DRAFT DECISION
Powerlink transmission determination
2017−18 to 2021−22

Attachment 6 – Capital expenditure

September 2016

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Note

This attachment forms part of the AER's final decision on Powerlink's transmission determination for 2017–22. It should be read with all other parts of the final decision.

The final decision includes the following documents:

Overview

Attachment 1 – Maximum allowed revenue

Attachment 2 – Regulatory asset base

Attachment 3 – Rate of return

Attachment 4 – Value of imputation credits

Attachment 5 – Regulatory depreciation

Attachment 6 – Capital expenditure

Attachment 7 – Operating expenditure

Attachment 8 – Corporate income tax

Attachment 9 – Efficiency benefit sharing scheme

Attachment 10 – Capital expenditure sharing scheme

Attachment 11 – Service target performance incentive scheme

Attachment 12 – Pricing methodology

Attachment 13 – Pass through events

Attachment 14 – Negotiated services

Contents

Shortened forms

Shortened form	Extended form
AARR	aggregate annual revenue requirement
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ASRR	annual service revenue requirement
augex	augmentation expenditure
capex	capital expenditure
CCP	Consumer Challenge Panel
CESS	capital expenditure sharing scheme
CPI	consumer price index
DMIA	demand management innovation allowance
DRP	debt risk premium
EBSS	efficiency benefit sharing scheme
ERP	equity risk premium
MAR	maximum allowed revenue
MRP	market risk premium
NEL	national electricity law
NEM	national electricity market
NEO	national electricity objective
NER	national electricity rules
NSP	network service provider
NTSC	negotiated transmission service criteria
opex	operating expenditure
PPI	partial performance indicators
PTRM	post-tax revenue model
RAB	regulatory asset base
RBA	Reserve Bank of Australia
repex	replacement expenditure
RFM	roll forward model
RIN	regulatory information notice

Shortened form	Extended form
RPP	revenue and pricing principles
SLCAPM	Sharpe-Lintner capital asset pricing model
STPIS	service target performance incentive scheme
TNSP	transmission network service provider
TUoS	transmission use of system
WACC	weighted average cost of capital

6 Capital expenditure

Capital expenditure (capex) refers to the capital expenses incurred in the provision of prescribed transmission services. This investment mostly relates to assets with long lives and these costs are recovered over several regulatory control periods. On an annual basis, however, the financing cost and depreciation associated with these assets are recovered (return on and of capital) as part of the building blocks that form Powerlink's total revenue requirement.[1]

This attachment sets out our draft decision on Powerlink's proposed total forecast capex for the 2017–22 regulatory control period. Further detailed analysis is in the following appendices:

- Appendix A - Assessment techniques
- Appendix B - Assessment of capex drivers
- Appendix C - Demand
- Appendix D - Contingent projects
- Appendix E - Ex post review - 2014–15 capex

6.1 Draft decision

We are not satisfied that Powerlink's proposed total forecast capex of $959.7 million ($2016–17) for the 2017–22 regulatory control period reasonably reflects the capex criteria. We have substituted it with our estimate of Powerlink's total forecast capex for the 2017–22 regulatory control period. We are satisfied that our substitute estimate of $775.2 million reasonably reflects the capex criteria. We seek comment from Powerlink and other stakeholders on the approach that we have adopted in their responses to our draft decision. Table 6.1 sets out our draft decision. The difference is due to our findings that Powerlink's replacement expenditure (repex) forecast is not prudent and efficient.

Table 6.1 Draft decision on Powerlink's forecast capex ($2016–17, million)

	2017–18	2018–19	2019–20	2020–21	2021–22	Total
Powerlink's proposal	198.6	194.7	191.9	192.8	181.8	959.7
AER draft decision	157.1	157.2	156.3	157.9	146.7	775.2
Total adjustment	-41.4	-37.5	-35.6	-34.9	-35.0	-184.5
Total adjustment (%)	-20.9%	-19.3%	-18.5%	-18.1%	-19.3%	-19.2%

Source: Powerlink, *Capex model PUBLIC*, January 2016; AER analysis.

[1] NER, cl. 6A.5.4(a).

Note: Numbers may not add up due to rounding.

Powerlink's capex proposal consists of $843.2 million for non-load driven capex, $10 million for augmentation capex, and $103.1 million for non-network capex. In our substitute estimate, we accept Powerlink's forecast for augmentation and non-network capex, but have substituted our own estimate for non-load driven capex.

Powerlink's non-load driven capex forecast consists of asset replacement ($794.3 million), security and compliance ($18.8 million), and other non-load driven capex ($30.1 million). Powerlink forecast the bulk of its asset replacement capex using a top-down approach that uses a modified version of the AER's repex model. This model relies on using asset age as a proxy for the many factors that influence individual asset replacements. Powerlink has calibrated and adjusted the repex model inputs using its actual expenditure from 2010 to 2015.

To assist our review of Powerlink's forecast, we engaged consultants to assess the prudency and efficiency of Powerlink's asset replacement forecast, including the forecasting methodology, inputs and assumptions. We also analysed Powerlink's forecast using our internal technical and engineering expertise.

Powerlink's forecast capex is 31% lower than its actual expenditure in the previous regulatory control period. The main reason for this reduction is low forecast demand growth. Queensland has transitioned from high to relatively flat demand growth over the last 5 years. Forecast low demand growth over the next 5 years means that Powerlink requires very little augmentation capex ($11 million or 1% of total capex) for this period.

The focus of Powerlink's capex program is replacement capex. The majority of Powerlink’s repex forecast is based on a top-down forecasting approach which uses the age profile of its existing assets and applies the historical average asset replacement age to determine a forecast of replacement requirements for the 2017–22 regulatory control period.

While we consider that Powerlink’s forecasting methodology is generally reasonable, we have a number of concerns with how Powerlink has implemented its approach. In particular, we have concerns with Powerlink's forecast replacement age of assets. In the past, Powerlink replaced assets at an earlier point than other transmission businesses and earlier than we now believe was necessary in some cases. Powerlink itself has recognised this issue and has adjusted its asset reinvestment policies and practices to bring it more into line with industry best practice. The revisions we have made to the asset replacement lives used in Powerlink's repex model attempt to capture Powerlink's more recent practice.

We seek input from Powerlink and other stakeholders on the approach that we have adopted. We concluded that Powerlink's average asset lives used as an input to the repex model were shorter than Powerlink is likely to achieve in practice and therefore needed to be longer to produce a prudent and efficient capex forecast. This change has led us to substitute an amount of $609.8 million for asset replacement capex instead of Powerlink's forecast $794.3 million. This change accounts for all of the difference between our substitute forecast and Powerlink's proposed forecast of total capex.

We are guided by the NER in our assessment of a network service provider's capex forecasts. The NER requires us to accept the forecast of required capex included in a building block proposal if we are satisfied that the total of the forecast capex for the regulatory control period reasonably reflects the criteria set out in clause 6A.6.7(c) of the NER, taking into account the capex factors set out in clause 6A.6.7(e). In the event that we are not so satisfied, the NER guides us to substitute the service provider's forecast of required capex with one that we are satisfied does reasonably reflect the capex criteria.[2]

We use a variety of techniques in arriving at a forecast of required capex that we are satisfied reasonably reflects the capex criteria, including economic benchmarking, trend analysis, and a review of forecasting methodology, inputs and assumptions. We also have regard to stakeholder submissions in arriving at our findings.

A summary of our reasons and findings that we present in this attachment and appendix B is set out in Table 6.2. In the table we present our reasons largely by 'capex category' such as repex and non-network capex. This reflects the way in which we tested Powerlink's proposed total forecast capex. Our testing used techniques tailored to the different capex categories taking into account the best available evidence. Through our techniques, we found some aspects of Powerlink's proposal were not consistent with the NER. Our findings on Powerlink's repex explain why we are not satisfied that Powerlink's total forecast capex meets the capex criteria.

Our findings on the capex categories are part of our broader analysis of overall expenditure and should not be considered in isolation. We do not approve an amount of forecast expenditure for each capex category. Our draft decision concerns Powerlink's total forecast capex for the 2017–22 regulatory control period. We use our findings on the different capex categories to arrive at a substitute estimate for total capex. We then test this total estimate of capex against the NER requirements.

Table 6.2 Summary of AER reasons and findings

Issue	Reasons and findings
Total capex forecast	Powerlink proposed a total capex forecast of $959.7 million ($2016–17) in its proposal. We are not satisfied this forecast reasonably reflects the capex criteria. We are satisfied our substitute estimate of $764.5 million ($2016–17) reasonably reflects the capex criteria. Our substitute estimate is 20 per cent lower than Powerlink's proposal. The reasons for this draft decision are summarised in this table and detailed in the remainder of this attachment.
Forecasting methodology, key assumptions and past	Our concerns involve some aspects of Powerlink's forecasting methodology and key assumptions which are material to our view that we are not reasonably satisfied that its

[2] NER, cl 6A.14.1(2)(ii).

capex performance	proposed total forecast capex reasonably reflects the capex criteria. Powerlink's capex forecasting methodology primarily relies on a top-down approach to forecast asset replacement requirements using a modified version of the AER's repex model. This model relies on using asset age as a proxy for the many factors that influence individual asset replacements. Powerlink has calibrated and adjusted the repex model inputs based on its actual asset replacement expenditure in the period from 2010 to 2015. In recent years, Powerlink has implemented a number of improvement initiatives and continues to review, revise and improve its asset management strategies. However, we are concerned that Powerlink's historical asset replacement policies and practices, particularly in the early years of the calibration period, are likely to distort the repex model calibration and result in average asset replacement lives which are shorter than Powerlink is actually likely to achieve in the 2017–22 regulatory control period. Based on Powerlink's historical repex project documentation and actual project outcomes, it is clear that the actual survival lives of assets achieved by Powerlink are typically longer than Powerlink has assumed in its repex model. We are therefore not satisfied that the inputs and assumptions which underpin Powerlink's use of the repex model are likely to result in a capex forecast which reasonably reflects the efficient costs that a prudent operator would require to achieve the capex objectives. Where Powerlink has forecast capex on an individual project basis, such as for power transformers, we also have some concerns that Powerlink has not necessarily considered an appropriate range of options or selected the most prudent and efficient approach to address the identified need.
Asset replacement (reinvestment)	We do not accept Powerlink's forecast repex of $794.3 million ($2016–17). In particular, we are not satisfied that Powerlink's assumptions of forecast asset replacement lives reflected in its repex modelling are realistic and likely to result in a forecast of asset replacement capex requirements which is prudent and efficient and reflects the capex objectives. We have included in our substitute estimate of overall total capex an amount of $609.8 million ($2016–17) for asset replacement (reinvestment) capex.
Security and compliance	We accept Powerlink's forecast of $18.8 million ($2016–17) for security and compliance non-load driven capex. We consider that Powerlink's forecasting methodology based on trend analysis adjusted to account for non-recurrent and abnormal items is appropriate for this category of capex.
Other non-load driven capex	We accept Powerlink's forecast of $30.1 million ($2016–17) for other non-load driven capex. We consider that Powerlink's forecasting methodology based on trend analysis adjusted to account for non-recurrent and abnormal items is appropriate for this category of capex. However, we expect that Powerlink will provide additional justification for the non-recurrent Wide Area Network telecommunications project in its revised proposal.
Augmentation	Powerlink proposed $10.8 million ($2016–17) in augmentation capex comprising $7.7 million ($2016–17) for easement and $3.1 million ($2016–17) for load-driven augex. We accept the $10.8 million ($2016–17) augmentation capex on the basis that it is significantly less than the historical level of augex and reflects the relatively flat demand trend in the current period.
Non-network capex	Powerlink proposed $103.1 million ($2016–17) for non-network capex, including $60.5 million for ICT and $24.5 million for commercial buildings. We accept Powerlink's forecast for non-network capex on the basis that this reasonably reflects the required expenditure for this category.
Real cost escalators	We discuss our assessment of forecast labour price growth for Powerlink in attachment 7. Consistent with our draft decision on forecast opex, we have made no adjustment to Powerlink's forecast capex in relation to forecast real labour cost escalation. Powerlink has not proposed to apply real cost escalation for materials in its capex forecast. We have accepted this approach.

Contingent projects	Powerlink proposed $590 million for seven contingent projects. We do not accept two of these projects (the North West Surat Basin Area project and the Southern Galilee Basin project) because we do not consider that the load growth Powerlink forecasted for these two projects will eventuate. We accept the remaining five projects as contingent projects but require Powerlink to amend the trigger events proposed for these projects.

Source: AER analysis.

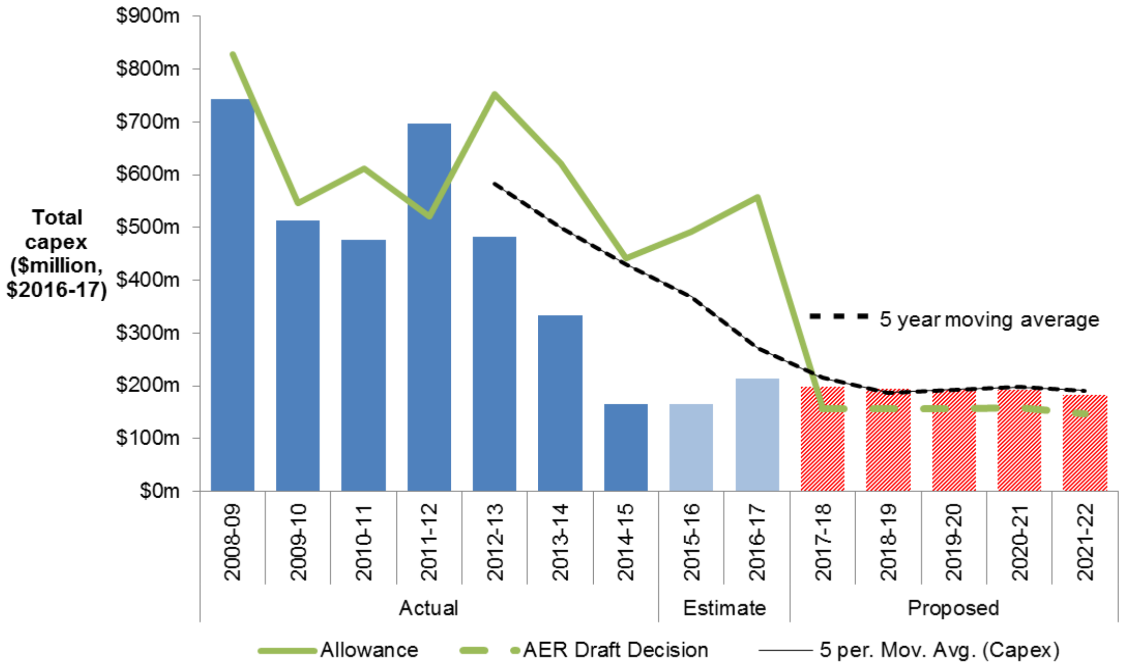
6.2 Powerlink's proposal

Powerlink's proposed total forecast capex of $959.7 million ($2016–17) for the 2017–22 regulatory control period. This is $399.9 million ($2016–17) or 30 per cent below Powerlink's actual and estimated capex of $1,359.6 million ($2016–17) for the 2012–17 period and $1,473.1 million ($2016–17) or 61 per cent less than Powerlink's capex for the 2007–12 period. As a result, Powerlink expects its RAB to reduce during the 2017–22 regulatory control period.

