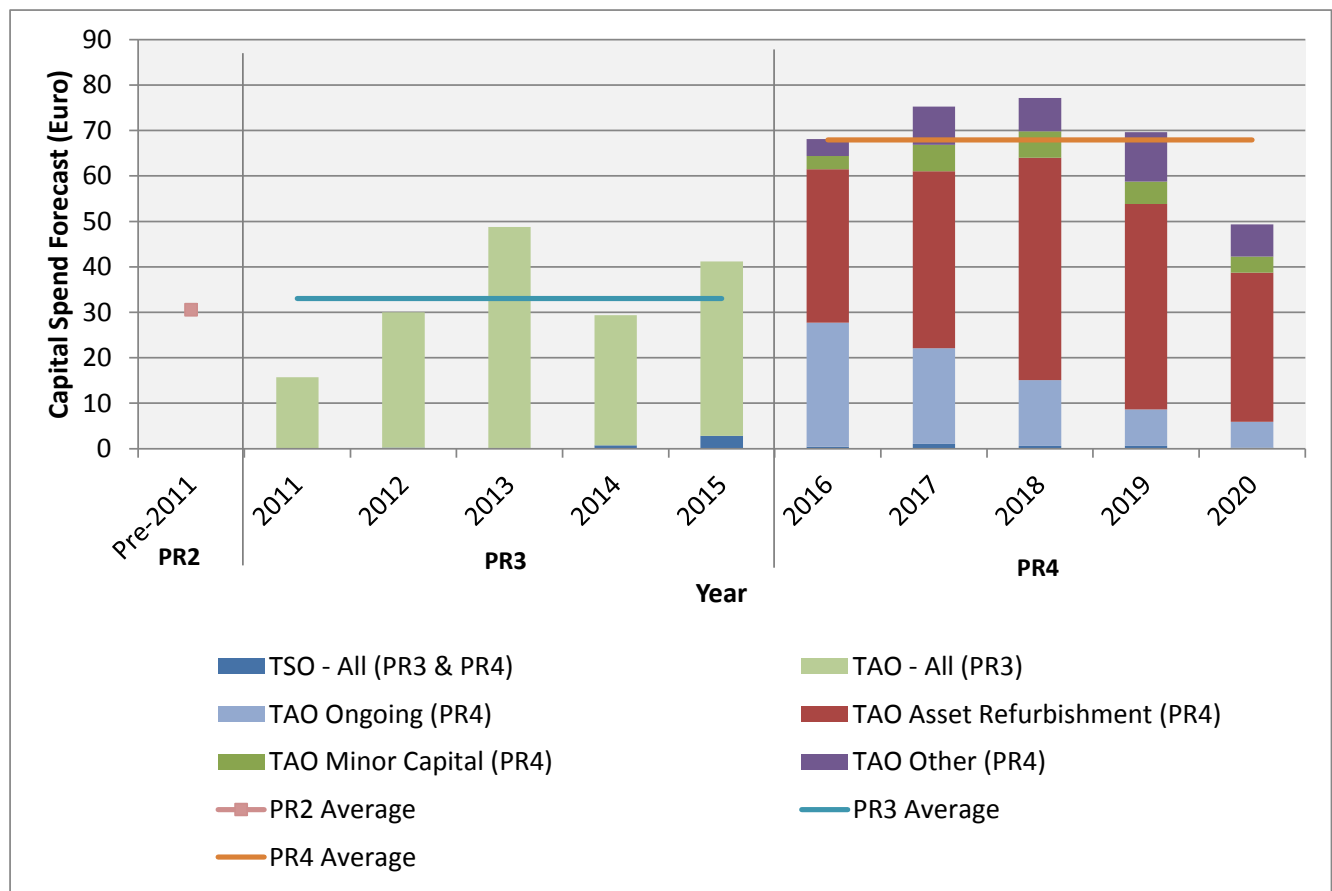
Non-load related expenditure is given by the TSO as those projects relating to asset refurbishment, minor capital and conflicts and other (primarily protection, telecoms and station security). New projects of this type are seen to account for €262.9m (~22.5% - Scenario 1) of the total forecast allowance in PR4, in addition to a further €76.5m or ~10% of ongoing projects from previous periods, to be completed in the PR4 period. Table 5.4 and Figure 5.5 detail the historic non-load related expenditure in the PR3 period and the forecast requirements in the PR4 period.

Table 5.4 : Historic and Forecast Non-Load Related Expenditure (TSO & TAO)³⁴

	PR2	PR3 (Historic)						PR4 (Forecast)					
	Pre 2011	2011	2012	2013	2014	2015	Sub-total	2016	2017	2018	2019	2020	Sub-total
<i>TSO – All</i>		0.04	0.21	0.16	0.76	2.81	3.98	0.45	1.02	0.60	0.59	0.20	2.86
TAO – Asset Refurb.		-	-	-	-	-	-	33.7	38.9	48.9	45.2	32.8	199.5
TAO – Minor Capital		-	-	-	-	-	-	2.93	5.85	5.85	4.97	3.51	23.1
TAO – Other		-	-	-	-	-	-	3.75	8.4	7.28	10.8	7.11	37.3
TAO Ongoing non-load related		-	-	-	-	-	-	27.3	21.0	14.5	8.0	5.7	76.5
<i>TAO - All</i>		15.7	29.8	48.6	28.6	38.4	161.0	67.7	74.2	76.5	69.0	49.1	336.5
<i>Total</i>	152.6	15.7	30.0	48.7	29.4	41.2	165.0	68.1	75.2	77.1	69.6	49.3	339.3

³⁴ Interest during construction has not been included within this assessment and is taken into account in overall capital expenditure

Figure 5.5 : Historic and Forecast Non-Load Related Expenditure (TSO & TAO)



Review of previous non-load related expenditure indicates that in the PR2 period, an allowance of €129.2m was provided on which an expenditure of €152.6m was made (exceeding forecast expenditure by €23.4m). In the PR3 period, an allowance of €149.2m was provided (subsequently increased to €215m) on which an expenditure of €165.0m was made (see Table 4.5). Subsequently, it can be seen that between these two periods, there was a marginal increase in expenditure (€152.6m to €165.0m) with regard to non-load related projects and in both periods.

However, Table 5.4 and Figure 5.5 highlights a significant increase in the total forecast non-load related expenditure for PR4 with respect to the historic PR3 expenditure, previously seen to be €165.0m and forecast to increase to €339.3m (105.6% increase). Furthermore, the previous average annual PR3 spend on non-load related expenditure was in the order of €33.0m, however this is seen to increase to €67.9m in the PR4 period, questioning the deliverability of such a significant increase in expenditure.

It is appreciated that TSO expenditure with respect to non-load related projects is very small (typically less than 1% of the total non-load related expenditure) and is anticipated to reduce from PR3 expenditure levels by 23.5%. The majority of the cost is therefore attributed to the TAO, particularly with respect to asset refurbishments. It is further emphasised that this is for new projects only and does not consider ongoing projects from PR3 which may have been initiated by the increased spend in that period. Subsequently, the evidence shows a significant increase in forecast expenditure for non-load related projects with respect to the TAO, however TSO spend is actually decreasing (albeit the level of direct cost is very low, accounting for less than 1% of the total value). Considering the forecast reduction in TSO expenditure, it is unexpected to see such a significant increase in TAO expenditure in the PR4 period, compared to the PR3 period. It is appreciated that the TSO indicated high expenditure at the end of the PR3 period; however the disparity in the TAO non-load related forecast expenditure in comparison to previous periods is significant.

Inspection of the provided submission documents does not indicate any significant network issues such as a deterioration in network performance (CMI and CML are consistent within the PR3 period and not anticipated to significantly change) that could drive the requirement for significantly above average expenditure on asset refurbishment in the coming period.

The TAO has noted that flood risk alleviation works are included within asset refurbishment projects which have been identified through a series of risk assessments. Furthermore, the TAO has noted that copper theft has increased throughout the PR3 period and improved security at substations is necessary in PR4 to minimise these events and comply with required safety legislation. A site visit to a number of transmission substations where copper theft continues to be an issue has illustrated the magnitude of the problem with little earth connections remaining on overhead outdoor structures, presenting a significant safety hazard. Currently the replacement of the connections is captured as an operational expenditure; however additional security such as power fences would result in capital expenditure but may be the most efficient long term solution to address this issue.

It is therefore concluded that with respect to non-load related expenditure there is little evidence at present to justify the significant increase in allowance from the PR2/PR3 to PR4 periods. It is therefore suggested that a TAO total allowance broadly in line with that seen in PR2 and PR3 levels be maintained for the PR4 period, with an acceptance that some additional works that have been identified (substation security and flood risk management) will be required above and beyond that previously incurred.

With respect to the TSO, no change to the requested allowance with respect to non-load related projects is to be made. Subsequently, the TSO allowance for these categories is provided as €2.86m, as requested.

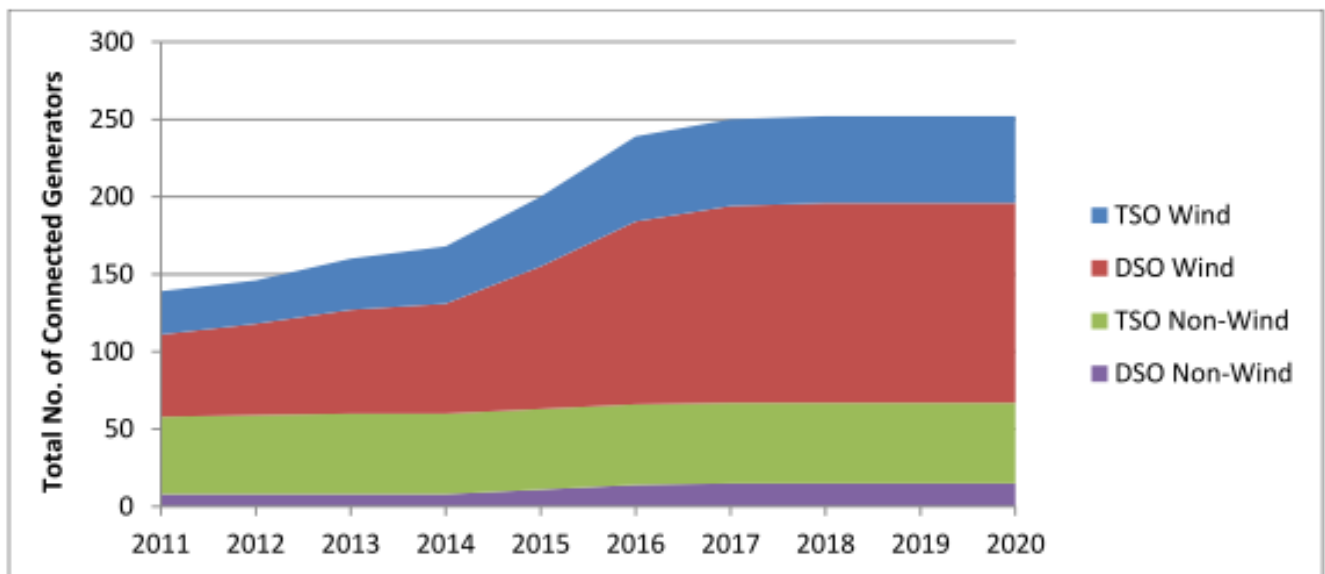
5.3.5 Network Needs and New System Reinforcements

Figure 5.2 has shown that the overall forecast allowance requirements for the PR4 period are broadly aligned with that seen within PR3, however the majority of this workload is as a result of ongoing projects for the TAO to finalise delivery, with a significant reduction in the forecast expenditure of the TSO planning requirements. Subsequently, this section looks at the forecast network needs within the PR4 period to investigate load and generator connection growth, alongside the forecast allowance requirements.

5.3.5.1 Generation Connection Forecasts

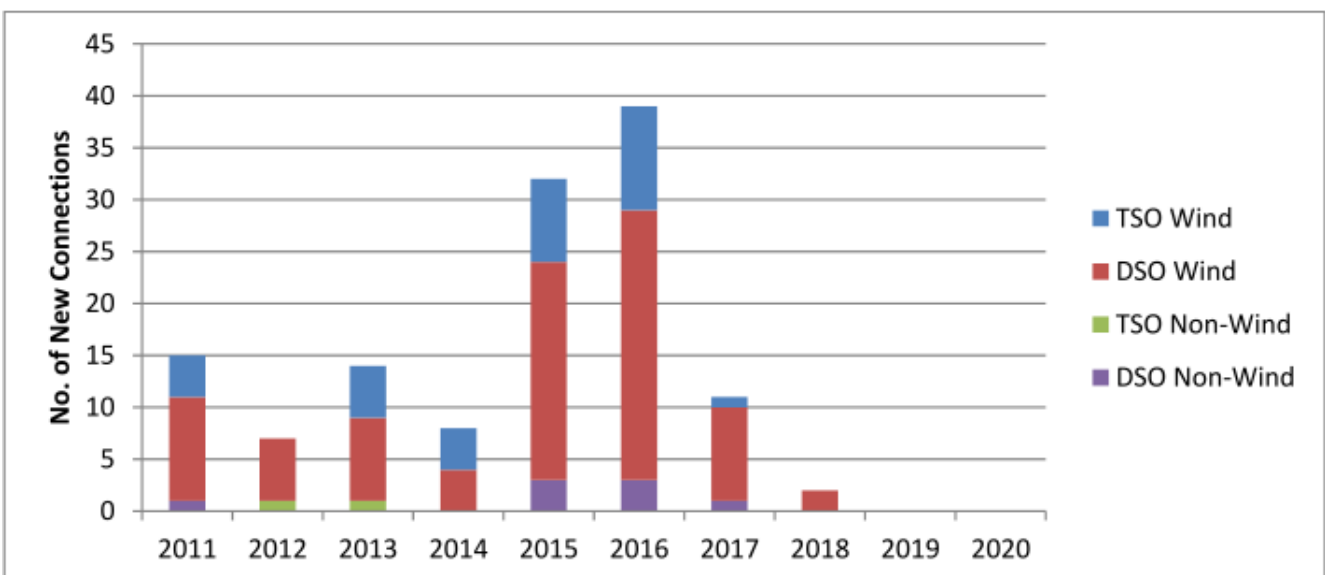
The renewable energy objective of 40% renewable energy sources by 2020 in Ireland and Northern Ireland remains to be targeted with the end of the PR4 period representing the remaining timeframe for this goal. As a result of this target and the associated generator incentives, the number of renewable generator connections has increased substantially in recent years.

Figure 5.6 shows the historic and projected cumulative increases in the total number of TSO and DSO connected generators in Ireland from 2011 through to 2020. The information provided is based on total numbers of executed, signed and live connection agreements as at the 10th November 2014. Some 60+ additional connections are not accounted for in the figure due to uncertainty over the energisation dates and it is currently assumed that these will connect beyond 2020.

Figure 5.6 : Growth in Generator Connections (Historic and Projected)³⁵

It can be seen from Figure 5.6 that a significant ramp up of connections has occurred and is expected to occur in the near future to 2016. With respect to connected capacity, EirGrid and SONI have delivered 652 MW of additional wind generation since 2011. Total wind generation installed on the island of Ireland has therefore increased by over 800 MW, from 1,790 MW to 2,635 MW since January 2011. Beyond 2016, the number of connections plateaus, indicating a stark reduction in new generators in the PR4 period.

Figure 5.7 breaks down the historic and forecast generator connections on an annual basis to provide greater clarity on the number of connections.

Figure 5.7 : Annual Generator Connections (Historic & Projected)³⁵

Again, Figure 5.7 illustrates a significant ramp up in the number of new connections in 2015 and 2016 with a subsequent reduction beyond this timeframe. Based on the latest projection, there are currently no known live

³⁵ Provided within TSO forecast capex submission Paper 4 – Business Drivers: Operations Paper. Discussions with the TSO note that this is the latest view, superseding that presented in the Ten Year Network Development Plan (TDP) and represents the total number of executed, signed and live connection agreements as at the 10th November 2014.

generation connections from 2018 and although generation connection applications can be presented at any time, the downward trend in known applications is of importance. It is believed that the spike in schemes in 2015/16 is driven by the REFIT scheme deadline for generators to be operational at the end of 2017 which will limit incentives for new connections beyond this timeframe as the 40% renewable target by 2020 is approached.

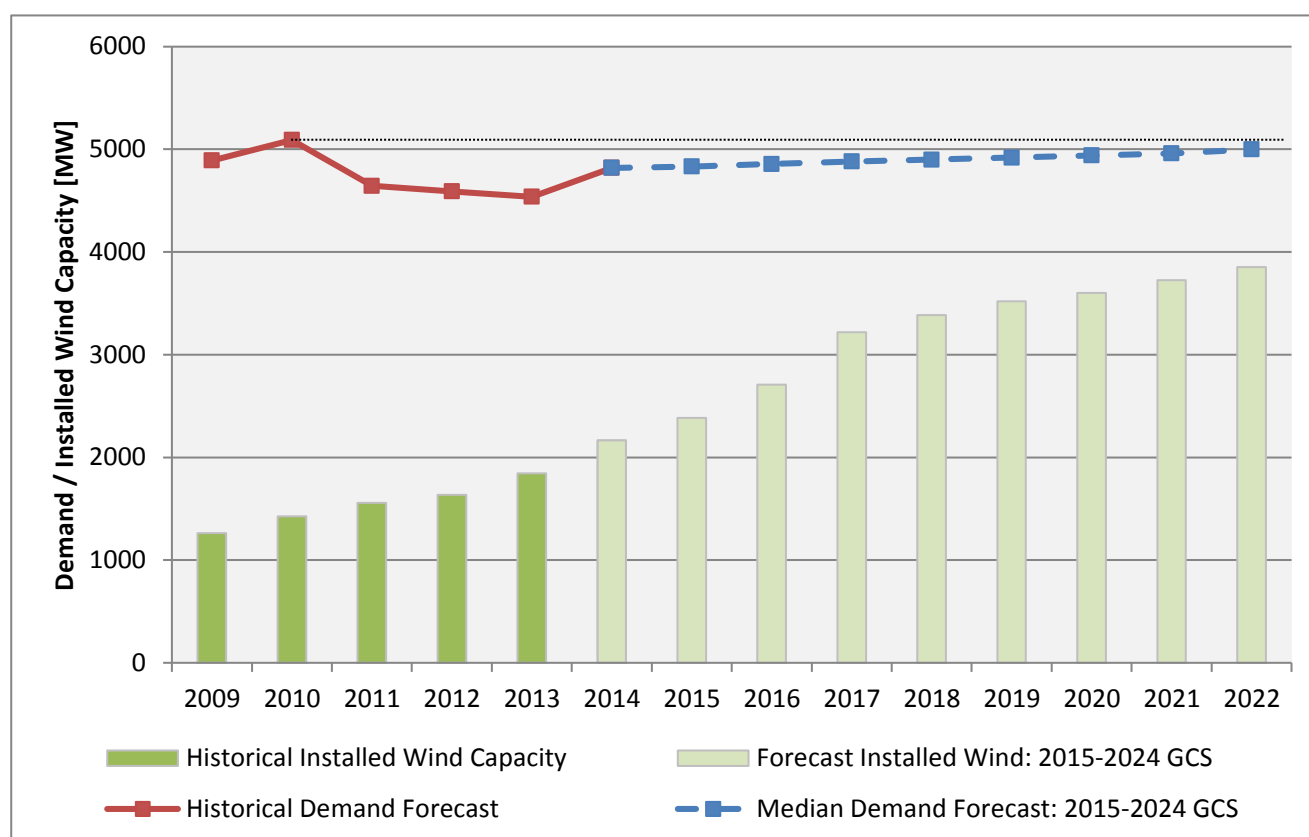
Subsequently, it is clear that, based on provided EirGrid forecasts, the number of new generator connections in the PR4 period is currently projected to be low, with no live connections known beyond 2018³⁶ and a total of 14 connections (primarily DSO Wind) within the entire PR4 period, less than the annual number of new connections in the PR3 period (exception to 2012 and 2014).