Powerlink largely attributed the reduction in proposed capex to a reduction in forecast demand growth. A consequence of a reduction in forecast demand growth is that the load driven categories of capex (augmentations, connections and easements) make up a very small proportion of Powerlink's total forecast capex of $10.8 million or 1.1 per cent. Replacement capex comprises the largest single category of capex accounting for $794.3 million or 83 per cent of total forecast capex. Information and communications technology is the next largest category, accounting for $60.5 million or 6.3 per cent of total forecast capex. All expenditure categories have capex forecasts which are less than our approved capex for the 2012–17 regulatory control period.

Figure 6.1 shows Powerlink's forecast capex for the 2017–22 regulatory control period. It also shows Powerlink's actual capex for each year of the 2008–17 period.

Figure 6.1 Powerlink's total actual and forecast capex



Source: AER analysis.

6.2.1 Submissions on Powerlink's proposal

We received a number of submissions which commented on Powerlink's historical and forecast capex. Consumer Challenge Panel (CCP) members Hugh Grant and David Headberry submitted that Powerlink's historical capex is less efficient than other TNSPs, having incurred significantly higher capex in the past decade. The CCP members' submission suggested that we should examine Powerlink's repex forecast to determine an efficient allowance, arguing that Powerlink's past repex had not been shown to be efficient. [3]

Cotton Australia was encouraged to see a significant reduction in the capex requested by Powerlink which represents a reduction of 66 per cent compared with the current regulatory period. However, it suggested that the AER carefully consider the implications of a contingency based approach to capex on consumers for the future regulatory period.[4] In contrast, the Queensland Resources Council supported Powerlink's proposed contingent projects as an appropriate way for managing demand uncertainty. [5]

3 CCP (Hugh Grant and David Headberry), *Submission to the AER, Powerlink Queensland 2018–22 revenue proposal*, 20 June 2016, p. 4.

4 Cotton Australia, *Submission on Powerlink Regulatory Proposal 2017-22*, May 2016, p. 3.

5 Queensland Resources Council, *Submission on Powerlink Regulatory Proposal 2017–22*, April 2016, p. 2.

Jo De Silva, a member of the CCP, suggested that the AER undertake detailed analysis about business cases and allowances for each significant capex projects and programs. [6] Professor Simon Bartlett from the University of Queensland submitted that Powerlink's repex forecast incorporates significant efficiency improvements and that further regulatory cuts may lead to higher costs in the future.[7]

Our detailed assessment in appendix B takes into account these submissions. In appendix B we examine whether Powerlink's revenue proposal reflects its expected operating environment.

6.3 Assessment approach

This section outlines our approach to capex assessments. It sets out the relevant legislative and rule requirements, and outlines our assessment techniques. It also explains how we derive an alternative estimate of total forecast capex against which we compare the service provider's total forecast capex. The information Powerlink provided in its revenue proposal, including its response to our RIN, is an important part of our assessment. We have also taken into account information that Powerlink provided in response to our information requests, and submissions from stakeholders.

Our assessment approach involves the following steps:

- Our starting point is Powerlink's revenue proposal.[8] We apply our various assessment techniques, both qualitative and quantitative, to assess the different elements of Powerlink's proposal. This analysis informs our view on whether Powerlink's proposal reasonably reflects the capex criteria set out in the NER.[9] It also provides us with an alternative forecast that we consider reasonably reflects the criteria. In arriving at our alternative estimate, we weight the various techniques used in our assessment. We give more weight to techniques we consider are more robust in the particular circumstances of the assessment.
- Having established our alternative estimate of the total forecast capex, we can test the service provider's total forecast capex. This includes comparing our alternative estimate total with the service provider's total forecast capex and what the reasons for any differences are. If there is a difference between the two, we may need to exercise our judgement as to what is a reasonable margin of difference.

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[6] CCP (Jo De Silva), *Submission to the Australian Energy Regulator on Powerlink's Regulatory Proposal 2017–19*, 28 April 2016, p. ii.

[7] Professor Simon Bartlett AM, *Submission on Powerlink Queensland's Revenue Application 2017-22*, 28 April 2016, p.7.

[8] AER, *Expenditure Forecast Electricity Transmission Guideline*, November 2013, p. 9; see also AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, 29 November 2012, pp. 111 and 112.

[9] NER, cl. 6A.6.7(c).

If we are satisfied that the service provider's proposal reasonably reflects the capex criteria in meeting the capex objectives, we accept it. The capital expenditure objectives (capex objectives) referred to in the capex criteria are to:[10]

- meet or manage the expected demand for prescribed transmission services over the period;
- comply with all regulatory obligations or requirements associated with the provision of prescribed transmission services;
- to the extent that there are no such obligations or requirements, maintain service quality, reliability and security of supply of prescribed transmission services and maintain the reliability and security of the transmission system; and
- maintain the safety of the transmission system through the supply of prescribed transmission services.

If we are not satisfied, the NER requires us to put in place a substitute estimate which we are satisfied reasonably reflects the capex criteria.[11] Where we have done this, our substitute estimate is based on our alternative estimate.

The capex criteria are:

- the efficient costs of achieving the capital expenditure objectives;
- the costs that a prudent operator would require to achieve the capital expenditure objectives; and
- a realistic expectation of the demand forecast and cost inputs required to achieve the capital expenditure objectives.

The AEMC noted that '[t]hese criteria broadly reflect the NEO [National Electricity Objective]'.[12] Importantly, we approve a total capex forecast and not particular categories, projects or programs in the capex forecast. Our review of particular categories or projects informs our assessment of the total capex forecast. The AEMC stated:[13]

> It should be noted here that what the AER approves in this context is expenditure allowances, not projects.

In deciding whether we are satisfied that Powerlink's proposed total forecast capex reasonably reflects the capex criteria, we have regard to the capex factors.[14]

In taking these factors into account, the AEMC has noted that:[15]

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10 NER, cl. 6A.6.7(a).

11 NER, cl. 6A.14.1(2)(ii).

12 AEMC, *Final Rule Determination: National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012, p. 113 (AEMC Economic Regulation Final Rule Determination).

13 AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, 29 November 2012, p. vii.

14 NER, cl. 6A.6.7(e).

> …this does not mean that every factor will be relevant to every aspect of every regulatory determination the AER makes. The AER may decide that certain factors are not relevant in certain cases once it has considered them.

Table 6.6 summarises how we took the capex factors into consideration.

More broadly, we note that in exercising our discretion, we take into account the revenue and pricing principles set out in the NEL.[16] In particular, we take into account whether our overall capex forecast provides Powerlink a reasonable opportunity to recover at least the efficient costs it incurs in:

- providing direct control network services; and
- complying with its regulatory obligations and requirements.[17]

Expenditure Forecast Assessment Guideline

We published our Expenditure Forecast Assessment Guideline for electricity transmission (Guideline) in November 2013.[18] The Guideline sets out our proposed general approach to assessing capex (and opex) forecasts. This assists in providing transparency and predictability in regulatory processes and outcomes. We also set out our approach to assessing capex in our framework and approach paper. For Powerlink, we stated that we would apply the Guideline, including the assessment techniques outlined in it. However, we stated that we would exercise our judgement in determining the extent to which we use a particular technique as set out in the Guideline. In the Framework and Approach process, Powerlink notified us of its intention to apply a "Top-Down" approach to its capex forecast rather than the traditional method of a "Bottom-Up Build".[19] We may depart from our Guideline approach and if we do so, we need to provide reasons. In this draft decision, we have not departed from the approach set out in our Guideline. We considered that Powerlink may make use of "top–down" forecasting but if we consider it is inappropriate to a particular expenditure category, Powerlink will be at risk of that proposal being rejected or substantially amended.[20]

We note that the RIN data form part of a service provider's revenue proposal.[21] In our Guideline we stated we would "require all the data that facilitate the application of our assessment approach and assessment techniques". We also stated that the RIN we issued in advance of a service provider lodging its revenue proposal would specify the

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15 AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, 29 November 2012, p. 115.

16 NEL, ss. 7A and 16(2).

17 NEL, s. 7A.

18 AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013.

19 AER, *Final Framework and Approach for Powerlink for the regulatory control period commencing 2017*, June 2015, p. 33.

20 AER, *Final Framework and Approach for Powerlink for the regulatory control period commencing 2017*, June 2015, p. 35.

21 NER, cl. 6A.10.1(c).

exact information we require.[22] Our Guideline made clear our intention to rely upon RIN data in transmission revenue determinations.

6.3.1 Building an alternative estimate of total forecast capex

The following section sets out the approach we apply to arrive at an alternative estimate of total forecast capex.

Our starting point for building an alternative estimate is Powerlink's proposal.[23] We review the proposed forecast methodology and the key assumptions that underlie the forecast. We also consider its performance in the previous regulatory control period to inform our alternative estimate.

We then apply our specific assessment techniques to develop an estimate and assess the economic justifications that Powerlink put forward. Many of our techniques encompass having regard to the capex factors. Appendix A and appendix B contain further details on each of these techniques.

Some of these techniques focus on total capex; others focus on high level, standardised sub-categories of capex. Importantly, while we may consider certain projects and programs in forming a view on the total capex forecast, we do not determine which projects or programs the service provider should or should not undertake. This is consistent with the regulatory framework and the AEMC's statement that the AER does not approve specific projects. Rather, we approve an overall revenue requirement that includes an assessment of what we find to be an efficient total capex forecast.[24]

We determine total revenue by reference to our analysis of the proposed capex and the various building blocks. Once we approve total revenue, the service provider is able to prioritise its capex program given its circumstances over the course of the regulatory control period. Powerlink may need to undertake projects or programs it did not anticipate in its revenue proposal. Powerlink may also not require some of the projects or programs it proposed for the regulatory control period. We consider a prudent and efficient service provider would consider the changing environment throughout the regulatory control period in its decision-making.

As we explained in our Guideline:[25]

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22 AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013, p. 25.

23 AER, *Better regulation: Explanatory statement: Expenditure forecast assessment guideline*, November 2013, p. 7; and AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, 29 November 2012, pp. 111 and 112.

24 AEMC, *Final Rule Determination: National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 29 November 2012, p. vii.

25 AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013, p. 12.

> Our assessment techniques may complement each other in terms of the information they provide. This holistic approach gives us the ability to use all of these techniques, and refine them over time. The extent to which we use each technique will vary depending on the expenditure proposal we are assessing, but we intend to consider the inter-connections between our assessment techniques when determining total capex … forecasts. We typically would not infer the findings of an assessment technique in isolation from other techniques.

In arriving at our estimate, we weight the various techniques used in our assessment. We weight these techniques on a case by case basis using our judgement. Broadly, we give more weight to techniques we consider to be more robust in the particular circumstances of the assessment. By relying on a number of techniques, we ensure we consider a wide variety of information and can take a holistic approach to assessing the service provider's capex forecast.

We also take into account the various interrelationships between the total forecast capex and other components of a service provider's transmission determination. The other components that directly affect the total forecast capex include:

- forecast opex
- forecast demand
- the service target performance incentive scheme
- the capital expenditure sharing scheme
- real cost escalation
- contingent projects.

We discuss how these components impact the total forecast capex in Table 6.4.

Underlying our approach are two general assumptions:

- the capex criteria relating to a prudent operator and efficient costs are complementary. Prudent and efficient expenditure reflects the lowest long-term cost to consumers for the most appropriate investment or activity required to achieve the expenditure objectives;[26] and
- past expenditure was sufficient for Powerlink to manage and operate its network in past periods, in a manner that achieved the capex objectives.[27]

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26 AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013, pp. 8 and 9. The Tribunal has previously endorsed this approach: see : Application by Ergon Energy Corporation Limited (Non-system property capital expenditure) (No 4) [2010] ACompT 12; Application by EnergyAustralia and Others [2009] ACompT 8; Application by Ergon Energy Corporation Limited (Labour Cost Escalators) (No 3) [2010] ACompT 11; Application by DBNGP (WA) Transmission Pty Ltd (No 3) [2012] ACompT 14; Application by United Energy Distribution Pty Limited [2012] ACompT 1; Re: Application by ElectraNet Pty Limited (No 3) [2008] ACompT 3 ; Application by DBNGP (WA) Transmission Pty Ltd [2012] ACompT 6.

27 AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013, p. 9.

6.3.2 **Comparing the service provider's proposal with our alternative estimate**

Having established our estimate of the total forecast capex, we can test the service provider's proposed total forecast capex. This includes comparing our estimate of forecast total capex with Powerlink's proposal. Powerlink's forecasting methodology and its key assumptions may explain any differences between our alternative estimate and its proposal.

As the AEMC foreshadowed, we may need to exercise our judgement in determining whether any 'margin of difference' is reasonable:[28]

> The AER could be expected to approach the assessment of a NSP's expenditure (capex or opex) forecast by determining its own forecast of expenditure based on the material before it. Presumably this will never match exactly the amount proposed by the NSP. However there will be a certain margin of difference between the AER's forecast and that of the NSP within which the AER could say that the NSP's forecast is reasonable. What the margin is in a particular case, and therefore what the AER will accept as reasonable, is a matter for the AER exercising its regulatory judgment.

As noted above, we draw on a range of techniques, as well as our assessment of elements that impact upon capex such as demand and real cost escalators.

Our decision on the total forecast capex does not strictly limit a service provider's actual spending. A service provider might spend more on capex than the total forecast capex amount specified in our decision in response to unanticipated expenditure needs.

The regulatory framework has a number of mechanisms to deal with such circumstances. Importantly, a service provider does not bear the full cost where unexpected events lead to an overspend of the approved capex forecast. Rather, under the Capital Expenditure Sharing Scheme the service provider bears 30 per cent of this cost if the expenditure is subsequently found to be prudent and efficient. Further, the pass through provisions provide a means for a service provider to pass on significant, unexpected capex to customers, where appropriate.[29] Similarly, a service provider may spend less than the capex forecast because they have been more efficient than expected. In this case the service provider will keep on average 30 per cent of this reduction over time in accordance with the Capital Expenditure Sharing Scheme.

We set our alternative estimate at the level where the service provider has a reasonable opportunity to recover efficient costs. The regulatory framework allows the service provider to respond to any unanticipated issues that arise during the regulatory control period. In the event that this leads to the approved total revenue

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28 AEMC, *Final rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012*, 29 November 2012, p. 112.

29 NER, r. 6A. 7.3

underestimating the total capex required, the service provider should have sufficient flexibility to allow it to meet its safety and reliability obligations by reallocating its budget. Conversely, if there is an overestimation, the stronger incentives the AEMC put in place in 2012 should result in the service provider only spending what is efficient. As noted, the service provider and consumers share the benefits of the underspend and the costs of an overspend under the regulatory regime.

6.4 Reasons for draft decision

We applied the assessment approach set out in section 6.3 to Powerlink. In this draft decision, we are not satisfied Powerlink's total forecast capex reasonably reflects the capex criteria. We compared Powerlink's capex forecast to the alternative capex forecast we constructed using the approach and techniques outlined in appendices A**Error! Reference source not found.** and B. Powerlink's proposal is materially higher than ours. We are satisfied that our alternative estimate reasonably reflects the capex criteria.

Table 6.3 sets out the capex amounts by driver that we included in our alternative estimate of Powerlink's total forecast capex for the 2017–22 regulatory control period.

Table 6.3 Draft decision assessment of required capex by capex driver 2017–22 ($2016–17, million)

Category	2017–18	2018–19	2019–20	2020–21	2021–22	Total
Augmentation	0.3	2.6	0.3	0.0	0.0	3.1
Easements	2.6	1.5	3.2	0.3	0.0	7.7
Replacement	120.2	123.7	120.2	124.7	121.0	609.8
Security and compliance	3.7	3.7	3.8	3.8	3.8	18.8
Other non-load driven	12.0	6.1	4.0	4.0	4.0	30.1
Non-network	18.3	19.6	24.9	25.0	18.0	105.8
Total capex	157.1	157.2	156.3	157.9	146.7	775.2

Source: AER analysis.

Note: Numbers may not add up due to rounding.

Our alternative estimate of $775.2 million is $184.5 million lower than Powerlink's forecast of $959.7 million. This reflects a reduction in repex driven by different assumptions of expected asset replacement lives.

Our assessments of capex drivers are in appendix B. These set out the application of our assessment techniques to the capex drivers, and the weighting we gave to particular techniques. We used our reasoning in the appendices to form our alternative estimate.

We discuss our assessment of Powerlink's forecasting methodology, key assumptions and past capex performance in the sections below.

6.4.1 **Ex post review of past capital expenditure**

The capex incentive regime aims to ensure that only capex that is efficient should enter the regulatory asset base to be recovered from consumers.[30] We are required to provide a statement on whether past expenditure included in the roll forward of the regulatory asset base contributes to the achievement of the capital expenditure incentive objective.[31] For this decision, our statement relates only to the 2014–15 regulatory year.[32]

We have assessed the extent to which the roll forward of the regulatory asset base from the 2012–17 regulatory control period to the commencement of the 2017–22 regulatory control period contributes to the achievement of the capital expenditure incentive objective.[33] The capital expenditure incentive objective essentially requires that only prudent and efficient expenditure is included in the regulatory asset base.

Our approach to this assessment applies the approach set out in our Capital Expenditure Incentive Guideline.[34] Our Guideline outlines a two stage process for assessing whether past expenditure is likely to be efficient and prudent.[35] The first stage considers whether a service provider has over-spent against its approved total capex forecast and how that expenditure compares with previous levels of capex and with other service providers.

As discussed in appendix E, our assessment of Powerlink's past capex relates only to the 2014–15 regulatory year. We are satisfied that Powerlink's actual capex incurred in 2014–15 is below the forecast allowance. Therefore, the overspending requirement for an efficiency review of past capex is not satisfied.[36] Accordingly, this supports the view that this expenditure is consistent with the capital expenditure incentive objective.

6.4.2 **Key assumptions**

The NER requires Powerlink to include in its revenue proposal the key assumptions that underlie its proposed forecast capex. Powerlink must also provide a certification by its Directors that those key assumptions are reasonable.[37]

The key assumptions and inputs that underlie Powerlink's capex forecasts are:[38]

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[30] AEMC, *Final Position Paper - National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, 15 November 2012, p. v.

[31] NER cl. 6A.14.2.(b)

[32] The NER requires that this statement will not apply to the regulatory year in which the Expenditure Incentive Guideline was published. As the Guideline was published in December 2013, our statement and assessment of whether any expenditure should be excluded from the RAB only covers the 2014-15 regulatory year.

[33] NER cl. S6A.2.2A

[34] AER, *Capital Expenditure Incentive Guideline for Electricity Network Service Providers*, November 2013.

[35] AER, *Capital Expenditure Incentive Guideline for Electricity Network Service Providers*, November 2013, pp.19-22.

[36] NER, cl. S6A.2.2A(c).

[37] NER, cll. S6A.1.1(2), (4) and (5).

[38] Powerlink, *Revenue proposal 2017–22*, January 2016, pp. 47-51.

- demand forecasts
- asset management planning
- asset reinvestment
- network modelling
- network planning criteria.

We assessed Powerlink's key assumptions in appendices B and C to this capex attachment. We have identified concerns with some of the key assumptions relied upon by Powerlink either in how they were formulated or applied (e.g. we have used updated asset lives and adopted some alternative assumptions/inputs used in Powerlink's repex model). These concerns contribute to our draft decision that we are not satisfied that Powerlink's forecast capex reasonably reflects the capex criteria.

6.4.3 **Forecasting methodology**

The NER requires Powerlink to set out the methodology it proposes to use to prepare its forecast capex allowance before it submits its revenue proposal.[39] Powerlink must include this information in its revenue proposal.[40]

Powerlink submitted that it has adopted a hybrid forecasting approach by using a mix of both bottom-up and top-down forecasting methods to determine its total forecast capital expenditure.[41]

Powerlink considers that as the triggers for load driven capex are based on specific local demand growth forecasts and the amount of existing headroom in network capability in those areas, the forecast expenditure profile tends to be quite lumpy and that a bottom-up analysis remains the most practical means for developing forecasts. For load driven projects, Powerlink has developed cost estimates using its standard project estimating processes and considered only the most likely scenario of forecast demand growth (medium economic outlook) from its 2015 Transmission Annual Planning Report.[42]

For the most significant of the non-load driven categories, replacement capex, Powerlink has used predictive modelling techniques based on the AER's Replacement Expenditure Model.[43] The remaining components of non-load driven capex including security/ compliance and other capex have been forecast using a trend analysis technique.[44] Powerlink forecast information and communications technology capex using a planning process that identified future business needs and required capex for

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39 NER, cl. 6A.10.1B.

40 NER, cl. 6A.10.1.

41 Powerlink, *Regulatory proposal*, January 2016, p. 45.

42 Powerlink, *Regulatory proposal*, January 2016, p. 45.

43 Powerlink, *Regulatory proposal*, January 2016, p. 45.

44 Powerlink, *Regulatory proposal*, January 2016, p. 46.

information technology applications and infrastructure.[45] Buildings, fleet, and tools capex forecasts were developed using a mix of historic trends and expected future business requirements.[46]

6.4.4 Powerlink's capex performance

We have looked at a number of historical metrics of Powerlink's capex performance to help inform our assessment of Powerlink's proposed capex forecast. This includes Powerlink's relative multilateral total factor productivity (MTFP) performance from our annual benchmarking report, and its proposed forecast capex allowance against historical trends.

We note that the NER sets out that we must have regard to our annual benchmarking report.[47] This section shows how we have taken it into account. We consider this high level benchmarking at the overall capex level is suitable to gain an overall understanding of Powerlink's proposal in a broader context. However, in our capex assessment we have not relied on our high level benchmarking metrics set out below other than to note that these metrics generally support the outcomes of our other techniques. We have not used this analysis deterministically in our capex assessment.

Figure 6.2 shows Powerlink's MTFP performance over time and relative to the other service providers. MTFP measures how efficient a business is in terms of its inputs (costs) and outputs (customer numbers, ratcheted maximum demand, reliability, circuit line length and energy delivered). These results show that Powerlink's cost efficiency has decreased slightly since 2012. Powerlink submitted that it expects its performance under the MTFP to improve in the 2017–22 regulatory period with reduced forecast expenditure and forecast increases in demand and energy consumption due to the ramp up of LNG production in the Surat Basin.[48]

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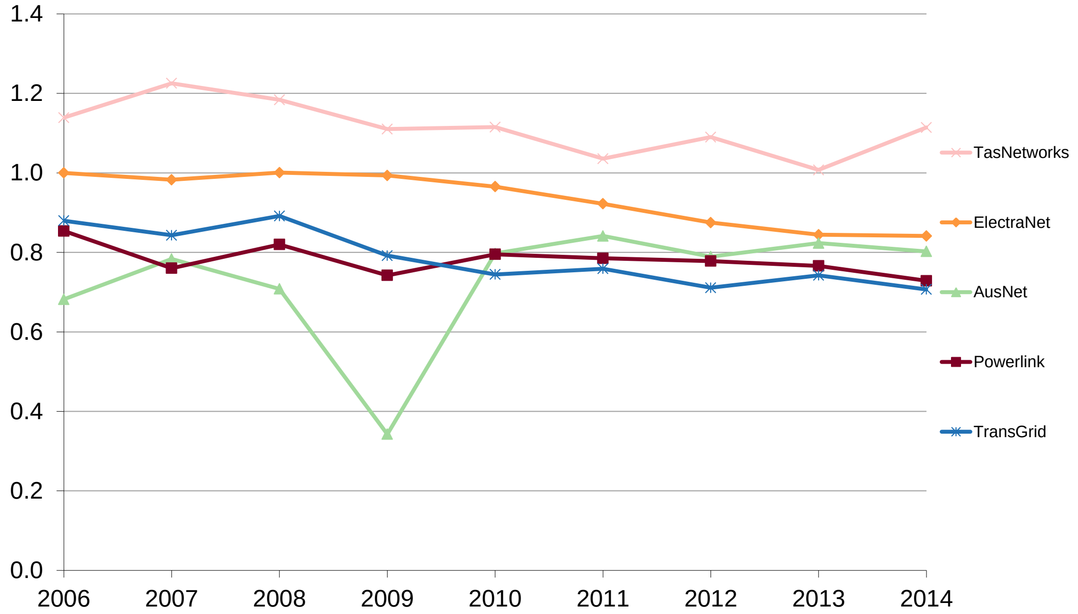
45 Powerlink, *Regulatory proposal*, January 2016, p. 47.

46 Powerlink, *Regulatory proposal*, January 2016, p. 47.

47 NER, cl 6A.6.7(e)(4).

48 Powerlink, *Regulatory proposal*, January 2016, p. 33.

Figure 6.2 Relative MFTP performance of transmission networks



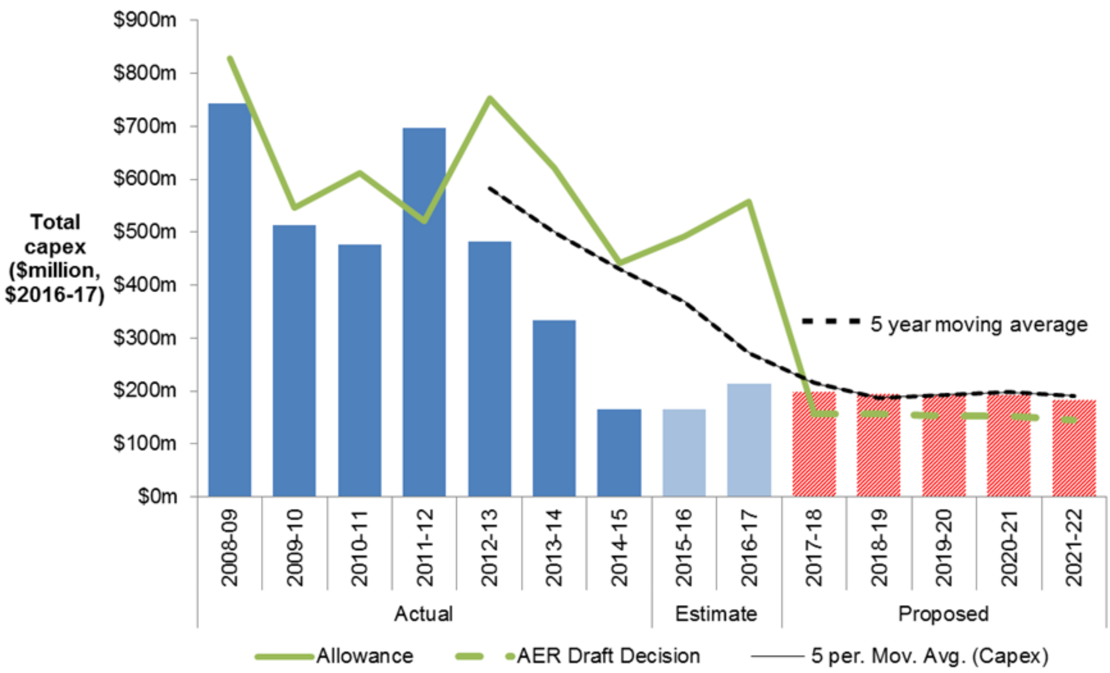
Source: AER, *Annual benchmarking report: Electricity transmission network service providers*, November 2015, p.11.

6.4.4.1 Powerlink's historical capex trends

We compared Powerlink's capex proposal for the 2017–22 regulatory control period against the long term historical trend in capex levels.

Figure 6.3 shows actual historic capex and proposed capex between 2008 and 2022. This figure shows Powerlink forecasted lower capex in the 2017–22 regulatory control period compared to actual/estimated capex in the 2012–17 period. Powerlink's capex forecast for the 2017–22 regulatory control period is also forecast to decline to relatively low levels compared to historical expenditure.

Figure 6.3 Powerlink total capex - historical and forecast ($2016–17)



Source: AER analysis

Powerlink stated its forecast capex is on average 54 per cent lower than the AER's allowance for the 2012–17 regulatory control period. Powerlink submitted that its lower capex forecast is attributed to a significant reduction in electricity demand growth which has resulted in Powerlink cancelling or deferring load driven investment and taking a different approach to its panned reinvestment program.[49]

6.4.5 Interrelationships

There are a number of interrelationships between Powerlink's total forecast capex for the 2017–22 regulatory control period and other components of its transmission determination (see Table 6.4). We considered these interrelationships in coming to our draft decision on total forecast capex.