5.3.5.2 Demand

Historical network demand has recently reduced as a result of the financial crisis driven recession from peak levels in 2010. Latest median demand forecasts provided within the 2015-2024 Generation Capacity Statement (GCS) estimate that demand will not return to these levels until 2024, growing at an average year on year rate of 0.5% between 2014 and 2022, see Figure 5.8.

This figure also illustrates the historic and forecast installed wind capacity against the total load forecast levels. It should be noted that this forecast wind capacity data is provided by the 2015-2024 GCS and includes projected new generation connections currently not known and is therefore not fully comparable to the known wind generation connections shown in Figure 5.6 and Figure 5.7. A reduction in wind capacity growth is however seen from 2017 which broadly aligns with the reduction in known generation connections provided in Figure 5.6 and Figure 5.7.

Figure 5.8 : Historic and Forecast Network Demand and Wind Capacity (2015-2024 GCS)



³⁶ As noted previously, some 60+ connections are not presented within this analysis due to uncertainty over the associated energisation dates. The TSO has indicated that it assumes the majority of these connections will occur beyond the PR4 period (post 2020). Furthermore, DSO connected generators with a maximum export capacity less than 5 MW have been omitted due to the limited impact they have on TSO / TAO workload.

Some 18.5% of forecasted PR4 TSO and TAO spend is for new system reinforcements which are not ongoing from PR3. Considering low levels of demand growth and a reduction in the number of known generator connections (and slowing growth of forecast installed wind capacity) in the PR4 period, further investigation into the proposed system reinforcements has been conducted. Such investigation has highlighted that the proposed new reinforcements constitute the following summary:

- 16 new or uprated lines
- 3 busbar uprates
- 3 new or refurbished substations
- 5 generic reactive compensation projects
- 5 generic harmonic distortion projects
- 5 generic applications of busbar policy

Figure 5.9 provides an overview of the proposed PR4 new system reinforcements broken down by the categories noted above including the Stage 1 spend and Stage 2 factored costs for each category. The chart also allows an overview of the allocation of the total PR4 new system reinforcement costs on a category basis.

Figure 5.9 : PR4 New System Reinforcements – Stage 1 Spend and Stage 2 Factored Costs

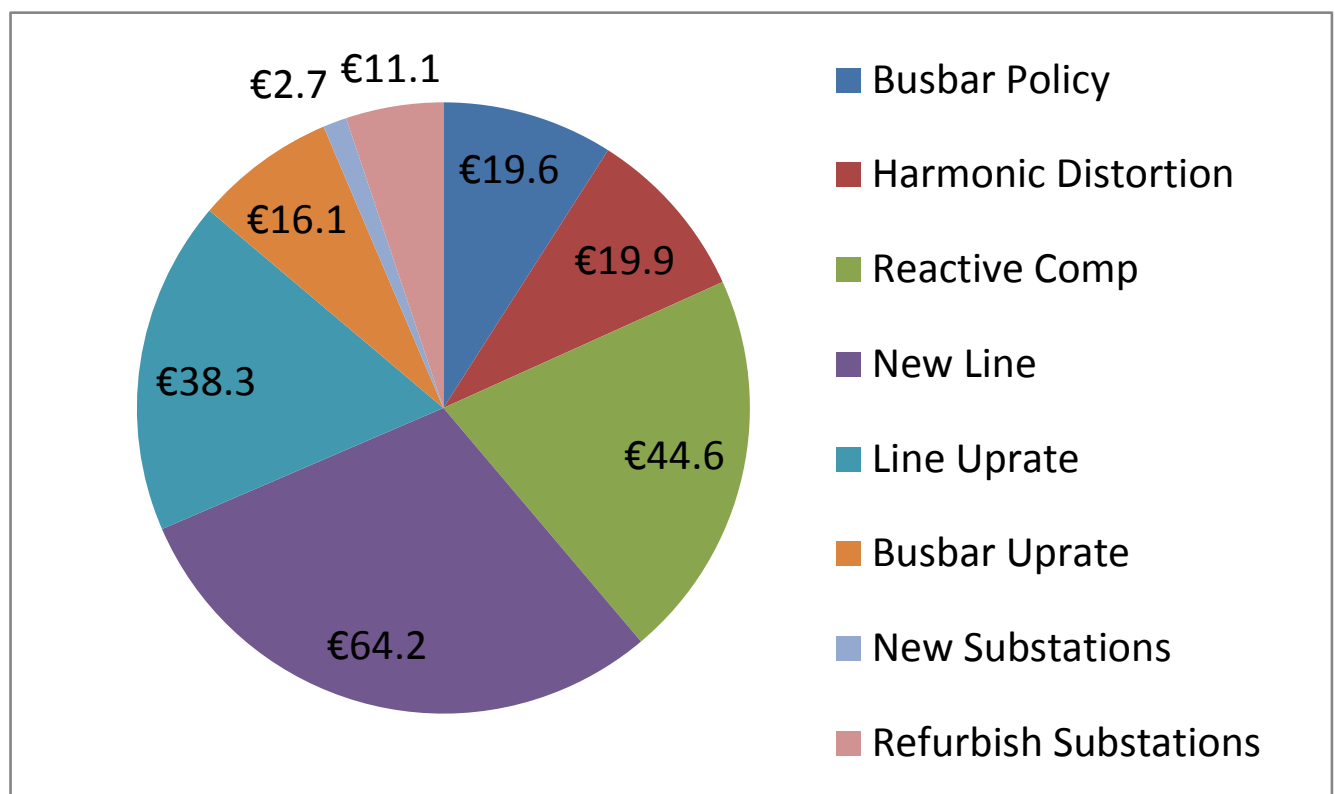


Figure 5.9 shows that the generic projects alone equate to some €84m (€19.6m + €19.9m + €44.6m) of Stage 1 and Stage 2 factored invoice/spend, approximately 40% of the total forecast system reinforcements in the PR4 period. Further inspection of these generic projects highlights the projected requirement for some 1200 MVARs of reactive compensation³⁷ proposed to be primarily of STATCOM technology, allowance for the employment of a proposed new busbar policy and allowance for projects to combat harmonic distortion. Limited detail is provided as to the benefits these projects could provide, where they are to be located and the true expenditure required to implement these projects (generic spend curve across the PR4 period and beyond).

³⁷ It is understood that this is in addition to the DS3 system services policy which aims to procure reactive power from generators. The forecast expenditure is for standalone reactive compensation assets required to carry out network reinforcements.

Taking as an example the revised busbar policy proposed to be introduced – moving from a typical H busbar configuration to a ring or C-type arrangement. Review of the documentation provided by the TSO, which appears to be dated from around 2011, highlights that whilst the proposed revised busbar design can potentially provide benefits e.g. allow higher capacity circuit ratings to be adopted, improve reliability, etc. none of the identified potential benefits have any quantification, even using a typical example as a basis. Furthermore, the TAO has indicated in documentation provided with the forecast PR4 submission that the application of the new busbar policy will increase unit costs. Consequently, whilst it is accepted that the proposed busbar policy can potentially provide benefits to end consumers through more efficient use of transmission infrastructure³⁸, the lack of detail included in present plans is insufficient to allow a determination of whether the requested PR4 funding is appropriate or not. A case by case assessment of the application of the proposed busbar policy should be developed with appropriate business cases submitted to the CER for additional monies with respect to these developments, was such cost/benefit assessments have been conducted.

It is appreciated that works regarding reactive compensation, harmonic distortion and implementation of the busbar policy will be required in the PR4 period, however until further clarity is known on the specific scope and scale of these works, it would not be appropriate to provide a large scale generic allowance as requested, with respect to justifying end customer value for money. 10% of the requested allowance (€6.1m) with respect to generic projects is recommended to be provided to allow for investigative works to continue (€0.61m). Further monies can be requested once greater clarity on the locations and benefits of these developments is known and sufficiently supported through appropriate business case documents.

A further €102m relates to the new or uprated lines of which there are five specified new lines and eleven uprates. It is proposed by the TSO that all eleven of the uprates be conducted utilising HTLS technology (€38.3m) and are located in the rural regions of the North East, North West and Midlands. These conductors can be classified as a new conductor technology and is a welcome development, representing the use of new technologies to provide alternative solutions over constructing a new line. It is not clear if the use of other new technologies, such as DLR³⁹, are also being considered for these projects. Furthermore, the five new lines, with a cost of €64.2m, are proposed to utilise traditional conductor types, although two of these projects are proposing to upgrade existing 220 kV lines to 400 kV (located near Kildare in the East). Again, it is not clear if the use of other technologies has been duly considered for these projects, however it is appreciated that at this early planning stage of the project, not all solutions may have been fully explored. Subsequently, the allowance for new/uprated line projects is included within the factored efficiency target of 5.77% to continue to incentivise further development and roll-out of appropriate technology solution options, such as HTLS and SPS.

Remaining forecast capital expenditure related to new substations, busbar uprates and refurbishment of substations (<14% of New System Reinforcements total expenditure) is recommended to be provided less a factored 5.77% efficiency target, as these activities typically involve 'business as usual' works of reasonably well known scope and cost.