Table 6.4 Interrelationships between total forecast capex and other components

Other component	Interrelationships with total forecast capex
Total forecast opex	There are elements of Powerlink's total forecast opex that are related to its total forecast capex. These include the forecast labour price growth that we included in our opex forecast in Attachment 7. This is because the price of labour affects both total forecast capex and total forecast opex. More generally, we note our total opex forecast will provide Powerlink with sufficient opex to maintain the reliability and safety of its network. Although we do not approve opex on specific categories of opex such as maintenance, the total opex we approve will in part influence the

49 Powerlink, *Revenue proposal 2017–22*, January 2016, p. iv.

Other component	Interrelationships with total forecast capex
	repex Powerlink needs to spend during the 2017–22 period. We have reduced Powerlink's forecast repex be extending Powerlink's mean replacement lives of assets. However, we have also offset this reduction by providing additional capex for asset reinvestment and life extension strategies. We therefore do not consider that any increase in forecast opex is required as a result of this draft decision on forecast capex.
Forecast demand	Forecast demand is related to Powerlink's total forecast capex. Growth driven capex, which includes augex and easements capex, is typically triggered by a need to build or upgrade the network to address changes in demand or to comply with quality, reliability and security of supply requirements. Hence, the main driver of growth-related capex is maximum demand and its effect on network utilisation and reliability. Forecast demand also affects the need and timing of asset replacement capex as this affects the risk of unserved energy as a result of asset failure. In circumstances of flat or falling demand, it may be possible to decommission aged assets with replacement, or to re-configure the network to avoid the need to replace specific assets. Hence, maximum demand and its effect on network utilisation and reliability is also a driver of replacement related capex.
Capital Expenditure Sharing Scheme (CESS)	The CESS is related to Powerlink's total forecast capex. In particular, the effective application of the CESS is contingent on the approved total forecast capex being efficient, and that it reasonably reflects the capex criteria. As we note in the capex criteria table below, this is because any efficiency gains or losses are measured against the approved total forecast capex. In addition, we are required to undertake an ex post review of the efficiency and prudency of capex, with the option to exclude any inefficient capex in excess of the approved total forecast capex from Powerlink's regulatory asset base. In particular, the CESS will ensure that Powerlink bears at least 30 per cent of any overspend against the capex allowance. Similarly, if Powerlink can fulfil their objectives without spending the full capex allowance, it will be able to retain 30 per cent of the benefit of this. In addition, if an over-spend is found to be inefficient through the ex post review, Powerlink risks having to bear the entire overspend.
Service Target Performance Incentive Scheme (STPIS)	The STPIS is interrelated to Powerlink's total forecast capex, in so far as it is important that it does not include any expenditure for the purposes of improving supply reliability during the 2017–22 regulatory control period. This is because such expenditure should be offset by rewards provided through the application of the STPIS. Further, the forecast capex should be sufficient to allow Powerlink to maintain performance at the targets set under the STPIS. The capex allowance should not be set such that there is an expectation that it will lead to Powerlink systematically under or over performing against its targets.
Contingent projects	Generally, contingent projects are significant network augmentation projects that are reasonably required to be undertaken in order to achieve the capex objectives. However, unlike other proposed capex projects, the need for the project within the regulatory period and the associated costs are not sufficiently certain. Consequently, expenditure for such projects does not form a part of the total forecast capex that we approve in this determination. Powerlink proposed $590 million for seven contingent projects for the 2017–22 period. Powerlink submitted that the proposed projects are for managing the risk of significant network investments which may be triggered by material changes in demand or new connections (including new coal mines and LNG production projects). [50]

Source: AER analysis

6.4.6 Summary of submissions on Powerlink's capex proposal

[50] Powerlink, *Revenue Proposal 2017-22*, January 2016, p.57.

Table 6.5 provides a summary of stakeholder submissions on Powerlink's capex proposal and our response.

Table 6.5 Submissions on Powerlink's capex proposal and our response

Stakeholder	Issue	Our response
Queensland Resources Council	The Queensland Resources Council supported Powerlink's proposal for contingent projects, noting this approach is a better system for managing demand uncertainty.[51]	We accept five of the seven proposed projects as contingent projects but require Powerlink to amend the trigger events proposed for these projects. We do not accept the North West Surat Basin Area project and the Southern Galilee Basin project.
	QRC submitted that Powerlink's relatively low reduction in operational capital seems inconsistent with the much larger reductions in forecast capital expenditure or even in maximum allowable revenue.[52]	Our review shows that Powerlink's proposed capex of $959.7million is largely made up of repex (around 83 per cent). Our assessment of Powerlink's proposed repex shows that Powerlink could prudently reduce its forecast through deferral of projects and application of life extension techniques.
Cotton Australia	Cotton Australia submitted the significant drop in capex forecast compared to the current regulatory period is a reflection of the demand to materialise in contrast to previous forecasts.[53]	Our assessment of the proposed augex also reaches this view.
	It submitted that the AER should consider the implications of a contingency based approach to capex on consumers for the future regulatory period.[54]	Powerlink has proposed the regulatory investment test (RIT-T) as a trigger event for some of the proposed contingent projects. We consider the RIT-T should be a trigger event for each of the contingent projects we accepted because one of the tests under the RIT-T is cost benefit analysis for the required project.
	It submitted that the repex forecasts appear to be built around standard asset lives as opposed to any actual replacement assessment.[55]	Our assessment of Powerlink's proposed repex shows that reductions can be made based on different assumptions of expected asset replacement lives and deferral of projects into the 2022–27 regulatory control period.
CCP members	CCP members submitted that Powerlink's proposed business IT capex is higher than other transmission networks' IT capex. [56]	Our assessment of Powerlink's proposed information and communications capex is set out in section **Error! eference source not found.**.
	They submitted that Powerlink incurred significantly higher capex	Our review of Powerlink's demand forecast is set out in appendix **Error! Reference source not found.**.

51 Queensland Resources Council, *Submission on Powerlink Regulatory Proposal 2017–22*, April 2016, p. 2.

52 Queensland Resources Council, *Submission on Powerlink Regulatory Proposal 2017–22*, April 2016, p. 2.

53 Cotton Australia, *Submission on Powerlink Regulatory Proposal 2017-22*, May 2016, p.3.

54 Cotton Australia, *Submission on Powerlink Regulatory Proposal 2017-22*, May 2016, p.3.

55 Cotton Australia, *Submission on Powerlink Regulatory Proposal 2017-22*, May 2016, p.3.

56 CCP (Hugh Grant and David Headberry), *Submission to the AER, Powerlink Queensland 2018–22 revenue proposal*, 20 June 2016, p.5.

Stakeholder	Issue	Our response
	to meet demand growth than the other transmission networks.[57]	
	They submitted that Powerlink's proposed load-driven capex is most likely to be reflective of its needs for subsequent regulatory periods.[58]	Our review of the load-driven capex is set out in section **Error! Reference source not found.**.
	They submitted that the AER's repex assessment can be refined to have a greater regard to Powerlink's excess capacity, low asset utilisation levels and detailed assessments of the proposed repex projects.[59]	The assessment techniques we used for Powerlink's proposed repex are set out in section **Error! Reference ource not found.** and our assessment of Powerlink's repex is set out in section B.3.
Professor Simon Bartlett	Professor Bartlett submitted that Powerlink's strategy of minimising capex during 2017–22 may significantly increase refurbishment and repex costs in the subsequent regulatory periods. This will impose otherwise avoidable constraints on the economic development of Queensland's best renewable resources in Northern and Central Queensland. [60]	Powerlink has proposed seven contingent projects to deal with uncertainty in forecast load growth. This has resulted in reduced capex forecast for the 2017–22 regulatory control period. We consider that the RIT-T should be a trigger event for each of the contingent projects we accepted because one of the tests under the RIT-T is consideration of network alternatives.

6.4.7 Consideration of the capex factors

As we discussed in section **Error! Reference source not found.**, we had regard to the capex factors when assessing Powerlink's total capex forecast.[61] Table 6.6 summarises how we have had regard to the capex factors.

Table 6.6 AER consideration of the capex factors

Capex factor	AER consideration
The most recent annual benchmarking report and benchmarking capex that would be incurred by an efficient distributor over the relevant regulatory control period	We had regard to our most recent benchmarking report in assessing Powerlink's proposed total forecast for the 2017–22 regulatory control period. This can be seen in the metrics we used in our assessment of Powerlink's capex performance in section 6.4.4.
The actual and expected capex of Powerlink during	We had regard to Powerlink's actual and expected capex during

57 CCP (Hugh Grant and David Headberry), *Submission to the AER, Powerlink Queensland 2018–22 revenue proposal*, 20 June 2016, p. 21.

58 CCP (Hugh Grant and David Headberry), *Submission to the AER, Powerlink Queensland 2018–22 revenue proposal*, 20 June 2016, p. 82.

59 CCP (Hugh Grant and David Headberry), *Submission to the AER, Powerlink Queensland 2018–22 revenue proposal*, 20 June 2016, p. 57.

60 Professor Simon Bartlett AM, *Submission on Powerlink Queensland's Revenue Application 2017-22*, 28 April 2016, p.7.

61 NER, cll. 6.5.7(c), (d) and (e).

Capex factor	AER consideration
any preceding regulatory control periods	the 2012–17 regulatory control period and preceding regulatory control periods in assessing its proposed total forecast. This can be seen in our assessment of Powerlink's capex performance. It can also be seen in our assessment of the forecast capex associated with the capex drivers and programs that underlie Powerlink's total forecast capex.
The extent to which the capex forecast includes expenditure to address concerns of electricity consumers as identified by Powerlink in the course of its engagement with electricity consumers	We had regard to the extent to which Powerlink engaged with customers in its approach to forecasting capex. Powerlink has established its Customer and Consumer Panel in May 2015, to meet on a quarterly basis to provide a face-to-face forum for stakeholders to provide their input to Powerlink decision making processes and methodologies.[62]
The relative prices of operating and capital inputs	We had regard to the relative prices of operating and capital inputs in assessing Powerlink's proposed real cost escalation factors. In particular, we have accepted Powerlink's proposed cost escalation for labour as applied to forecast capex.
The substitution possibilities between operating and capital expenditure	We had regard to the substitution possibilities between opex and capex. We considered whether there are more efficient and prudent trade-offs in investing more or less in capital in place of ongoing operations. See our discussion about the interrelationships between Powerlink's total forecast capex and total forecast opex in Table 6.4 above.
Whether the capex forecast is consistent with any incentive scheme or schemes that apply to Powerlink	We had regard to whether Powerlink's proposed total forecast capex is consistent with the CESS and the STPIS. See our discussion about the interrelationships between Powerlink's total forecast capex and the application of the CESS and the STPIS in Table 6.4 above.
The extent to which the capex forecast is referrable to arrangements with a person other than the service provider that do not reflect arm's length terms	We had regard to whether any part of Powerlink's proposed total forecast capex or our alternative estimate is referrable to arrangements with a person other than Powerlink that do not reflect arm's length terms. Based on the information provided by Powerlink we are satisfied that the capex forecast is based on arrangements that reflect arm's length terms.
Whether the capex forecast includes an amount relating to a project that should more appropriately be included as a contingent project	We had regard to whether any amount of Powerlink's proposed total forecast capex or our alternative estimate relates to a project that should more appropriately be included as a contingent project. We did not identify any such amounts that should more appropriately be included as a contingent project.
The most recent National Transmission Network Development Plan (NTNDP), and any submissions made by AEMO, in accordance with the Rules, on the forecast of Powerlink's required capex	We have taken into account the most recent NTNDP in assessing Powerlink's forecast capex. AEMO did not make a submission on Powerlink's capex proposal in this instance.
The extent to which Powerlink has considered and made provision for efficient and prudent non-network alternatives	We have had regard to the extent to which Powerlink made provision for efficient and prudent non-network alternatives. Powerlink makes provision for non-network alternatives in its asset reinvestment planning. See appendix B.
Any relevant project assessment conclusions report required under clause 5.16 of the NER	We have had regard to the extent to which Powerlink made project assessment conclusions under clause 5.16 of the NER.

[62] Powerlink, Revenue Proposal 2017-22, January 2016, p.15.

Capex factor	AER consideration
	See appendix B.
Any other factor the AER considers relevant and which the AER has notified Powerlink in writing, prior to the submission of its revenue proposal, is a capex factor	We did not identify any other capex factor that we consider relevant.

Source: AER analysis.

A Assessment techniques

This Appendix describes the assessment approaches we have applied in assessing Powerlink's proposed forecast capex. The extent to which we rely on each of the assessment techniques is set out in appendix B.

The assessment techniques that we apply in capex are necessarily different from those we apply in the assessment of opex. This is reflective of differences in the nature of the expenditure being assessed. As such, we use some assessment techniques in our capex assessment that are not suitable for assessing opex and vice versa. We set this out in our Expenditure Guideline, where we stated:[63]

> Past actual expenditure may not be an appropriate starting point for capex given it is largely non-recurrent or 'lumpy', and so past expenditures or work volumes may not be indicative of future volumes. For non-recurrent expenditure, we will attempt to normalise for work volumes and examine per unit costs (including through benchmarking across TNSPs) when forming a view on forecast unit costs.
>
> Other drivers of capex (such as replacement expenditure and connections works) may be recurrent. For such expenditure, we will attempt to identify trends in revealed volumes and costs as an indicator of forecast requirements.

The assessment techniques that we have used to assess Powerlink's capex are set out below.

A.1 Economic benchmarking

Economic benchmarking is one of the key outputs of our annual benchmarking report. We are required to consider economic benchmarking as it is one of the capex factors under the NER.[64] Economic benchmarking applies economic theory to measure the efficiency of a service provider's use of inputs to produce outputs, having regard to operating environment factors.[65] It allows us to compare the performance of a service provider against its own past performance, and the performance of other service providers. Economic benchmarking helps us to assess whether a service provider's capex forecast represents efficient costs.[66] As stated by the AEMC, 'benchmarking is a critical exercise in assessing the efficiency of a NSP'.[67]

A number of economic benchmarks from the annual benchmarking report are relevant to our assessment of capex. These include measures of total cost efficiency and

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63 AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013, p.10.

64 NER, cl. 6A.6.7(e)(4).

65 AER, *Explanatory Statement: Expenditure Forecasting Assessment Guidelines*, November 2013.

66 NER, cl. 6A.6.7(c)

67 AEMC, *National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, November 2012, p. 25.

overall capex efficiency. In general, these measures calculate a service provider's efficiency with consideration given to its inputs, outputs and its operating environment. We have considered each service provider's operating environment insofar as there are factors that are outside of a NSP's control but which affect a NSP's ability to convert inputs into outputs.[68] Once such exogenous factors are taken into account, we expect service providers to operate at similar levels of efficiency. One example of an exogenous factor that we have taken into account is customer density. For more on how we have forecast these measures, see our annual benchmarking report.[69]

For the TNSPs we consider this economic benchmarking can give an indication of how the efficiency of each service provider has changed over time. We accept that it is not currently robust enough to draw conclusions about the relative efficiency of these service providers.

A.2 Trend analysis

We have considered past trends in actual and forecast capex. This is one of the capex factors that we are required to have regard to.[70]

Trend analysis involves comparing service providers forecast capex and work volumes against historic levels. Where forecast capex and volumes are materially different to historic levels, we have sought to understand what has caused these differences. In doing so, we have considered the reasons given by the service providers in their proposals, as well as changes in the circumstances of the service provider.

In considering whether a business' capex forecast reasonably reflects the capex criteria, we need to consider whether the forecast will allow the business to maintain reliability and safety performance, and comply with relevant regulatory obligations.[71] The requirement to maintain reliability and safety, including regulatory obligations (specifically, service standards) are key drivers of capex. More onerous standards will typically increase capex, conversely, reduced service obligations will likely cause a reduction in the amount of capex required by a service provider.

Maximum demand is also a driver of replacement expenditure as changes in demand will affect the economic value of asset failure. As replacement often needs to occur prior to demand growth being realised, forecast rather than actual demand is relevant when a business is deciding what replacement projects will be required in an upcoming regulatory control period. However, to the extent that revised forecasts differ from the initial demand forecast, a service provider should incorporate this updated information in a timely manner and should reassess the need and timing for the projects.

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[68] See AEMC, *National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012*, November 2012, p.113. Exogenous factors could include geographic factors, customer factors, network factors and jurisdictional factors.

[69] AER, *Annual Benchmarking Report*, 2014.

[70] NER, cl. 6A.6.7(e)(5).

[71] NER, cl. 6A.6.7(a)(3).

For service standards, there is generally a lag between when capex is undertaken (or not) and when the service improves (or declines). This is important in considering the expected impact of an increase or decrease in capex on service levels. It is also relevant to consider when service standards have changed and how this has affected a NSP's capex requirements.

We have looked at trends in capex across a range of levels, including at the total capex level, for replacement and non-network capex, and categories of replacement and non-network capex as relevant.

A.3 Methodology review

We have considered the methodology that Powerlink has used to determine its capex forecasts, including assumptions, inputs and models. This has involved reviewing whether Powerlink's methodology is a sound basis for developing expenditure forecasts that reasonably reflect the capex criteria.[72]

Where we are not satisfied that the forecasting methodology is likely to reasonably reflect prudent and efficient costs, we have adjusted the methodology such that it is a reasonable basis for developing expenditure forecasts that reasonably reflect the capex criteria. In some circumstances we may consider the methodology to be reasonable but may not consider the inputs or assumptions used in a service providers' proposed forecasting methodology to be reasonable.

In relation to Powerlink's proposed amount for repex we have focused on the following key inputs used in its expenditure forecasting methodology:

- forecast asset replacement lives and unit costs used as inputs to the repex model
- the basis of Powerlink's calibration and adjustments made to the repex model
- condition assessment reports and options analysis used to justify forecast project specific capex.

We have considered these factors as they relate directly to our assessment of whether Powerlink's proposal reflects the efficient costs that a prudent operator would require to achieve the capex objectives.

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72 AER, *Expenditure Forecasting Assessment Guideline*, December 2013.

B Assessment of capex drivers

B.1 Alternative estimate

Having examined Powerlink's proposal, we formed a view on our alternative estimate of the capex required to reasonably reflect the capex criteria. Our alternative estimate is based on our assessment techniques (refer to appendix A). Our weighting of each of these techniques, and our response to Powerlink's submissions on the weighting that should be given to particular techniques, is set out under the capex drivers in this appendix.

We are satisfied that our alternative estimate reasonably reflects the capex criteria.

B.2 Forecast load-driven capex

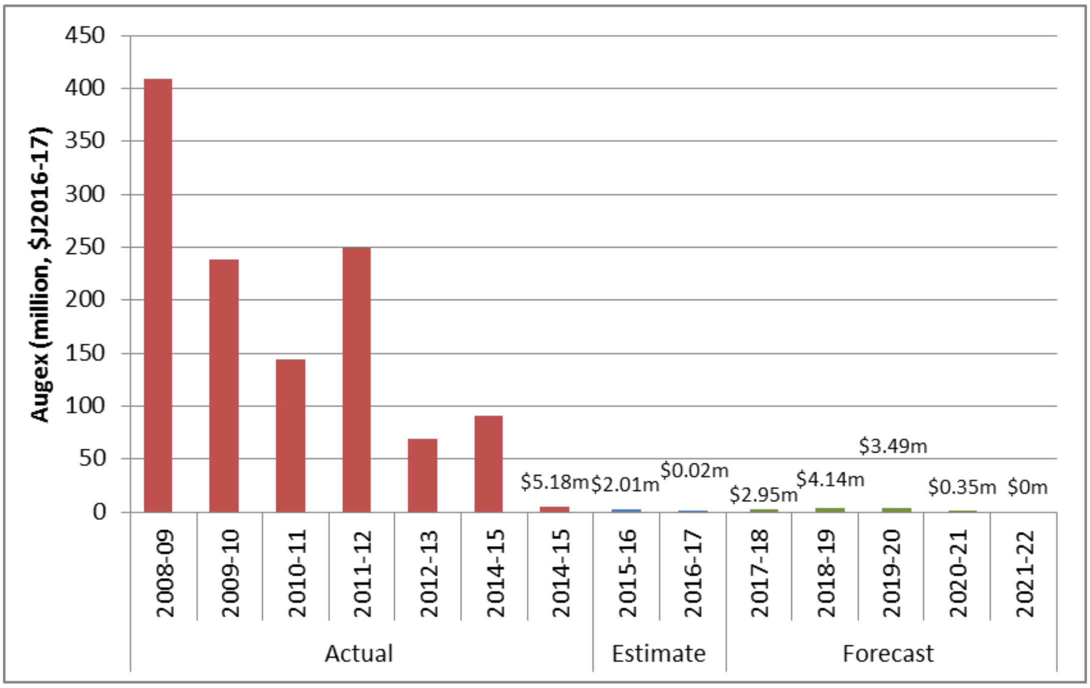
Powerlink proposed $10.9 million ($2016–17) in load-driven capex or augex (which includes $7.8 million ($2016–17) easements for land acquisitions associated with substations or communication sites and $3.1 million for demand-driven augex).[73] Powerlink proposed zero connections capex. Powerlink submitted that the reason for the lower augex forecast is that the maximum demand forecast (the main trigger of this capex) is expected to be flat over the 2017–22 regulatory period.[74] We consider forecast maximum demand in appendix C.

Powerlink's trend in actual and forecast augex is shown in Figure 6.4 below. This shows that total forecast augex is similar to the last three years of the current regulatory period, and 94 per cent lower than the $185.9 million ($2016–17) incurred for the previous five years (2012–17).

[73] Powerlink, *Revenue Proposal 2018-22,* January 2016, p.44.

[74] Powerlink, *Revenue Proposal 2018-22*, January 2016, p.77.

Figure 6.4 Powerlink's demand-driven augex ($million, $2016–17, excluding overheads and easements)



Source: Powerlink, *Regulatory information notice*, template 2.3, January 2016; Powerlink, *Category Analysis RIN 2008–13*, template 2.3; Powerlink, *Category Analysis RIN 2013–14*, template 2.3; Powerlink, *Category Analysis RIN 2014–15*, template 2.3; AER analysis.

We accept the $10.9 million ($2016–17) proposed for augex on the basis that it is significantly less than the historical levels of augex and reflects the relatively flat demand trend in the current period. Therefore, the forecast augex of $10.9 million ($2016–17) reasonably reflects the capex criteria and will enable Powerlink to achieve the capex objectives.

However, Powerlink also proposed $590 million ($2016–17) for seven contingent projects that are triggered by material increases in demand or new major connections. Our consideration of these contingent projects is discussed in appendix D.

B.3 Forecast non-load driven capex

Powerlink's non-load driven capex primarily reflects asset replacement expenditure (repex) as well as minor expenditure related to security and compliance and other network capex needs. Repex involves replacing an asset with its modern equivalent where the asset has reached the end of its economic life. Economic life takes into account the age, condition, technology or operating environment of an existing asset. In general, we classify capex as repex where the expenditure decision is primarily based on the existing asset's inability to efficiently maintain its service performance requirement.

B.3.1 Position

We do not accept Powerlink's proposed non-load driven capex of $843.2 million ($2016–17). We have instead included in our alternative estimate of overall total capex an amount of $658.7 million ($2016–17) for non-load driven capex. This is 22 per cent lower than Powerlink's proposal. However, we seek comment form Powerlink and other stakeholders on the approach we have adopted in response to our draft decision.

We are satisfied that this amount reasonably reflects the capex criteria. In coming to this view, as discussed in Appendix A, we applied:

- trend analysis, comparing past trends in total actual and forecast capex for the proposed non-load driven capex programs;[75] and
- a methodology review of Powerlink's expenditure forecasting methodology, including key inputs and assumptions.

Table 6.7 summarises Powerlink's proposal and our alternative amount for non-load driven capex.

Table 6.7 Draft decision on Powerlink's total forecast non-load driven capex ($2016–17, million)

	2017–18	2018–19	2019–20	2020–21	2021–22	Total
Powerlink's proposal	177.3	171.0	163.6	167.4	163.8	843.2
AER draft decision	135.9	133.5	128.0	132.5	128.8	658.7
Total adjustment	-41.4	-37.5	-35.6	-34.9	-35.0	-184.5
Total adjustment (%)	-23.4%	-22.0%	-21.8%	-20.8%	-21.4%	-21.9%

Source: AER analysis.

Note: Numbers may not add up due to rounding.

B.3.2 Powerlink's revenue proposal

Powerlink's forecast non-load driven capex is $843.2 million. Powerlink submitted that this expenditure is driven by:[76]

- the need to meet the demand for prescribed transmission services, with regard to the demand forecast and the continued application of deterministically expressed planning standards;
- the requirement to comply with applicable regulatory obligations, including to ensure the safety and security of people and assets; and

[75] NER, cl. 6.5.7(e)(5).

[76] Powerlink, *Revenue proposal 2017–22*, January 2016, pp. 42-43.

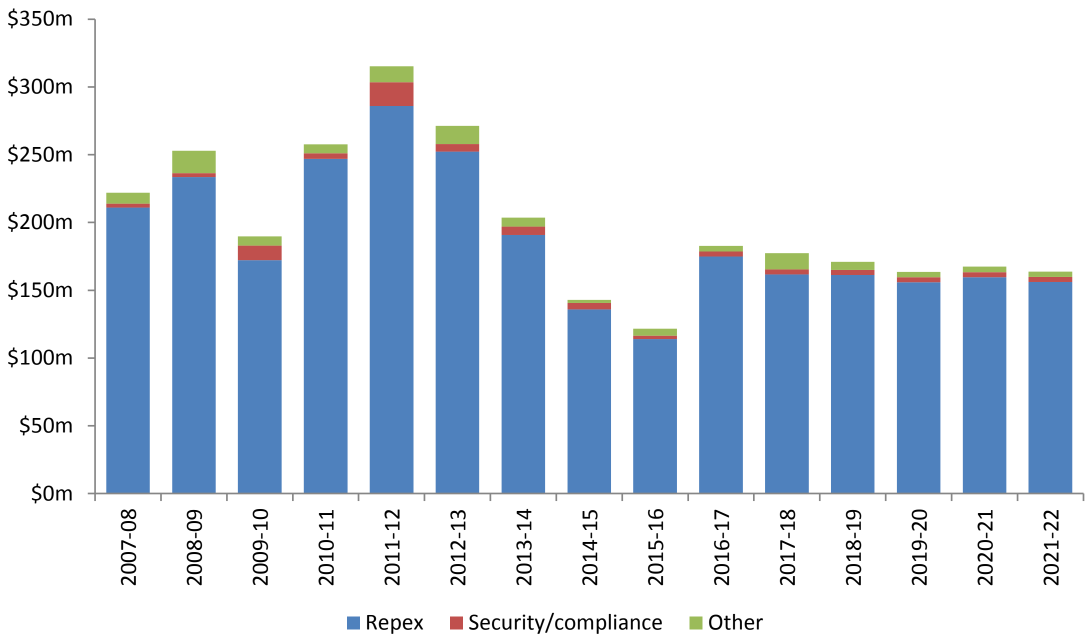
- asset reinvestment needs in an environment of low demand growth.

B.3.3 AER non-load driven capex findings

Historical and forecast non-load driven capex trends

We have conducted a trend analysis of non-load driven capex. The NER requires that we consider the actual and expected capital expenditure during any preceding regulatory control period.[77] Our use of trend analysis for non-load driven capex allows us to gauge how Powerlink's historical actual non-load driven capex compares to its expected non-load driven capex for the 2017–22 regulatory control period. Figure 6.5 shows Powerlink's non-load driven capex spending peaked in 2011–12 and has been steadily reducing to its current level. Total non-load driven capex spending is forecast to increase in 2016–17 and then remain steady over the 2017–22 regulatory control period.

Figure 6.5 Powerlink - Actual and forecast total non-load driven capex ($2016–17)



Source: Powerlink, *Revenue proposal 2017–22*, January 2016, p. 24 and AER analysis.

Note: Powerlink used actual historical replacement volumes in the five year period from 2010-11 to 2014-15 to calibrate its repex modelling.

Replacement capex accounts for $794.3 million ($ 2016–17) which is almost 90 per cent of total non-load driven capex and 83 per cent of total forecast capex. Powerlink's

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[77] NER, cl. 6A.6.7(e)(5).

forecast non-load driven capex is 9 per cent lower than actual and estimated non-load driven capex for the 2012–2017 regulatory control period. This, in turn, is 26 per cent less than actual non-load driven capex in the 2007–12 regulatory control period. Powerlink submitted that a reduction in forecast demand growth over the previous two regulatory control periods has had an impact on non-load driven capex. This is because network reinvestment plans have been focused on different outcomes, such as removing assets without replacement, or replacing with assets of different capacity and/or configuration. Powerlink also stated that this reduction in forecast demand growth has provided the opportunity for greater use of alternative options, such as network support or network reconfiguration, to manage asset condition and risk at a lower overall cost.[78]

An increasing or decreasing trend in total non-load driven capex does not, in and of itself, indicate that a service provider has proposed non-load driven capex that is likely to reflect or not reflect the capex criteria. In the case of Powerlink, which has proposed an average annual decrease in non-load driven capex from the last regulatory control period, we must consider whether it has sufficiently justified that this expenditure reasonably reflects the capex criteria. We use our trend analysis on key programs, a methodology review, the views of stakeholders and consultants, and the material put forward by Powerlink in support of its forecast, to help us form a view on whether Powerlink has sufficiently justified its proposed total non-load driven capex.

We have had particular regard to historical and forecast expenditure trends in our assessment of Powerlink's security and compliance and 'other' capex programs. Powerlink has used trend analysis to forecast expenditure in these categories, given it expects expenditure in these categories to be ongoing and relatively recurrent in nature. This is discussed further as part of our forecasting methodology review below.

Powerlink's non-load driven capex trend shows a decline from 2011–12 to 2015–16, followed by an increase of 50 per cent in the 2016–17 year. Powerlink stated that the anticipated increase in non-load driven capex in 2016–17 reflects a correction from lower levels of expenditure in 2015–16 to a more typical profile of investment. Powerlink submitted that the proposed increase in replacement capex in 2016–17 is largely driven by its decision to take a more detailed review of its overall network planning and investment process (including a review of Area Plans) in response to the changed demand environment, the timing of establishment of its transmission line refit panel, and other factors.[79]

For the 2012–17 regulatory control period there was a wide variation between Powerlink's forecast and actual non-load driven capex, particularly in the early years (2012–13 and 2013–14) of the regulatory control period. Powerlink expects to underspend its non-load driven capex by $592 million ($2016–17) or 40 per cent

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78 Powerlink, *Revenue proposal 2017–22*, January 2016, p. 52.

79 Powerlink, *Response to AER information request #004 follow up question, 20 June 2016, p. 1*.

compared to our regulatory determination for the 2013–17 regulatory control period.[80] Powerlink has underspent its capex forecast for all the non-load driven capex categories (repex, security and compliance, and 'other').

Powerlink identified the following drivers for the capex underspend during the 2012–17 regulatory control period:[81]

- refinement of project scope and timing as a result of a review of ongoing asset requirements in the context of the unexpected downturn in forecast demand (38 per cent of underspend)
- refinement of project scope and timing arising from more detailed asset condition assessment (24 per cent of underspend)
- achievement of lower that forecast costs for work, due primarily to softer market conditions, a pilot program for transmission line refits, and improvements to its contracting strategy (25 per cent of underspend).

The unexpected reduction in forecast demand was a significant driver of Powerlink's underspending of non-load driven capex in the 2012–17 regulatory control period. However, it is concerning that Powerlink significantly underspent its forecast capex as a result of the deferral, re-scoping and reduced cost of planned repex following a more detailed project-level analysis of options based on updated condition data. In our view, this suggests a historical bias towards over-forecasting the scope, timing and cost of work required. This in turn brings into question Powerlink's historical asset refurbishment and replacement governance policies and practices. We have considered these issues further as part of our forecasting methodology review below.