The following section therefore reviews other new technologies that have previously been investigated by the TSO to minimise new reinforcement requirements/costs and the application of these new technologies.

5.3.5.3 New Technologies

As part SKM's review of forecast PR3 capital expenditure in the previous price control period, it was identified that the use of new technologies, particularly dynamic line rating (DLR) could provide notable cost efficiencies by making capacity available within the existing network. Initial investigations indicated that due to the high levels of intermittent wind generation, significant capacity increases could be achieved, potentially beyond 50% of nominal static line rating.

³⁸ The TSO has provided examples where the application of the busbar policy made cost savings of €14.2 and €11m respectively on two separate projects compared to the next best option.

³⁹ A key element of the stretched network needs scenario developed as part of the PR3 forecast allowance was identified potential efficiency benefits that could be realised by employing technologies such as DLR. It would therefore be expected that such technologies would be considered or utilised in the PR3 and forthcoming PR4 periods.

The following sections review the application of new technologies in the previous PR3 period, reviewing the benefits gained, followed by a critique of the proposed new technology investigations in the PR4 period and the use of new technologies to provide efficient reinforcement options.

Application of New Technologies in PR3

It was noted in the previous price review that proposals for installing DLR equipment on the Cashla – Tynagh and Aghada – Knockraha 220 kV lines were being investigated to understand the potential advantages of such technology. It is understood that DLR equipment was in fact installed in November 2009 and March 2010 on the respective circuits as part of a trial system.

The TSO noted that the equipment allowed an average increase in conductor rating (after applying conservative safety margins) of 46%, providing similar results to those seen from the desktop study conducted by SKM as part of the PR3 forecast (see above). To add further context, the re-conductoring of an existing ACSR 220 kV overhead line with new HTLS conductor will result in a 68% line rating. The TSO therefore concludes that 'for cases where circuit up-ratings are required exclusively as a consequence of N-1 over-load contingencies, DLR may provide significantly faster and more economical solution.'⁴⁰

The limitations of DLR were also identified, including the variability of line rating dependant on a vast array of factors which limits the technologies application, particularly in security of supply requirements where supply of demand must be met under all ambient conditions. As noted in the study by SKM, the technology is subsequently most applicable to economic applications such as the temporary reduction of constraints for wind farm connections.

HTLS and SPS (Special Protection Schemes) were successfully employed within the PR3 period, providing additional network benefits, generally above and beyond alternative solutions such as DLR. The continued implementation of HTLS is proposed in PR4 and represents the successful application of a new technology within EirGrid's planning 'toolbox'. However, DLR should also continue to be considered as part of this 'toolbox' where applicable.

Two other new technologies were considered within the PR3 period, namely aggregated demand side management and superconducting fault current limiters which are being implemented and trialled further, respectively. The potential applicability and wider benefits of these technologies are uncertain however and further analysis is required to confirm applicability for further deployment / application in PR4.

Proposed New Technologies to be Pursued in PR4

As part of the forecast submission the TSO noted a number of new technologies that are believed to be appropriate for trialling in the PR4 period, however they consider that there is insufficient certainty at this stage to give a definitive list of which of the new technologies are best. A summary of the TSO proposed new technologies for pursuance in PR4 is detailed as:

- Demand side metering technology (smart metering approaches approved by CER are not sufficient to measure demand side reserve provisions)
- Flywheel and battery storage technologies
- Distributed technologies
 - Electric vehicles
 - Distributed generation
 - Distributed heat
- New technologies to emerging operational challenges
 - Synchronous condensers

⁴⁰ Report on the Dynamic Line Rating Pilot Project, November 2010

- Distributed storage
- STATCOMS and FACTS devices
- Dynamic reactive power

The technologies noted above generally represent state of the art approaches relating to active network management and system management (e.g. flywheels, FACTs etc) and can be deemed as more long term developments which are still within the initial stages of industrial implementation. The benefits at this stage, for such technology trials, are however still unclear - reference is made to the technologies pursued in PR3 such as superconducting fault limiting reactors, which have not been considered further.

Additionally, reviewing the information on new technology trials completed in PR3 it is further considered that a progression of recent new technologies e.g. further DLR roll out potentially in conjunction with HTLS⁴¹, may be more appropriate to be pursued (rather than new state of the art technologies) as this could provide further tangible network capacity increases, potentially deferring further more costly network capacity reinforcements.

To support the investigation and demonstration of some of these new technologies, some €22.1m of financial support in the PR4 period has been requested⁴². However, whilst it is considered that the investigation of new technologies which provide potential benefit to customers is important, given the ongoing lack of application for technologies investigated in PR3 (specifically DLR), the lack of specific details on technologies to be investigated in PR4 as well as the potential benefits that could be gained, it is considered that the requested allowance for Research, Development and Demonstration (RD&D) is highly questionable. It is therefore suggested that a small allowance (10%) is provided to facilitate ongoing research works and pursue preliminary concept development during the early years of PR4. Furthermore, it is recommended that the TSO / TAO are allowed to submit applications for the funding of specific projects within the PR4 period on a case by case basis, once more clarity has developed over the specific projects / technologies to be trialled as well as the anticipated capital costs and associated benefits. Again, we would expect such applications to be supported with a detailed business case outlining:

- the specific projects / technologies that funding is being requested to support,
- the timescales over which the trials will take place,
- details of the potential benefits and outputs to be obtained from the trials / project, including potential cost savings, deferrals of other works / reinforcement, reliability / system resilience improvements, etc.,
- and a close out report once the trial / project has been completed detailing how the TSO / TAO intend to integrate the findings / outputs from the RD&D work into their normal business practices, or otherwise if the project is not successful what lessons have been learned that can be shared and factored into subsequent funding requests.

The final point above is considered fundamentally important, as it is essential that some direct benefits / value improvements to TSO / TAO activities and transmission infrastructure development is gained by consumers for such monies spent. The subsequent allowance for RD&D works is therefore provided as €2.21m from a request of €22.1m.

5.3.5.4 Network Needs, New System Reinforcements and New Technologies Conclusion

With regard to new reinforcements required to meet network needs, it has been demonstrated previously that the number of generator connections is anticipated to plateau beyond 2017 with load growth revisiting 2010 peak levels in 2024 and an annual growth in the order of 0.5%. Subsequently, there is little evidence to suggest substantial new reinforcements would be required in the PR4 period⁴³.

⁴¹ A potential option that could be explored is the usage of DLR with HTLS technologies - the latter is proposed for new line uprates, however a combination of the technologies could provide additional capacity benefits or allow the deferral of the HTLS uprate.

⁴² It is understood that this represents additional funding that is not included within the primary submission outlined in Table 5.1.

⁴³ It is appreciated that ongoing reinforcements will be required to permit full network access to existing and proposed generators and to ensure continued compliance with relevant security standards. However, significant new reinforcements driven by notable demand growth or new connections are not foreseen.

Additionally, review of proposed PR4 projects has identified a number of generic works to overcome harmonic distortion, reactive compensation and implementing a new busbar policy. As these projects are not currently developed or detailed to a sufficient extent to allow clarity of the “where, what and when” or indeed what the exact capital expenditure level that is required, it is not suggested to allow a large scale allowance for such generic projects. 10% of the requested allowance (€6.1m) with respect to generic projects is recommended to be provided to allow for investigative works to continue (€0.61m). Further monies can be requested once greater clarity on the locations and benefits of these developments is known and sufficiently supported through appropriate business case documents.

Review of the forecast PR4 capital expenditure plan regarding new reinforcements has identified that nearly 50% of the proposed expenditure relates to new or uprated lines. Of these projects, a notable proportion are proposed to utilise HTLS conductor, illustrating the use of new technologies to provide alternative solutions to constructing a new line. As part of the PR3 forecast it was noted that the use of DLR could also provide significant benefits. The TSO has previously conducted trials of this technology and has identified a potential increase in line capacity up to 45%, approaching close to the additional capacity provided by restrung some overhead lines with HTLS. It would therefore be expected that the use of DLR in the PR3 and subsequent PR4 period be more prominent than has actually been the case to date considering the benefits that have been identified through the trials. However, no evidence has been provided to suggest that this technology has been significantly considered against more traditional investment options with the new reinforcement projects proposed for PR4. As such, it is anticipated that cost savings in new reinforcements can potentially be made through the further application and roll-out of DLR technology, potentially in conjunction with HTLS, on a more widespread basis. Consequently, the allowance for new/uprated line projects during PR4 is suggested to be reduced by a factored 5.77% efficiency target from that requested by the TSO, subject to allowing potential additional expenditure during PR4 at a later date if supported by a detailed business cases. Such business cases would be expected to detail the options / technologies considered for specific, individual line uprate projects, including demonstration and incorporation of the outcomes of RD&D projects, as well as the applicable costs (both capital and operational) over the lifetime of the project and other associated benefits and risks.

5.3.5.5 Under Consideration - Shallow Connections

In addition to new system reinforcements, provision is separately provided to allow the connection of new generation. 40 projects are identified of which 32 are related to specific projects and a further 8 are for generic allowances on the assumption of new connections appearing within the PR4 period (‘typical distribution/contestable transmission/non-contestable transmission projects and RTU only projects 2016/17/18).

Considering that there are currently no known generator connections beyond 2018 (Figure 5.6) and that generation capacity growth is forecast to slow from 2017 (Figure 5.8), in alignment with the conclusion made regarding generic new system reinforcements, it is proposed that no allowance be provided for generic shallow connection projects. It is appreciated that currently unknown generator connections may arise within the period, therefore a specific request for additional PR4 capital expenditure funding can be made should this occur, if required, supported with a detailed business case submission to justify the additional funding.

Of the remaining specific projects, it is seen that all are ongoing from the PR3 period. Subsequently, the forecast expenditure for these specific ongoing projects is suggested to be provided as requested, less a factored 5.77% efficiency target to incentivise delivery. This results in a reduction from the request (€2.80m, excluding generic projects) to €2.64m.