Notwithstanding these concerns, on the basis of our review of Powerlink's historic asset failure and outage and system reliability performance (of which further details are discussed in the network health indicators section below), we consider that Powerlink's past expenditure has been sufficient to maintain the quality, reliability and security of supply of its prescribed transmission services.

Forecasting methodology review

We have reviewed Powerlink's expenditure forecasting methodology for non-load driven capex, including key input assumptions, to assess whether the resulting capex forecast reasonably reflects the capex criteria. In doing so, we have drawn on the engineering and technical expertise of our consultants, EMCa, as well as the information provided in Powerlink's revenue proposal and submissions from stakeholders.

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80 Powerlink, *Regulatory proposal, Appendix 5.01 – Powerlink Queensland Operating and Capital Expenditure Criteria and Factors*, December 2015, p. 10.

81 Powerlink, *PQ0131 - AER/EMCa Site Visit Action Items 1*, 30 May 2016.

Our assessment of key issues identified in relation to Powerlink's forecasting methodology and assumptions is set out below.

Repex model

Powerlink used a modified version of the AER's repex model[82] to forecast repex requirements in the 2017–22 regulatory control period for the following asset categories:[83]

- transmission line structures – tower rebuilds and refits by corrosion zone;
- substation switchgear – circuit breakers, isolators/earth switches, voltage transformers (VTs) and current transformers (CTs);
- secondary systems and telecommunications – bay and non-bay secondary systems, telecommunications and metering; and
- substation buildings and infrastructure – substation buildings, communications buildings and site infrastructure.

Other asset types have been excluded from the repex model, either because Powerlink has not forecast any reinvestment need in the 2017–22 regulatory control period (conductors, underground cables and reactive plant) or because they are low volume, high cost assets more suited to individual needs-based forecast (power transformers). Powerlink has also excluded forecast capex for committed projects it expects to complete in the 2017–22 regulatory control period.[84] Overall, forecasts derived from the repex model make up approximately 74 per cent of Powerlink's total forecast capex for the 2017–22 regulatory control period.[85]

Powerlink's 2017–22 revenue proposal is the first time that a transmission network service provider has used the repex model to forecast a significant proportion of its capex requirements. In doing so, Powerlink has applied a range of modelling approaches, data inputs and assumptions to arrive at a capex forecast which it considers reasonably reflects a prudent and efficient forecast of required capex. The key aspects of Powerlink's approach in forecasting its repex requirements using the repex model include:

- the use of regulatory information notice (RIN) data to populate the model, and the application of a range of adjustments to that input data;

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82 The repex model is a predictive modelling tool that forecasts quantities of assets to be replaced over time based on a mean replacement life and a profile of the quantities of assets and the years they were installed. The forecast is based on a probability distribution for each asset type that describes when those assets are likely to be replaced. Powerlink is the first transmission network service provider to use the repex model to forecast capex in this way.

83 Powerlink, *Appendix 5.05 - Non-load driven network capital expenditure forecasting methodology*, January 2016, p. 26.

84 Powerlink, *Revenue proposal*, January 2016, p. 54.

85 Powerlink, *Appendix 5.05 - Non-load driven network capital expenditure forecasting methodology*, January 2016, p. i.

- the methodology used to calibrate the model, including the use of historical replacement volumes to calculate average asset replacement lives; and
- the unit rates applied to the forecast asset quantities to produce the repex forecast.

Powerlink supported its repex model based forecast with a sample of likely future projects to provide an indication of the type and scale of work it expects to undertake in the 2017–22 regulatory control period. Powerlink highlighted that the sample projects did not represent a firm program of work, and that the estimated cost of most of these sample projects was not directly reflected in its capex forecast.[86]

Powerlink's use of the repex model was foreshadowed in its expenditure forecasting methodology, and considered by the AER and other stakeholders through the Framework and Approach process for Powerlink's 2017–22 regulatory review. At that time, CCP members (Jo De Silva and David Headberry) submitted that Powerlink's capex forecasting methodology would not provide sufficient information as to the governance behind the development of the capex allowance, the risk assessments made underpinning the capex forecasts, the structure of cost inputs and the need for the capex claimed.[87] In our final Framework and Approach for Powerlink, we noted that:[88]

- we continue to expect that the major technique used in forecasting capex will be a project based 'bottom-up' basis; and
- Powerlink may make use of the repex model as a basis for forecasting but if we consider it is inappropriate for a particular expenditure, Powerlink would be at risk of that proposal being rejected or substantially amended.

The CCP members' submission on Powerlink's revenue proposal reiterated their concerns with Powerlink's repex forecasting methodology, and submitted that:[89]

- an appropriate mix of top down and bottom up forecasting is required to demonstrate the prudency and efficiency of Powerlink’s proposed repex;
- Powerlink's forecasting approach is overly reliant on the use of its historical repex costs, which have not been demonstrated to be efficient;
- Powerlink's repex proposal is not justified by asset condition information and is based on excessively conservative and predominately qualitative risk assessments;
- Powerlink's assumed standard asset lives are much shorter than the asset lives being achieved by other networks; and

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86 Powerlink, *Revenue proposal*, January 2016, pp. 53-54.

87 CCP (Jo De Silva and David Headberry), *CCP4 Sub-Panel Submission, Draft Powerlink framework and approach (F&A)*, 3 April 2015, p. 4.

88 AER, *Final Framework and Approach for Powerlink*, June 2015, p. 35.

89 CCP (Hugh Grant and David Headberry), *Submission to the AER, Powerlink Queensland 2018–22 revenue proposal*, 20 June 2016, pp. 49–50.

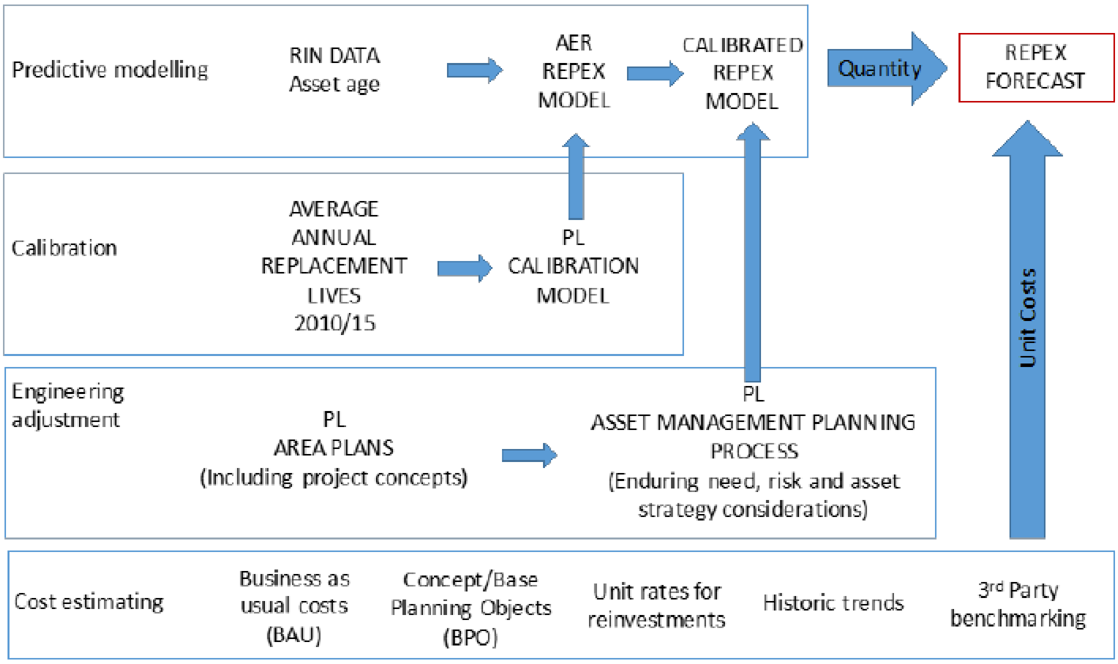
- Powerlink has not identified the outcomes, in terms of system performance, that its repex proposal would deliver.

Our expenditure forecasting assessment guideline recognises that a range of different estimating techniques may be employed to develop an expenditure forecast.[90] Our concern is to ensure that the forecasting techniques employed provide a reasonable assessment of Powerlink's prudent and efficient future capex requirements. Noting the concerns raised by the CCP members, and the significant contribution of predictive repex modelling to Powerlink's overall capex forecast, we sought advice from EMCa to identify any systemic issues with Powerlink's forecasting approach.

EMCa reviewed Powerlink's repex forecasting methodology, including the underlying inputs and assumptions, capex governance and management policies, and a sample of historical and forecast project documentation.[91] We have also drawn on our own internal technical and engineering expertise as part of this assessment, including to critically review and test EMCa's analysis and findings. EMCA's advice and our views are detailed below.

EMCa summarised Powerlink's repex forecasting process as shown in Figure 6.6.

Figure 6.6 Powerlink's repex forecasting process



Source: EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, p. 31.

90 AER, *Better regulation: Expenditure forecast assessment guideline for electricity transmission*, November 2013.

91 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016.

In relation to Powerlink's use of the repex model to forecast its non-load driven capex, EMCa found that:

- Powerlink’s use of the repex model represents a significant departure from the capex forecasting methodology used for its previous revenue proposal, and is coincident with a significant change in the primary driver of Powerlink's capex from growth to reinvestment;[92]
- Powerlink has adjusted the input repex RIN data significantly with the aim of enhancing forecast accuracy (for example by excluding assets which it expects to decommission but not replace), and by introducing sub-categories for various assets (for example, different corrosion zones for transmission towers);[93]
- Powerlink’s calibration model uses actual historical replacement volumes in the calibration period (2010–2015) to calculate the average annual replacement volume and mean asset replacement life;[94]
- Powerlink’s repex forecasting approach takes the mean replacement lives determined by the calibration model and applies them to the asset age profile at the start of the forecast period to derive the reinvestment schedule;[95]
- the unit costs used to produce Powerlink's repex forecast were based on historical costs from actual projects and the most recent unit costs observed in project tenders, benchmarked against industry average unit costs produced independently by Powerlink's consultant Jacobs;[96]
- Powerlink's model calibration and adjustments, when applied appropriately should produce a predictive replacement schedule that reflects historical practice;[97]
- the use of historical data to calibrate the repex model means that any lack of prudency or inefficiency in Powerlink’s management of its asset replacement program in the five year period used to calibrate the model will deliver a repex forecast that mirrors this performance;[98]
- improvements to asset management decision-making in recent years, or in the course of deployment, will not be fully captured by the model calibration;[99] and
- in order to conclude that the forecast produced by the repex model reflects the prudent and efficient costs needed to maintain Powerlink's network requires an assessment of Powerlink’s actual performance when implementing its asset replacement programmes.[100]

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92 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, p. 35.

93 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, pp. 28-29.

94 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, p. 32.

95 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, pp. 31-32.

96 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, p. 38.

97 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, p. 29.

98 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, p. 39.

99 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, p. 39.

100 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, p. 39.

EMCa's conclusions are consistent with our own views on the operation and utility of the repex model. Our repex model handbook explains that the model relies on using asset age as a proxy for the many factors that influence individual asset replacements. The timing of the replacement need must therefore be directly or implicitly linked to the age of the asset.[101] Where the timing of actual historical replacements has been driven by other factors, such as augmentation requirements, poor maintenance practices, or imprudent and inefficient asset replacement decisions, trending forward the observed asset replacement lives will perpetuate these issues into the repex forecast.

In our view, this can be a particular problem for electricity transmission businesses, as replacement projects tend to have a more 'lumpy' profile than the ongoing replacement programs more typical for distribution businesses. For example, a transmission line replacement program may, for practical reasons, require the replacement of all towers on a particular line at the same time even though some towers are in better condition and have longer remaining useful lives than others.

This issue was recognised by Powerlink's consultant Nuttall Consulting. Powerlink engaged Nuttall Consulting to review and validate its repex forecasting methodologies. Relevantly, Nuttall Consulting found that:[102]

- the repex model, with suitable application, can be an appropriate method for preparing the replacement forecast for many asset classes;
- this finding relies on the underlying assumption that historical practices represented prudent and efficient decisions; and
- if this assumption is not valid then some form of adjustment to the forecast produced through Powerlink's methodology will be required.

We tested the validity of the assumption that Powerlink's historical practices represented prudent and efficient asset replacement decisions. To do this, we sought further advice from EMCa regarding Powerlink's capex governance and asset management policies and practices in the context of a sample of 18 historical projects completed or commenced in the 2012–17 regulatory control period. The 18 projects had a total approved cost of $683.9 million. EMCa reviewed the asset condition assessment reports, business cases and other supporting documentation associated with these projects.[103] It is important to recognise that this analysis was not an ex post review intended to determine the prudency and efficiency of historical capex, but rather a means of testing the suitability of Powerlink's repex modelling inputs used to forecast repex in the 2017–22 regulatory control period.

Based on this review and our own analysis informed by our internal technical and engineering expertise, we consider that despite Powerlink's repex model calibration and adjustments, Powerlink's repex modelling is likely to be based on asset

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101 AER, *Electricity network service providers - replacement model handbook*, December 2011, pp. 6-9.

102 Powerlink, *Appendix 5.04 Nuttall Consulting Forecasting Methodology Review*, 9 November 2015, pp. 4 and 9.

103 EMCa, *Review of forecast non-load driven capital expenditure - addendum report*, August 2016.

replacement lives that are too short for the asset classes considered. EMCa's findings on Powerlink's historical asset replacement governance and practices for each asset class included in Powerlink's repex model are summarised in turn below.

Transmission lines

EMCa examined four transmission line replacement projects with total approved costs of $255.1 million, and found that:[104]

- in each of the four transmission line condition assessment reports, it appears that a strategy of replacement rather than life extension has been adopted;
- Powerlink’s condition assessment reports typically provide sufficient information to conclude that some form of corrective action is required to address condition-related defects, but on balance do not provide sufficient evidence for the need to replace all the towers;
- Powerlink has not provided compelling options analysis for the four projects, including option analysis for life extension rather than replacement;
- there was significant augmentation of the replaced assets, including load driven capacity upgrades and unjustified upgrades to communications capacity. While Powerlink made a deduction of nine per cent to its repex model inputs to remove non-condition driven expenditure, EMCa was unable to verify whether the amount of the deduction was appropriate or how it had been applied;
- the actual replacement life of the four transmission lines was on average 12 years or 31 per cent longer than the average 40.3 years assumed in Powerlink’s repex model for lines in coastal areas (corrosion zones D, E and F); and
- if Powerlink had adopted a refurbishment strategy directed to economic life extension (such as bringing forward tower repainting) the replacement lives would be longer still.

Primary substation equipment

EMCa examined six primary equipment replacement projects with total approved costs of $331.4 million, and found that:[105]

- Powerlink’s condition assessment reports are generally sufficient to demonstrate that at least some of the key substation assets will require replacement within ten years from the assessment without remedial action;
- Powerlink undertakes limited options analysis, both in terms of the range of options considered and the depth of analysis;

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[104] EMCa, *Review of forecast non-load driven capital expenditure - addendum report*, August 2016, pp. 7-13.

[105] EMCa, *Review of forecast non-load driven capital expenditure - addendum report*, August 2016, pp. 18-25.