5.3.5.6 Under Consideration – DSO

Fourteen projects are identified as 110 kV substation enhancements or modifications to support the DSO network. All of the projects are defined with all expected to involve some expenditure in the first two years of the PR4 period. Again, it is recommended that the requested PR4 submission allowance is provided, less a factored 5.77% efficiency target to incentivise delivery. This results in a reduction from the requested €0.053m to €0.050m.

5.3.6 Non-Network Capital Expenditure

5.3.6.1 Overview

Table 5.5 below shows the forecast non-network (IS) capital expenditure over the PR4 period year on year.

Table 5.5 : PR4 Forecast Non-Network Capital Expenditure Breakdown⁴⁴

Item	2016	2017	2018	2019	2020	Total
IS Infrastructure (incl Desktop)	0.30	2.18	0.79	1.65	0.53	5.44
Corporate Systems	1.27	0.52	0.88	0.33	0.52	3.53
Energy Management Systems – All Island Operations	0.69	0.15	0.15	0.65	1.55	3.19
EDIL/RCUC/AMP	0.48	0.36	0.25	0.18	0.18	1.44
TUoS/Settlement/Metering	0.79	0.34	0.94	0.38	0.38	2.81
Big Data / Data Mining	0.86	0.75	0.15	0.00	0.00	1.76
DS3/Smart Grids	0.60	0.94	1.69	1.13	0.45	4.80
Operations Changes – Network Codes	0.00	0.75	0.00	0.00	0.00	0.75
Telecoms	5.25	3.69	2.24	2.10	2.05	15.31
Facilities	0.02	0.02	0.02	0.02	0.10	0.18
TOTAL	10.25	9.69	7.10	6.42	5.74	39.21

Review of Table 5.5 indicates a total non-network capital expenditure of €39.21m over the five year period. It can be seen that the expenditure decreases year on year, similar to that seen in Figure 5.3 from a peak in 2016 of €10.25m to half that value (€5.74m) in 2020. An analysis of each of the core items shown in Table 5.5 is detailed below.

5.3.6.2 Detailed Assessment

IS Infrastructure

EirGrid have indicated that a number of key infrastructure elements including firewalls and core switches are approaching the notional end of life period with planned replacement in 2017 (providing some reasoning for the spike in expenditure in this year). Furthermore, server infrastructure is proposed to be upgraded in 2019 with the benefits of upgraded equipment and subsequent new support contracts outweighing prolonged end of life support contracts.

Expenditure in this category is on a par with that seen in PR3 (which was some €2m greater than the initial allowance), however, as discussed within the historic capital expenditure review, it is understood that synchronised replacement cycles in the PR3 period (assumed through advanced expenditure) should allow a reduction in expenditure in the PR4 period, which is not being seen. Furthermore, EirGrid stated that the organisation had made significant savings by combining the buying power of EirGrid TSO, SONI TSO and SEMO (Market Operator) for software licensing and its recent hardware tender, however this does not appear to have resulted in a reduction in the PR4 period forecast expenditure. Subsequently, a reduction of €0.5m (€0.1m per annum) is recommended to be made to the requested expenditure, to reflect the anticipated additional savings that can be made from this combined buying power.

Corporate Systems

In addition to standard corporate system upgrading, EirGrid are proposing to progress two major projects relating to the Customer Relationship Management (CRM) System and the Human Resources Management

⁴⁴ Paper 5 – Business Drivers: IS Paper, 21st November 2014

System (HRMS). Each system is being developed to provide a centralised database for customer and human resources activities with the view of creating greater productivity. The allowance for these developments is recommended to be provided at this time, however improvements in operational productivity and reduced operational costs will be required to be illustrated to justify this investment at the end of the PR4 period.

Energy Management Systems

Energy management systems typically require a five year update and the current upgrade includes integration between Dublin and Belfast, due for completion in late 2015. A subsequent upgrade is therefore planned for 2019/20. The upgrade in 2020 will add further enhancements with respect to power system management, management of renewables and European developments.

Generator and Trading Systems (EDIL, RCUC and AMP)

Generator and trading systems under consideration are required under I-SEM and the forecast expenditure provided does not include any direct cost associated with I-SEM requirements. However, EirGrid is currently proceeding on the basis that the RCUC and EDIL will endure under the I-SEM and the costs are submitted on this basis (any changes driven by I-SEM are not included).

TuOS / Settlement / Metering

Forecasted expenditure considered under this topic relates to the overall co-operation and co-ordination of EirGrid and SONI to minimise licencing costs and reduce the overhead of supporting multiple different critical systems, particularly with regard to gathering meter information.

Big Data and Data Mining

EirGrid proposes that the investment in significant levels of data analysis and management in real time of ever increasing volumes and variety of data sets from the network will allow a more efficient development and operation of the network. The forecast expenditure progresses this to a point where the analysis of data will become more of a specialism requiring an increase in headcount, expenditure on leading edge database and analytics in addition to technology to allow a large amount of the data available externally.

DS3 and Smart Grids

With reference to DS3, the Regulatory Authorities in Ireland and Northern Ireland approved the high level System Service products in December 2013, and as a result the TSO business can commence works in the area of DS3 system services procurement framework development. However, as a final decision on the new System Services and remuneration options were not made until Q4 2014 – after the cut-off date for initial data for this review – the full IS requirements to facilitate the decision are unknown⁴⁴. Given the range of potential solutions and the wide variation in IS costs associated, no system (hardware or software) costs for implementing the final decision have been included. The costs included are therefore relating to data analytics and improvements in current control centres to allow full implementation of the DS3 work programme and Smart Grid.

The inclusion of these costs to allow full implementation of DS3 within this submission is recommended to be allowed within the PR4 submission.

European Network Codes

Changes in European network codes are anticipated to drive changes to the network, system and operational requirements of the TSO which will subsequently impact on the requirements for data transparency and data links to Europe. The exact requirements are currently unknown and the forecasted expenditure provides for preliminary works to be conducted only.

Telecoms

Telecoms shows the highest forecast expenditure across all other non-network capital expenditure categories at €15m across the five year period. A high proportion of telecoms costs are broadly aligned with new generator connections as SCADA links are installed. Comparison to Figure 5.7 does indeed show an expenditure profile broadly aligned with the forecast number of new connections, with ongoing underlying costs relating to IP network migration and SCADA implementation at new substations not necessarily driven by new generators.

Facilities

A forecast capital expenditure of €0.18m is noted as a 'provision for the Oval building' with regards to facilities. It is unclear for what purpose this forecast provision has been made. Furthermore, in alignment with the wider PR4 philosophy, allowances for generic projects and provisions where the scope of the required capital expenditure is not clear or suitably defined are recommended to be reduced or reserved until greater clarity is known, at which time requests for additional expenditure during the period can be made, supported by appropriate business case documentation. Subsequently, the generic provision for capital expenditure associated with the Oval building is recommended not to be provided.

5.3.6.3 Conclusion

Review of the PR3 outturn non-network capital expenditure returns a total spend of €31.4m against a forecast of €31.1m. The forecast PR4 expenditure of €39.21m therefore represents an increase of €7.63m (~25%). It is appreciated that the number of generator connections is anticipated to peak in the PR4 period (2016 specifically) resulting in additional telecoms costs which were delayed from the PR3 period due to network need (PR3 outturn for telecoms costs are ~€5m lower than forecast expenditure).

However, it was expected that efficiencies in IS infrastructure and corporate infrastructure could be gained through co-operation and integration with SONI, however forecast expenditure is broadly in line with that seen in PR3.

Minimising IS expenditure based on perceived buying power improvements and removing generic provisions for capital expenditure on the Oval building, results in a total non-network capital expenditure forecast of €38.53m, some 25% greater than the outturn expenditure seen in the PR3 period. Considering telecoms costs were underspent in the PR3 period by circa €5m due to delayed generation connections now forecasted in the PR4 period, the revised total non-network capital expenditure of €38.53m (from a PR3 outturn of €31.4m) is deemed appropriate for PR4 development, although ongoing capital and operational efficiencies should be sought and justified from the co-operation and integration with SONI. Quantification of these benefits should be made available within the PR4 period to ensure ongoing efficiencies are gained from this approach.

5.4 Specific Findings from Forecast PR4 Review

The previous sub-sections of this document have outlined our review of the TSO (and related TAO) capital expenditure requirements during PR4. We have examined the various elements of the TSO PR4 capital expenditure requested and made reference to outturn expenditure during previous price control periods as well as other relevant information e.g. system demand, generation connections, etc. The review has focussed on the following key areas:

- Network development scenarios
- TSO capitalised expenditure trends and ongoing projects from the PR3 period
- Non-load related expenditure
- Network needs, new network reinforcements and associated new technologies
- Other expenditure streams

Through this review it is clear that whilst certain elements of the TSO (and TAO) PR4 submission are developed to such an extent where there is reasonable clarity on the requirement for, and extent of expenditure required to fund underlying activities, other areas are considerably less transparent in this regard. To a certain extent this is the nature of such forecast activities, where plans in the first year or two of a forthcoming price control period are generally reasonably well known and detailed, with such visibility and transparency reducing in the subsequent years. Hence, there is always an element of uncertainty associated with forecasting the required allowances for transmission businesses regulated under such a price control mechanism, and in this case both TSO and TAO have, to some extent, acknowledged this.

Taking account of the above, and the suggested revisions to the PR4 operating and review process, including periodic review of business plans, expected output metrics and capital expenditure as detailed in Section 5.2, the following recommendations are made as regards efficient TSO capital expenditure requirements for PR4.

- i. The PR4 allowance should be based on consideration of the capital costs included in the TSO Scenario 1. Whilst it is recognised that certain new transmission projects will inevitably require the usage of underground cable for techno-economic and environmental reasons, at the present time the extent of potential underground cable costs required is unclear. For any projects where underground cable is assessed to be required, particularly the larger 400 kV projects where such costs may be significant, it is recommended that the TSO (and TAO) provide requests for additional PR4 funding during the periodic review and reporting activities, or on a case by case basis for the largest projects. This will be required to be supported by a detailed explanation of additional costs and demonstration of efficient asset delivery practices.
- ii. Projects which are reasonably well defined, ongoing and appear suitable to be progressed are recommended to be allowed as per the original PR4 request, subject to an efficiency target of 7.5% on gross project value, relating to 5.77% on factored values.³³ It is expected that this efficiency can be achieved through a number of initiatives including co-ordinated planning and proactive engagement with suppliers and planning bodies on the future network development programme, refinement of project / contract management and implementation, plus potential advanced purchases of material and equipment to avoid manufacturing delays. If at the end of PR4, review identifies that the expected number of transmission system projects and / or key output metrics have been achieved and overall costs are above the targeted “efficient” value then this would still be allowable if supported by robust information demonstrating that outturn costs incurred were efficient
- iii. Reporting against the targeted allowance for ongoing projects could be provided by the transmission businesses during the periodic reporting time scales, allowing them the opportunity to provide new information to support any potential cost variations expected to be faced.
- iv. Capital project expenditure within this category includes the €76.9m and €714.7m of TSO and TAO expenditure detailed as Ongoing Projects in Scenario 1. This further includes the expenditure for new substations, busbar uprates and refurbishments included under New System Reinforcements, provided as €8.85m for the TSO and under consideration DSO projects at €0.1m.

- v. Capital expenditure for the 32 specific generation connections included within the Under Consideration – Shallow Connections also falls within this category (€27.82m) of which TSO (invoiced) expenditure is forecast as €2.8m.

Subsequently, the revised TSO allowance for these categories is provided as €83.47m, reduced from a request (excluding generic projects), of €88.53m

- vi. Non-network capital expenditure is forecast to increase by ~25% in comparison to PR3 outturn levels. A primary driver for the increased cost is as a result of forecast new connections in the PR4 period with associated telecoms costs. Other non-network costs are broadly aligned with that seen in PR3. Considering the ~€5m reduction on telecoms in PR3 against forecast expenditure due to delayed generator connections, **a revised allowance of €38.53m** (against a PR3 outturn of €31.4m) is deemed appropriate to accommodate the additional connections anticipated in PR4 in addition to ongoing non-network related capital expenditure. This is a reduction of €0.68m from the requested PR4 allowance (€0.18m removal of provision for facilities capital expenditure), €0.5m of which is proposed to be gained through improved IS infrastructure buying power with the integration of EirGrid, SONI and SEMO systems.
- vii. For PR4 non-load related capital expenditure, it is recommended that the TSO PR4 factored forecast expenditure of **€2.86m is allowed** as requested.
- viii. Whilst assessing the requirement for potential transmission system capacity reinforcements during PR3, the Stretch Network Needs scenario used as the basis for the PR3 funding allowance included specific assumptions that technologies such as DLR would be used as alternatives to existing line uprate and traditional capacity enhancement solutions. It has become clear through DLR trials that the technology has limited applications.

However, the implementation of other new technologies such as HTLS and SPS has been successful and projects within the PR4 period are proposed to utilise these new technologies as alternatives to 'traditional' approaches. As the planning of new/uprated line projects is currently incomplete, **the allowance for new/uprated line projects is included within the factored efficiency target of 5.77%** to continue to incentivise further development and roll-out of appropriate technology solution options, such as HTLS and SPS.

As with the other investment categories outlined where some reduction in requested funding is suggested, further capital expenditure on new / uprated lines beyond the outlined value may be considered, subject to being supported by a detailed business case

- ix. A significant number of generic new reinforcement projects are forecast, relating to reactive compensation, harmonic distortion and implementation of the new busbar policy. A further eight generic shallow connection projects noted as being generic allowances for future potential connections which are currently unknown. No specific details regarding the scope, cost, timing and potential benefits that may arise from these works have been provided. Therefore, 10% of the requested generic project allowance is suggested to be provided at this time to allow works to continue with a recommendation that the TSO / TAO are allowed to submit an application for further funding required during PR4 for project expenditure that would fall within these generic projects, once further details of the specific project scope, timing and cost requirements are made available and also supported by detailed business cases.

The subsequent TSO allowance for these generic projects is provided as €0.61m, reduced from a request of €6.1m

- x. With respect to financial support to fund the investigation and demonstration of further new technologies within the PR4 period (outside of the PR4 forecast capital expenditure request), it is proposed that a minimised **allowance of €2.21m** (10% of requested allowance of €22.1m) is given due to the current lack of clarity on which suitable technologies are to be pursued. The investigation of new technologies which provide benefits to end customers in relation to transmission system development, management and operation is important. Hence, whilst a minimised allowance is given here which should at least enable concept development and technology review to begin, it is proposed that business cases to support the investigation of specific new technologies, including quantified benefits, be submitted within the period and financial support provided on this basis.

5.5 PR4 Summary and Conclusions

This document has reviewed the forecast capital expenditure over the PR4 period 2016 to 2020 for the Transmission System Operator in Ireland, EirGrid. The review has focussed on the following areas, and has included comparison with the historic expenditure seen in the previous PR3 and PR2 periods.

The review has identified that the project capital expenditure requested by the TSO (and TAO) through PR4 can be broadly split into the following categories:

- i. Project or capital expenditure areas which are well defined, supported by detailed costs or where review has identified that the requested expenditure is in line with previous price review periods.

This includes non-network as well as non-load related capital expenditure. The requested level of PR4 non-load related expenditure for the TSO is actually lower than the outturn experience in PR3 and as such is considered reasonable. Total TSO non-load related capital expenditure therefore amounts to €2.86m.

Total TSO non-network related capital expenditure (not included in Scenario 1) is provided as €38.53m which reflects the forecast expenditure, less €0.68m, €0.5m of which is proposed to be gained through improved IS infrastructure buying power with the integration of EirGrid, SONI and SEMO systems and €0.18m provision for capital expenditure on facilities which is recommended not to be included.

- ii. Projects which are reasonably well defined, ongoing and have a high likelihood of progressing as planned and to expected costs.

Projects in this category include all Ongoing Projects, certain work activities within the New System Reinforcements (new substations, busbar uprates and substation refurbishments) as well as capital expenditure for specific generation connections (32) and other EirGrid capital expenditure included in relation to DSO activities.

In order to incentivise the TSO to continue timely and efficient project planning, an efficiency target of 7.5% on gross allowance (equivalent to 5.77% on factored allowance) is to be applied. Whilst the adoption of any such efficiency target would effectively be a notional value, the use of such an approach will at least provide a driver for the TSO to maintain an efficient spend profile through PR4, and perhaps as critically, require significantly more detailed documentation and business case analysis to be provided to substantiate outturn expenditure.

Collectively this expenditure amounts to €83.47m following the efficiency incentive target for the TSO and accounts for the bulk of the requested PR4 capital expenditure.

- iii. For project areas where there is an acknowledgement of a requirement for capital expenditure during PR4 but for which current expenditure plans are not well enough detailed at present, it is recommended that a more significant reduction in PR4 allowed expenditure be applied.

Project work included in this category includes further RD&D work during PR4. It is acknowledged that there is a requirement for such activities, and the solutions and technology options resulting from such research projects and trials can be useful in order to assess and evaluate future solution options that may bring benefits to network development efficiency, performance and reliability, as well as provide value for money to end customers. However, the existing TSO plans for PR4 are not currently well enough developed, which in conjunction with the lack of transparency over the benefits obtained from RD&D work undertaken during PR3, suggests that only a smaller allowance of €2.21m (10% of request) – note that this also is not included in Scenario 1 – is given at the outset of PR4 in order to allow progression of technology evaluations and concept assessment in advance of specific project trials.

It is however recommended that the TSO is allowed to submit applications for the funding of specific RD&D projects within the PR4 period on a case by case basis, once more clarity has developed over the specific projects / technologies to be trialled as well as the anticipated capital costs and associated benefits that are likely to be obtained. A close out report once the trial / project has been completed detailing how the TSO intends to integrate the findings / outputs from the RD&D work into their normal business practices should also be considered mandatory along with the approval of any project funding.

- iv. The final category of project expenditure are those projects that are classed as generic projects, which by definition are typically uncertain in project scope, timing and cost.

Project work in this category includes the proposed revised busbar policy, generic reactive compensation and harmonic mitigation projects, plus generic connection projects for eight generators. Whilst it is accepted that capital expenditure in relation to some or all of these generic projects may be required during PR4, the current specification and scope of these projects is limited and a minimised allowance of 10% of the forecast expenditure (equivalent to €0.61m) be provided at this time to allow works to continue.

A review of the allowance levels should be conducted once further details of the specific projects and requirements are developed and made available by the TSO within the PR4 period. It is expected that any such PR4 allowance revision would be expected to be supported by a detailed business cases demonstrating costs, options, risks and benefits to end consumers from undertaking such project work.

In addition to the specific conclusions made relating to individual TSO and TAO capital expenditure during PR4, as part of the review process we have identified some suggested revisions to the ongoing monitoring and compliance review activities to be undertaken during PR4. This includes:

- The development of a set of expected PR4 transmission system output metrics for both TSO and TAO businesses e.g. number of projects completed, km of new / uprated transmission circuit, MVA capacity of generation plant connected, as of the start of PR4. This will be used to monitor outturn network development activities and associated capital expenditure efficiency.
- The introduction of periodic review stages within PR4 (suggested as annually) in order to monitor and evaluate TSO and TAO project and asset delivery and associated capital expenditure, against the defined output metrics. Whilst it is expected that any network development or business plan will inevitably change through a price review period, the documentation of the necessary changes in the transmission project portfolio and expenditure programme should be transparent and documented. The periodic reporting stages can be used to allow revisions to the expected PR4 output metrics for the businesses and provide documented commentary from the TSO / TAO explaining major deviations in project number, type, progress, cost and development since the last reporting stage. In addition to providing more transparency of TSO and TAO ongoing business activities, which will at least make the process of assessing PR4 outturn capital expenditure efficiency significantly easier, these periodic reporting stages will also allow the transmission businesses to present updated investment plans plus applications for funding areas not included at the outset of PR4.