- the actual average replacement life of the primary plant assets was 7 years or 21 per cent longer than the average of the primary plant replacement lives used by Powerlink in its repex model; and
- Powerlink appears to have foregone the opportunity to extend the life of its primary assets through better targeted replacement or refurbishment. If asset management practices change to focus more on life extension, this should be taken into account in the repex model.

Secondary systems

EMCa examined five secondary systems replacement projects with total approved costs of $104.7 million, and found that:[106]

- the qualitative condition assessments indicate the need for corrective action on older secondary systems equipment on the grounds of condition and/or obsolescence, but do not support replacement of more recently installed systems;
- the options analysis:
    - does not consider a broad range of possible options, including life extension or partial refit;
    - does not include risk assessment in accordance with good industry practice; and
    - included limited risk-cost assessment to confirm the optimal timing of the selected option;
- the bundled replacement of older and younger assets may help explain the relatively low replacement life derived by Powerlink for use in its repex model, and also leads to relatively high asset write-offs;
- the actual average replacement life of the secondary systems equipment was 27 years, which is 7 years or 35 per cent longer than the average replacement life used by Powerlink in its repex model.

We also reviewed Powerlink's historical project outcomes and supporting documentation, and found that EMCa's analysis and findings accorded with our own view. We expect Powerlink will also review EMCa's analysis and findings and provide its response along with any further supporting or clarifying information with its revised revenue proposal.

In our view, having regard to EMCa's advice and our own review of Powerlink's historical repex project documentation and actual project outcomes, we are not satisfied that the inputs and assumptions which underpin Powerlink's use of the repex model are likely to result in a capex forecast which reasonably reflects the efficient

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[106] EMCa, *Review of forecast non-load driven capital expenditure - addendum report*, August 2016, pp. 26-32.

costs that a prudent operator would require to achieve the capex objectives.[107] We consider that the mean asset replacement lives used as inputs to Powerlink's repex model should be extended to ensure that the resulting estimate of forecast asset replacement requirements is not more than is reasonably necessary to achieve the capex objectives.

The key parameter for predicting asset replacement needs through the repex model is the asset replacement life. Powerlink's forecasting methodology uses a calibrated average replacement life based on average replacement volumes in the calibration period (2010–11 to 2014–15). Powerlink has implemented a number of improvement initiatives in recent years and continues to review, revise and improve its asset management strategies.[108] Powerlink described the changes in its approach to reinvestment decisions made in the 2012–17 regulatory control period (the later years of the repex model calibration period) in the following terms:[109]

> Powerlink has adapted its approach to reinvestment decisions, with a particular focus on assessing whether there was an enduring need for the key assets and alternative investment options to manage asset condition and risks at a lower cost (such as network reconfiguration or asset retirement). Also, Powerlink has taken a cautious approach in determining where it is appropriate to refit or replace aging transmission line assets and how to implement these works cost effectively. These changes have been aimed at delivering better value to consumers.

The effect of Powerlink's revised approach to asset reinvestment decisions is evident in Powerlink's historical repex trend. For example, actual repex in 2014–15 was less than half the level of expenditure in 2011–12. However, we are concerned that Powerlink's historical asset replacement policies and practices, particularly in the early years of the calibration period, are likely to distort the repex model calibration and result in average asset replacement lives which are shorter than Powerlink is actually likely to achieve in the 2017–22 regulatory control period. This is because:

- historically, Powerlink has not considered all technically viable options, in particular life extension options targeted at specific assets representing major risks;
- there is evidence that Powerlink has historically replaced equipment that was well short of its economic end of life by bundling younger assets with older assets in full replacement options when partial replacement or refurbishment options could have been deployed to address the asset condition/obsolescence issues;
- in almost all of the historical projects reviewed, the actual survival life of the assets was significantly longer than the comparable asset replacement lives that Powerlink has applied in its repex model; and

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107 NER, cl. 6A.6.7(c).

108 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, pp. 20-21; and Powerlink, *Response to AER information request #017 - part 2*, 9 August 2016, pp. 3-7.

109 Powerlink, *Revenue proposal*, January 2016, p. 25.

- Powerlink appears to have applied asset management strategies biased towards early replacement rather than refurbishment or life extension strategies, such that it is likely that Powerlink could have further extended the actual lives of its assets by adopting earlier, targeted replacement and refurbishment techniques.[110]

We recognise that Powerlink has made adjustments to the repex model input data, for example to exclude historical asset replacement quantities not driven by asset condition, and assets for which there is no enduring need.[111] These modifications have reduced Powerlink's forecast repex compared to what the forecast would have been had Powerlink not made these adjustments. Nonetheless, we are not satisfied that these adjustments are likely to correct for the fundamental issues with Powerlink's historical asset maintenance and replacement policies and practices identified by EMCa, or account for the full impact that changes in policy and practice will have on actual work undertaken in the future.

In modelling our alternative estimate of forecast capex for the 2017–22 regulatory control period, we have applied an alternative set of asset replacement lives to Powerlink's repex model. In determining our alternative asset replacement lives, we have had regard to expert advice from EMCa and our own internal technical and engineering expertise.[112] Our analysis and EMCa's advice found that in practice, including during the 2010–2015 calibration period, Powerlink replaced assets at later ages than the mean replacement ages used in the repex model. The actual replacement ages observed in the sample of historical projects reviewed exceeded the mean replacement ages used in Powerlink's repex model by between 7 and 12 years. This is at least one standard deviation above Powerlink's mean replacement life across the various asset categories reviewed. The standard deviation for the relevant asset classes is between 4.5 years and 8.5 years.[113] In our view, this level of variation between Powerlink's historically achieved asset lives and the forecast mean asset lives used as inputs to the repex model is significant.

We consider that extending the mean asset replacement lives for towers, primary substation assets and secondary systems, by an average of one standard deviation from the mean replacement lives in Powerlink's repex model, provides a more realistic estimate of the actual likely survival life of Powerlink's key asset categories in the 2017–22 regulatory control period. This is because the average variance in actual replacement lives from those assumed by Powerlink is similar to the average standard deviation observed in Powerlink's asset life data. This adjustment will increase the mean age at which asset replacement is forecast by the repex model to be more in line with the actual replacement ages historically achieved by Powerlink. Our substitute asset replacement lives are set out in Table 6.8 below.

[110] EMCa, *Review of forecast non-load driven capital expenditure - addendum report*, August 2016, p. 34.
[111] Powerlink, *Revenue proposal*, January 2016, p. 56.
[112] EMCa, *Review of forecast non-load driven capital expenditure - addendum report*, August 2016, p. 37.
[113] The standard deviation is a measure that quantifies the amount of variation in a data set.

Table 6.8 Powerlink and the AER's forecast average asset replacement lives (years)

Primary asset category	Sub-category	Powerlink forecast asset replacement life	AER forecast asset replacement life	Difference between AER and Powerlink replacement lives
Towers	Corrosion zone DEF	40.3	46.6	6.3
	Corrosion zone C	57.9	65.5	7.6
	Corrosion zone B	71.4	79.9	8.5
Primary substation equipment	Circuit breakers	34.2	40.2	6.0
	Isolators/earth switches	39.8	45.8	6.0
	Voltage transformers	34.6	40.6	6.0
	Current transformers	33.2	39.2	6.0
Secondary systems and telecommunications	Secondary systems (bay and non-bay)	20.2	24.7	4.5
	Telecommunications	10.7	10.7	-
Buildings and infrastructure	Substation buildings	34.3	34.3	-
	Communications buildings	42.3	42.3	-
	Site infrastructure	50.6	50.6	-

Source: AER analysis.

The extended asset replacement lives set out in Table 6.8, when applied as inputs to Powerlink's repex model, have the effect of deferring the profile of asset replacements forecast by the model and reducing forecast capex in the 2017–22 regulatory control period.

As a corollary to this reduction in forecast repex, we recognise that the extension of physical asset replacement lives is likely to require a prudent increase in preventative and corrective asset reinvestment capex within the 2017–22 regulatory control period. This would include asset life extension expenditure, such as the early painting of transmission towers to prevent corrosion. EMCa has estimated an offsetting allowance equivalent to 15 per cent of Powerlink's initial modelled repex as a reasonable estimate of the additional life extension capex likely to be required in the 2017–22 regulatory control period to achieve the extended mean asset replacement lives set out in this draft decision.[114] This is based on the experience of Transpower New Zealand, which has adopted an 'early' tower painting program in which it repaints towers before signs of significant corrosion appear. Transpower has demonstrated that this is a lower cost strategy than line replacement. EMCa advised that, based on Transpower's reported

[114] EMCa, *Review of forecast non-load driven capital expenditure - addendum report*, August 2016, p. 37.

criteria for tower painting and the average cost per tower, Powerlink would need to spend the equivalent of 15 per cent of its forecast tower replacement expenditure to adopt an early tower painting program.[115] We have accounted for this additional refurbishment capex in our alternative estimate of repex required to achieve the capex objectives. Given we have allowed for this offsetting increase in refurbishment capex, we do not consider that an increase in Powerlink's forecast maintenance opex would be required as a result of this draft decision on forecast capex.

Applying the alternative asset replacement lives set out in Table 6.8 and the 15 per cent offset for increased capitalised refurbishment and life extension costs results in a reduction in repex from $794.3 million to $609.8 million ($2015–16).

We consider that our reduction in forecast repex is realistic yet conservative in the circumstances, noting that our extended asset replacement lives remain shorter than those actually achieved by Powerlink for relevant asset classes in the sample of historical projects reviewed. Also, we have made no adjustment to Powerlink's forecast unit rates in this draft decision. While we found that several of Powerlink's historical repex projects used to calibrate its repex model inputs included expenditure to augment replaced assets, Powerlink advised that it had allowed for this by reducing historical replacement quantities, resulting in a reduction of approximately nine per cent from historical expenditure. In our final decision, we will further review the quantum and application of this adjustment, including the possible impact of historical augmentation capex on Powerlink's unit rates, to confirm that Powerlink has fully accounted for the impact of augmentation in historical repex projects.

We recognise that the proposed reduction in repex associated with extending the expected replacement lives of Powerlink's assets in the repex model as set out in this draft decision will, over time, result in an increase in the average age of Powerlink's network assets. We consider this to be reasonable, noting that, on average, Powerlink's existing assets are significantly younger than those of other Australian transmission network service providers, as shown in Table 6.9.

Table 6.9 Comparison of weighted average asset ages (years)

Asset type	Powerlink	AusNet Services	TransGrid	ElectraNet	TasNetworks
Towers	**26**	44	37	44	48
Substation power transformers	**17**	30	22	30	22
Substation switchgear	**14**	24	19	21	18
Conductors	**24**	41	37	41	41

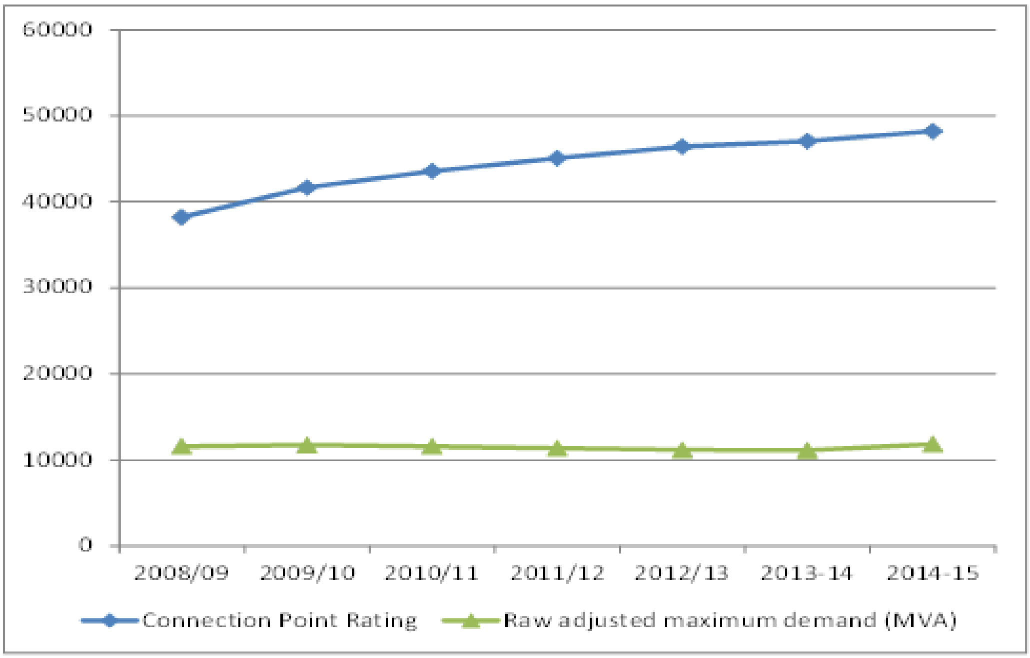
Source: AER analysis.

115 EMCa, *Review of forecast non-load driven capital expenditure - addendum report*, August 2016, p. 13.

We have also considered the effect that the associated reduction in repex may have on Powerlink's ability to meet the expected demand for prescribed transmission services, comply with applicable regulatory obligations and maintain the safety of the transmission system.

We note that there is a significant amount of spare capacity in Powerlink's transmission network. Transmission networks typically develop with greater capacity than forecast maximum demand to allow for a margin of spare capacity to manage asset outages for maintenance, to provide redundancy in the event of asset failure and to allow for future demand growth. However, as submitted by CCP members, the utilisation of Powerlink's network as measured by spare transformer capacity has declined in recent years.[116] Figure 6.7 shows that, on average, Powerlink has in recent years increased the margin of spare capacity in the network by increasing connection point capacity by 26 per cent, while demand has remained static.

Figure 6.7 Powerlink total connection point rating and maximum demand (MVA)



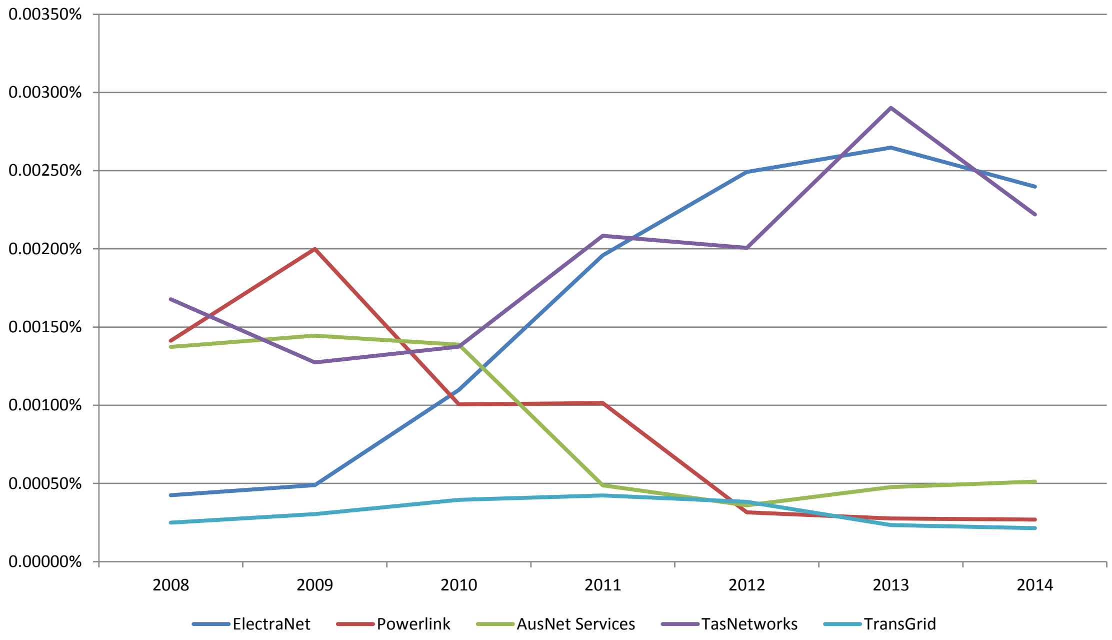
Source: AER analysis of Powerlink category analysis RINs.