For the highest capital and most complex transmission projects, typically 400 kV and regional interconnection projects, it is suggested that given the lengthy time to plan, obtain consenting and approval, design, develop and construct such projects which can span two or more price review periods, these could be removed from the base PR4 allowance for both the TSO and TAO. Such projects could be treated in a similar fashion to Strategic Wider Works projects by Ofgem in GB, allowing the transmission businesses more time to adequately refine and develop their proposed plans for such strategic projects, and seek funding on a project by project basis and subject to stakeholder review and challenge. The detailed development and documentation of such an approach or policy is beyond the scope of this work however key aspects that would need to be considered would include the definition of qualifying projects, as well as whether to apply this policy to existing projects already underway (there may be potential difficulties in tracking outturn costs for projects which have already achieved some level of capitalisation during PR3 or PR2) or only new projects expected to undergo TSO planning activities within PR4.

6. Allowed Revenues

With regard to Opex allowances, the TSO have forecast an additional €54.3m over the PR4 period compared with PR3. We consider that the TSO have been conservative in what can be achieved with the existing resource considering the headcount increases in PR3. The TSO recognise that there is uncertainty over the level of resource required in PR4 and we have reflected that in the approach to the resource allowances. This has resulted in reductions of €50.7m being proposed providing a total allowance of €217.4m which is 10% higher than expenditure in PR3. The major changes are on staffing where there are more opportunities to utilise the manpower increase already made in PR3 could be made, and in the proposed budget for R&D which we consider could be better controlled on a specific case by case basis with a thoroughly reviewed business case when needed. This is not intended to go against the principles of ex-ante regulation but to promote the identification of key deliverables and objectives for the Research and Development expenditure for the benefit of consumers.

The review has identified that the project capital expenditure requested by the TSO (and TAO) through PR4 can be broadly split into the following categories:

- i. Project or capital expenditure areas which are well defined, supported by detailed costs or where review has identified that the requested expenditure is line with previous price review periods.

This includes non-network as well as non-load related capital expenditure. The requested level of PR4 non-load related expenditure for the TSO is actually lower than the outturn experience in PR3 and as such is considered reasonable.

Total TSO non-load related capital expenditure therefore amounts to €2.86m. Total TSO non-network related capital expenditure (not included in Scenario 1) is provided as €38.53m which reflects the forecast expenditure, less €0.68m. €0.5m of which is proposed to be gained through improved IS infrastructure buying power with the integration of EirGrid, SONI and SEMO systems and €0.18m provision for capital expenditure on facilities which is not to be included.

- ii. Projects which are reasonably well defined, ongoing and have a high likelihood of progressing as planned and to expected costs.

Projects in this category include all Ongoing Projects, certain work activities within the New System Reinforcements (new substations, busbar uprates and substation refurbishments) as well as capital expenditure for specific generation connections (32) and other EirGrid capital expenditure included in relation to DSO activities.

In order to incentivise the TSO to continue timely and efficient project planning, an efficiency target of 7.5% on gross allowance (equivalent to 5.77% on factored allowance) is to be applied. Whilst the adoption of any such efficiency target would effectively be a notional value, the use of such an approach will at least provide a driver for the TSO to maintain an efficient spend profile through PR4, and perhaps as critically, require significantly more detailed documentation and business case analysis to be provided to substantiate outturn expenditure.

Collectively this expenditure amounts to €83.47m following the efficiency incentive target for the TSO and accounts for the bulk of the requested PR4 capital expenditure.

- iii. For project areas where there is an acknowledge of a requirement for capital expenditure during PR4 but for which current expenditure plans are not well enough detailed at present, it is recommended that a more significant reduction in PR4 allowed expenditure be applied.

Project work included in this category includes further RD&D work during PR4. It is acknowledged that there is a requirement for such activities, and the solutions and technology options resulting from such research projects and trials can be useful in order to assess and evaluate future solution options that may bring benefits to network development efficiency, performance and reliability, as well as provide value for money to end customers. However, the existing TSO plans for PR4 are not currently well enough developed, which in conjunction with the lack of transparency over the benefits obtained from RD&D work undertaken during PR3, suggests that only a minimal allowance of €2.21m (10% of request) – note that this also is not included in Scenario 1 – is given at the outset of PR4 in order to allow progression of technology evaluations and concept assessment in advance of specific project trials.

It is however recommended that the TSO is allowed to submit applications for the funding of specific RD&D projects within the PR4 period on a case by case basis, once more clarity has developed over the specific projects / technologies to be trialled as well as the anticipated capital costs and associated benefits that are likely to be obtained. A close out report once the trial / project has been completed detailing how the TSO intends to integrate the findings / outputs from the RD&D work into their normal business practices should also be considered mandatory along with the approval of any project funding.

- iv. The final category of project expenditure are those projects that are classed as generic projects, which by definition are typically uncertain in project scope, timing and cost.

Project work in this category includes the proposed revised busbar policy, generic reactive compensation and harmonic mitigation projects, plus generic connection projects for eight generators. Whilst it is accepted that capital expenditure in relation to some or all of these generic projects may be required during PR4, the current specification and scope of these projects is limited and a minimised allowance of 10% of the forecast expenditure (equivalent to €0.61m) be provided at this time to allow works to continue.

A review of the allowance levels should be conducted once further details of the specific projects and requirements are developed and made available by the TSO within the PR4 period. It is expected that any such PR4 allowance revision would be expected to be supported by a detailed business cases demonstrating costs, options, risks and benefits to end consumers from undertaking such project work.

In addition to the specific conclusions made relating to individual TSO and TAO capital expenditure during PR4, as part of the review process we have identified some suggested revisions to the ongoing monitoring and compliance review activities to be undertaken during PR4. This includes:

- The development of a set of expected PR4 transmission system output metrics for both TSO and TAO businesses e.g. number of projects completed, km of new / uprated transmission circuit, MVA capacity of generation plant connected, as of the start of PR4. This will be used to monitor outturn network development activities and associated capital expenditure efficiency.
- The introduction of periodic review stages within PR4 (suggested as annually) in order to monitor and evaluate TSO and TAO project and asset delivery and associated capital expenditure, against the defined output metrics. Whilst it is expected that any network development or business plan will inevitably change through a price review period, the documentation of the necessary changes in the transmission project portfolio and expenditure programme should be transparent and documented. The periodic reporting stages can be used to allow revisions to the expected PR4 output metrics for the businesses and provide documented commentary from the TSO / TAO explaining major deviations in project number, type, progress, cost and development since the last reporting stage. In addition to providing more transparency of TSO and TAO ongoing business activities, which will at least make the process of assessing PR4 outturn capital expenditure efficiency significantly easier, these periodic reporting stages will also allow the transmission businesses to present updated investment plans plus applications for funding areas not included at the outset of PR4.

For the highest capital and most complex transmission projects, typically 400 kV and regional interconnection projects, it is suggested that given the lengthy time to plan, obtain consenting and approval, design, develop and construct such projects which can span two or more price review periods, these could be removed from the base PR4 allowance for both the TSO and TAO. Such projects could be treated in a similar fashion to Strategic Wider Works projects by Ofgem in GB, allowing the transmission businesses more time to adequately refine and develop their proposed plans for such strategic projects, and seek funding on a project by project basis and subject to stakeholder review and challenge. The detailed development and documentation of such an approach or policy is beyond the scope of this work however key aspects that would need to be considered would include the definition of qualifying projects, as well as whether to apply this policy to existing projects already underway (there may be potential difficulties in tracking outturn costs for projects which have already achieved some level of capitalisation during PR3 or PR2) or only new projects expected to undergo TSO planning activities within PR4.

Table 6.1 : TSO Allowed Opex Revenue for PR4

	TSO Proposed PR4						Jacobs Proposed PR4						Variance	%
	2016	2017	2018	2019	2020	Total	2016	2017	2018	2019	2020	Total		
OPEX														
Staff Costs	29.2	29.8	30.1	30.3	30.3	149.6	26.1	26.1	26.1	26.1	26.1	130.4	-19.2	-12.8
Staff Related Costs	2.0	2.0	2.0	2.0	2.0	10.0	1.9	1.9	1.9	1.9	1.9	9.50	-0.5	-5.0
Contractors	2.0	2.0	2.0	2.0	2.0	10.0	1.6	1.6	1.6	1.6	1.6	8.0	-2.00	-200
Telecommunications	5.4	6.1	6.3	6.3	6.5	30.7	4.3	4.3	4.9	5.4	6.1	25.1	-5.6	-18,2
Premises	4.6	4.8	5.1	5.1	5.2	24.7	4.6	4.8	4.8	4.8	4.8	23.7	-1.0	-4.0
IT Costs	3.0	3.2	3.5	3.6	3.7	17.0	2.7	2.7	2.9	3.0	3.2	14.5	-2.5	-14.7
Insurance and Compensations	0.3	0.3	0.3	0.3	0.3	1.5	0.2	0.2	0.2	0.2	0.2	1.0	-0.5	-33.3
Selling and Advertising	0.2	0.2	0.2	0.2	0.2	1.2	0.1	0.1	0.1	0.1	0.1	0.5	-0.7	-58.3
Professional Services	3.4	3.5	3.3	3.0	3.1	16.3	2.9	2.9	2.9	2.9	2.9	14.5	-1.4	-8.5
Grid Maintenance	1.1	1.1	1.1	1.1	1.1	5.6	1.0	1.0	1.0	1.0	1.0	5.0	-0.6	-10.7
Intercompany – Corporate Recharges	-4.7	-4.7	-4.7	-4.8	-4.8	-23.6	-3.7	-3.7	-3.7	-3.8	-3.8	-18.6	-5.0	-21.2
Rates	0.6	0.6	0.6	0.6	0.6	2.9	0.6	0.6	0.6	0.6	0.6	2.9	0.0	0.0
Promotion of Research	0.7	0.7	0.7	0.7	0.7	3.5	0.2	0.2	0.2	0.2	0.2	1.0	-2.5	-71.4
Research, Development & Demonstration	1.5	2.0	4.1	5.6	5.7	18.9	0.0	0.0	0.0	0.0	0.0	0.0	-18.9	--100.0
Operating Costs (excl Depn)	49.3	51.6	54.5	56.1	56.6	268.2	42.5	42.6	43.4	44.1	44.8	217.4	-50.7	-18.9
Pass through costs														
Inter TSO Compensation	1.3	1.3	1.3	1.3	1.3	6.5	1.3	1.3	1.3	1.3	1.3	6.5	0	0

	TSO Proposed PR4						Jacobs Proposed PR4						Variance	%
	2016	2017	2018	2019	2020	Total	2016	2017	2018	2019	2020	Total		
TAO Payment	202.4	202.4	202.4	202.4	202.4	1011.8	202.4	202.4	202.4	202.4	202.4	1011.8	0	0
CORES0 subscription	0.0	1.0	1.0	1.0	1.0	4.0	0.0	1.0	1.0	1.0	1.0	4.0	0	0
Interconnector services	1.0	1.0	1.0	1.0	1.0	5.1	1.0	1.0	1.0	1.0	1.0	5.1	0	0
CER Levy	1.0	1.0	1.0	1.0	1.0	5.0	1.0	1.0	1.0	1.0	1.0	5.0	0	0
Ongoing service charge	1.3	1.3	1.3	1.3	1.3	6.5	1.3	1.3	1.3	1.3	1.3	6.5	0	0
DUoS costs	1.3	1.3	1.3	1.3	1.3	6.5	1.3	1.3	1.3	1.3	1.3	6.5	0	0
Ancillary Services	49.2	49.2	49.2	49.2	49.2	246.1	49.2	49.2	49.2	49.2	49.2	246.1	0	0
PSO	203.2	203.2	203.2	203.2	203.2	1015.9	203.2	203.2	203.2	203.2	203.2	1015.9	0	0
Total pass through costs	460.7	461.7	461.7	461.7	461.7	2307.4	460.7	461.7	461.7	461.7	461.7	2307.4	0	0
Total Opex	510.0	513.2	516.2	517.8	518.3	2575.5	503.2	504.3	505.1	505.8	506.5	2524.8	-50.7	-2.03

Table 6.2 : TSO Allowed Capex Revenue for PR4

	TSO Proposed PR4						Jacobs Proposed						Variance	%
	2016	2017	2018	2019	2020	Total	2016	2017	2018	2019	2020	Total		
Network CAPEX														
Ongoing Projects	€ 29.34	€ 13.48	€ 2.77	€ 11.69	€ 19.60	€ 76.89	€ 27.65	€ 12.71	€ 2.61	€ 11.02	€ 18.47	€ 72.45	-€ 4.44	5.77%
System Reinforcements	€ 1.03	€ 0.06	€ 0.07	€ 7.13	€ 0.55	€ 8.84	€ 0.97	€ 0.06	€ 0.07	€ 6.72	€ 0.52	€ 8.33	-€ 0.51	5.77%
Shallow Connections	€ 2.20	€ 0.59	€ 0.00	€ 0.00	€ 0.00	€ 2.80	€ 2.08	€ 0.56	€ 0.00	€ 0.00	€ 0.00	€ 2.64	-€ 0.16	5.77%
Asset Refurbishment	€ 0.17	€ 0.74	€ 0.32	€ 0.32	€ 0.00	€ 1.55	€ 0.17	€ 0.74	€ 0.32	€ 0.32	€ 0.00	€ 1.55	€ 0.00	0.00%
Minor Capital & Conflicts	€ 0.07	€ 0.07	€ 0.07	€ 0.07	€ 0.05	€ 0.32	€ 0.07	€ 0.07	€ 0.07	€ 0.07	€ 0.05	€ 0.32	€ 0.00	0.00%
DSO	€ 0.01	€ 0.04	€ 0.00	€ 0.00	€ 0.00	€ 0.05	€ 0.01	€ 0.04	€ 0.00	€ 0.00	€ 0.00	€ 0.05	-€ 0.00	5.77%
Protection, Telecoms and Station Security	€ 0.21	€ 0.21	€ 0.22	€ 0.20	€ 0.15	€ 0.99	€ 0.21	€ 0.21	€ 0.22	€ 0.20	€ 0.15	€ 0.99	€ 0.00	0.00%
Generic Projects	€ 0.79	€ 1.44	€ 2.25	€ 1.11	€ 0.55	€ 6.14	€ 0.08	€ 0.14	€ 0.22	€ 0.11	€ 0.06	€ 0.61	-€ 5.53	90.00%
Subtotal	€ 33.83	€ 16.63	€ 5.69	€ 20.52	€ 20.90	€ 97.58	€ 31.24	€ 14.52	€ 3.51	€ 18.44	€ 19.24	€ 86.95	-€ 10.64	10.90%
Customer Contributions (factored)	-€ 2.17	-€ 0.86	-€ 0.79	-€ 0.17	€ 0.00	-€ 4.00	-€ 1.94	-€ 0.77	-€ 0.70	-€ 0.16	€ 0.00	-€ 3.56	€ 0.44	10.90%
Community Gain (Factored)	€ 0.52	€ 0.43	€ 0.00	€ 11.68	€ 9.44	€ 22.07	€ 0.46	€ 0.38	€ 0.00	€ 10.41	€ 8.41	€ 19.67	-€ 2.41	10.90%
Client Engineering Capex	€ 1.46	€ 1.46	€ 1.46	€ 1.46	€ 1.46	€ 7.31	€ 1.30	€ 1.30	€ 1.30	€ 1.30	€ 1.30	€ 6.51	-€ 0.80	10.90%
Total	€ 33.64	€ 17.67	€ 6.37	€ 33.50	€ 31.80	€ 122.97	€ 31.07	€ 15.44	€ 4.11	€ 29.99	€ 28.96	€ 109.57	-€ 13.41	10.90%

Table 6.3 : TSO Allowed Non-Network Capex Revenue for PR4

	TSO Proposed PR4						Jacobs Proposed						Variance	%
	2016	2017	2018	2019	2020	Total	2016	2017	2018	2019	2020	Total		
Non-Network CAPEX														
IS Infrastructure (incl Desktop)	€ 0.30	€ 2.18	€ 0.79	€ 1.65	€ 0.53	€ 5.45	€ 0.20	€ 2.08	€ 0.69	€ 1.55	€ 0.43	€ 4.95	-€ 0.50	9.17%
Corporate Systems	€ 1.27	€ 0.52	€ 0.88	€ 0.33	€ 0.52	€ 3.53	€ 1.27	€ 0.52	€ 0.88	€ 0.33	€ 0.52	€ 3.53	€ 0.00	0%
Energy Management Systems – All Island Operations	€ 0.69	€ 0.15	€ 0.15	€ 0.65	€ 1.55	€ 3.19	€ 0.69	€ 0.15	€ 0.15	€ 0.65	€ 1.55	€ 3.19	€ 0.00	0%
EDIL/RCUC/AMP	€ 0.48	€ 0.36	€ 0.25	€ 0.18	€ 0.18	€ 1.44	€ 0.48	€ 0.36	€ 0.25	€ 0.18	€ 0.18	€ 1.44	€ 0.00	0%
TUoS/Settlement/Metering	€ 0.79	€ 0.34	€ 0.94	€ 0.38	€ 0.38	€ 2.81	€ 0.79	€ 0.34	€ 0.94	€ 0.38	€ 0.38	€ 2.81	€ 0.00	0%
Big Data / Data Mining	€ 0.86	€ 0.75	€ 0.15	€ 0.00	€ 0.00	€ 1.76	€ 0.86	€ 0.75	€ 0.15	€ 0.00	€ 0.00	€ 1.76	€ 0.00	0%
DS3/Smart Grids	€ 0.60	€ 0.94	€ 1.69	€ 1.13	€ 0.45	€ 4.80	€ 0.60	€ 0.94	€ 1.69	€ 1.13	€ 0.45	€ 4.80	€ 0.00	0%
Operations Changes – Network Codes	€ 0.00	€ 0.75	€ 0.00	€ 0.00	€ 0.00	€ 0.75	€ 0.00	€ 0.75	€ 0.00	€ 0.00	€ 0.00	€ 0.75	€ 0.00	0%
Telecoms	€ 5.25	€ 3.69	€ 2.24	€ 2.10	€ 2.05	€ 15.31	€ 5.25	€ 3.69	€ 2.24	€ 2.10	€ 2.05	€ 15.31	€ 0.00	0%
Facilities	€ 0.02	€ 0.02	€ 0.02	€ 0.02	€ 0.10	€ 0.18	€ 0.00	€ 0.00	€ 0.00	€ 0.00	€ 0.00	€ 0.00	-€ 0.18	100%
Total	€ 10.25	€ 9.69	€ 7.10	€ 6.42	€ 5.74	€ 39.21	€ 10.14	€ 9.58	€ 6.99	€ 6.32	€ 5.56	€ 38.53	-€ 0.68	1.73%