The increased margin in Powerlink's network capacity over recent years has provided more redundancy in Powerlink's network. Unplanned asset outages are therefore less likely to lead to customer interruptions. This is evident in the trend of network reliability as measured by the amount of unserved energy experienced by Powerlink's customers, which has consistently improved over this same period as shown in Figure

[116] CCP (Hugh Grant and David Headberry), *Submission to the AER, Powerlink Queensland 2018–22 revenue proposal*, 20 June 2016, pp. 55–56.

6.8. Unserved energy for Powerlink's customers has reduced (that is, reliability has improved) by around 22 per cent since 2007–08.[117]

Figure 6.8 TNSP unserved energy 2006 - 2014 (three year moving average)



Source: AER, *AER Transmission network service providers partial performance indicators 2010 - 2014 - Physical data worksheet*, 30 November 2015.

Having regard to Powerlink's existing asset age profile and levels of spare capacity, network redundancy and network reliability, we are satisfied that Powerlink's network is sufficiently robust to accommodate an increase in average asset age in the 2017–22 regulatory control period. We therefore consider that our alternative estimate of repex should be sufficient for a prudent and efficient service provider in Powerlink's circumstances to be able to maintain the safety, service quality, security and reliability of its network consistent with its current obligations. Powerlink will have an opportunity through its revised proposal to assess the likely impact, in terms of network health and reliability, of extending the mean asset replacement lives as envisaged in this draft decision. We will have regard to any such analysis in making our final decision.

Power transformers repex

Powerlink forecast repex of $43.1 million for seven power transformer replacement projects in the 2017–22 regulatory control period.[118] Power transformers are relatively low volume, high cost items and Powerlink therefore considers them not suitable for

117 AER analysis of category analysis RIN data.

118 Powerlink, *Capex model*, 'Project Driver' tab, January 2016.

modelling through the repex model. Powerlink has forecast its power transformer capex on an individual project basis.[119]

We reviewed the supporting documentation provided by Powerlink for the seven transformer replacement projects forecast for the 2017–22 regulatory control period, and sought advice from EMCa regarding the project need and Powerlink's application of its capex governance policies and procedures in the context of these projects.[120]

Powerlink's forecast transformer replacement projects are 'unapproved', meaning that business cases for the projects have yet to be developed.[121] Typically, Powerlink has supported its individual transformer replacement projects with project proposal documents and condition assessment reports as well as, in one case, a risk assessment.[122]

Based on its review of Powerlink's forecast project documentation, EMCa found that:[123]

- the scope of each project is well defined;
- the condition assessment reports provide adequate information to confirm that some action is required in the 2017–22 regulatory control period;
- limited options analysis is provided in most cases, with typically a discussion of one or two alternatives to the recommended approach;
- little or no economic analysis is presented to support the preferred option;
- where Powerlink has proposed the replacement of transformers with larger units or a higher total installed capacity, Powerlink has not justified this increase in capacity; and
- in several cases, it appears that transformer refurbishment may be a viable option yet in most cases there is no discussion of the technical viability of life extension rather than asset replacement.

EMCa also reviewed two examples of Powerlink's historical transformer replacement projects.[124] EMCa found that these historical projects displayed similar systemic issues to the forecast transformer projects and projects in other asset categories, including:[125]

- inadequate options analysis to demonstrate that the prudent and efficient option has been selected; and

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119 Powerlink, *Appendix 5.05 - Non-load driven network capital expenditure forecasting methodology*, January 2016, p. i.

120 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, pp. 52-54.

121 Powerlink, *Revenue proposal*, January 2016, p. 54; and Powerlink, *Project Approval for Network Capital Projects Procedure*, 16 November 2016, p. 7.

122 Risk assessment provided for the Dysart transformer replacement project.

123 EMCa, *Review of forecast non-load driven capital expenditure*, July 2016, pp. 52-54.

124 EMCa, *Review of forecast non-load driven capital expenditure - addendum report*, August 2016, pp. 14-17.

125 EMCa, *Review of forecast non-load driven capital expenditure - addendum report*, August 2016, p. 17.

- evidence that inappropriate asset management strategies have been applied in the past, leading to premature replacement of the assets being required.

Nonetheless, based on the available condition assessment information, EMCa considered that the condition of the transformers was such that these historical replacements were likely to be prudent.[126]

Based on this advice and our own assessment of Powerlink's transformer replacement project documentation, we are not yet satisfied that Powerlink has clearly demonstrated that the forecast power transformer capex reasonably reflects the efficient costs that a prudent operator would require in the 2017–22 regulatory control period.[127] In our view, on the information available it is not clear that Powerlink has sufficiently considered an appropriate range of options for these projects. Powerlink's condition assessment reports appear to show that, similar to the other asset categories discussed above, there may be scope for Powerlink to prudently reduce the proposed replacement expenditure through the deferral of projects and the application of life extension techniques in some cases. This could include limited component replacement rather than full transformer replacement in some cases.

Based on the information available, the extent to which Powerlink may be able to derive efficiencies or defer transformer replacement projects is unclear. Therefore, for this draft decision we have not made any specific adjustment to forecast power transformer capex in determining our alternative estimate of other non-load driven capex. Given that Powerlink's proposal is for replacement of only a very small proportion of its transformer fleet, it is unlikely that Powerlink has materially overestimated the prudent and efficient level of capex required for transformer reinvestment in the 2017–22 regulatory control period. We expect that Powerlink will further consider opportunities for project efficiencies and deferrals, including through increasing the application of life extension approaches in lieu of asset replacement. We will consider any additional information provided by Powerlink in its revised proposal when making our final decision.

Security and compliance capex

Powerlink forecast security and compliance capex of $18.8 million ($2016–17) for the 2017–22 regulatory control period. Expenditure in this category is required to maintain the physical and cyber security of the network, and to ensure compliance with amendments to technical, safety and environmental legislation.[128]

Powerlink forecast capex in this category using trend modelling, on the basis that there is a recurring level of expenditure in this category that is necessary for the ongoing provision of prescribed transmission services. Powerlink forecast its security and compliance capex by:

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126 EMCa, *Review of forecast non-load driven capital expenditure - addendum report*, August 2016, p. 17.

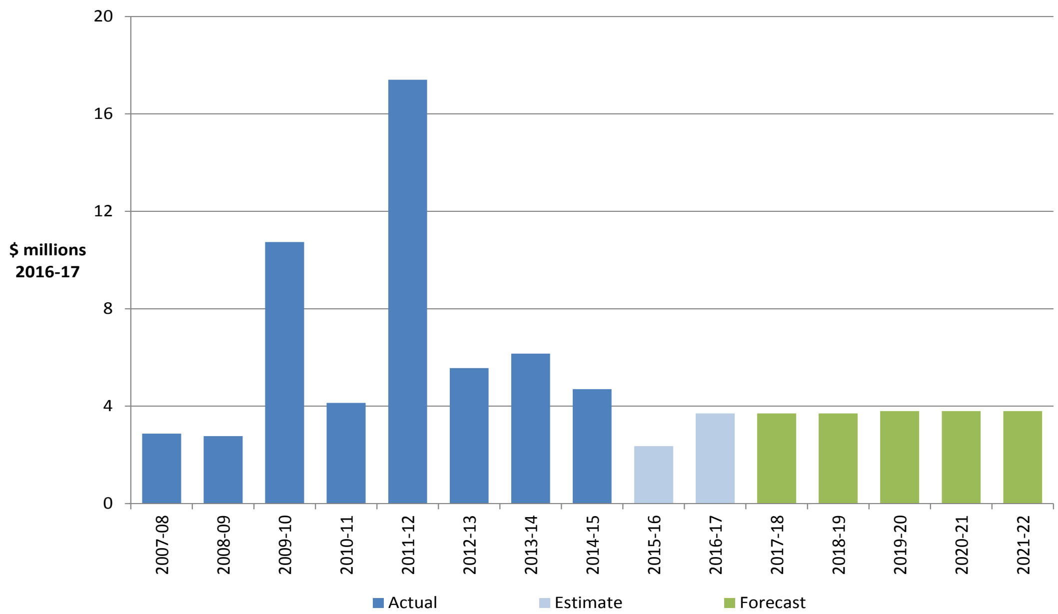
127 NER, cl. 6A.6.7(c).

128 Powerlink, *Revenue proposal*, January 2016, pp. 44 and 53.

- taking the most recent five years of actual historical capex in this category and adjusting the data by removing non-recurrent or abnormal projects which should not form part of the base trend;
- trending forward the adjusted average historical base expenditure as the forecast base expenditure for the 2017–22 regulatory control period; and
- adding any new non-recurrent or abnormal projects planned for the forecast period.

Figure 6.9 shows Powerlink's actual and expected security and compliance capex for the period from 2007 to 2017, and forecast capex for the 2017–22 regulatory control period.

Figure 6.9 Powerlink's security and compliance capex 2007 to 2022 ($m, 2016–17)



Source: Powerlink, *Revenue proposal*, January 2016, pp. 24 and 53; AER analysis.

Powerlink's forecast security and compliance capex is 16 per cent below actual and estimated expenditure in the 2012–17 regulatory control period, and 50 per cent below expenditure in the 2007–12 regulatory control period. These reductions compare favourably to the reductions in overall non-load driven capex of 8 per cent and 26 per cent respectively. In our view, this suggests that Powerlink's forecast of non-network capex requirements in the 2017–22 regulatory control period is likely to be reasonable having regard to past expenditure.[129]

We are satisfied that Powerlink's forecasting methodology for this category is reasonable and likely to produce a forecast of capex requirements which reflects the

129 NER, cl. 6A.6.7(e)(5).

capex criteria. Importantly, Powerlink has not simply used its actual historical expenditure as a base for its trend modelling, but has applied adjustments to remove abnormal and non-recurrent expenditures from the historical data. This ensures that only underlying, recurrent expenditure in this category is carried forward through the trend model into the forecasting period. Also, Powerlink has not applied any step changes to the trend based capex forecast for new non-recurrent or abnormal expenditure in the 2017–22 regulatory control period.

Having considered Powerlink's regulatory proposal, we are satisfied that Powerlink's forecast for security and compliance capex is likely to reasonably reflect prudent and efficient costs for this category of capex.[130] Our estimate of total capex for the 2017–22 regulatory control period reflects this conclusion.

Other non-load driven capex

Powerlink forecast other non-load driven capex of $30.1 million ($2016–17) for the 2017–22 regulatory control period. Expenditure in this category includes all other capex associated with the transmission network not captured by other categories, including enhancements to communication systems, improvements to network switching functionality, and insurance spares.[131]

Powerlink forecast capex in this category using trend modelling, on the basis that there is a recurring level of expenditure in this category that is necessary for the ongoing provision of prescribed transmission services. Powerlink forecast its other non-load driven capex, similar to its process for security and compliance capex, by:

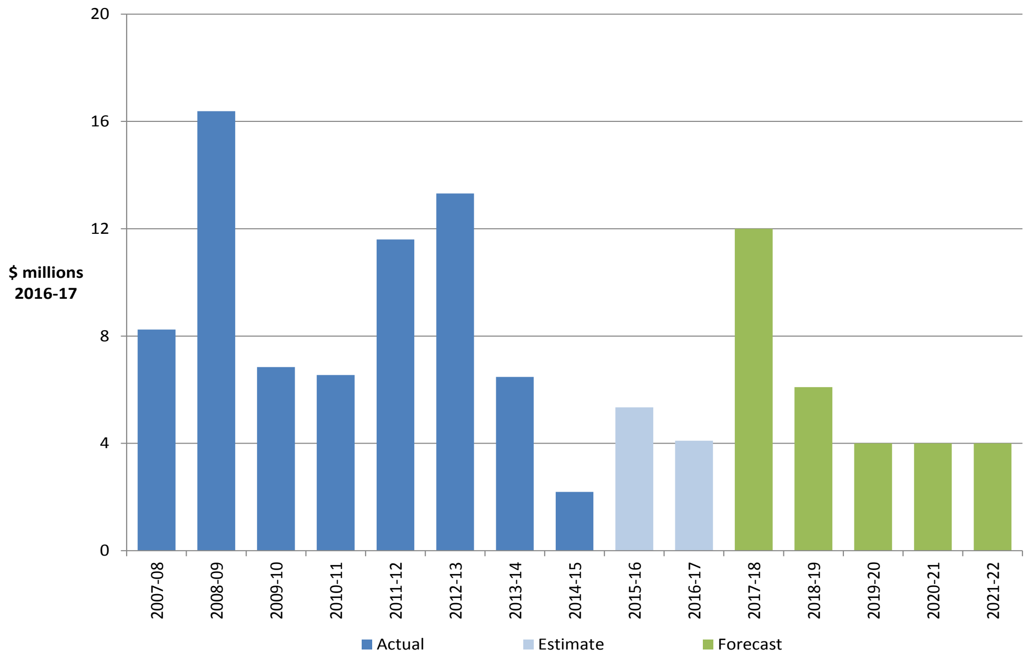
- taking the most recent five years of actual historical capex in this category and adjusting the data by removing non-recurrent or abnormal projects which should not form part of the base trend;
- trending forward the adjusted average historical base expenditure as the forecast base expenditure for the 2017–22 regulatory control period; and
- adding any new non-recurrent or abnormal projects planned for the forecast period.

Figure 6.10 shows Powerlink's actual and expected other non-load driven capex for the period from 2007 to 2017, and forecast capex for the 2017–22 regulatory control period.

130 NER, cl. 6A.6.7(c).

131 Powerlink, *Revenue proposal*, January 2016, pp. 44 and 53.

Figure 6.10 Powerlink's other non-load driven capex 2007 to 2022 ($m, 2016–17)



Source: Source: Powerlink, *Revenue proposal*, January 2016, pp. 24 and 53; AER analysis.

Powerlink's forecast other non-load driven capex is 4 per cent below actual and estimated expenditure in the 2012–17 regulatory control period, and 39 per cent below expenditure in the 2007–12 regulatory control period. This is less than the 8 per cent reduction in overall non-load driven capex from the 2012–17 regulatory control period, but more than the 26 per cent reduction from the 2007–12 regulatory control period. In our view, this suggests that Powerlink's forecast of non-network capex requirements in the 2017–22 regulatory control period may be reasonable having regard to past expenditure.[132] However, further review is warranted to determine why the forecast reduction in other non-load driven capex is less than the reduction in total non-load driven capex. Figure 6.10 also shows that Powerlink's forecast other non-load driven capex is front loaded within the 2017–22 regulatory control period, with 40 per cent of the forecast capex to be incurred in the 2017–18 year. We have therefore reviewed the drivers behind this forecast capex profile to confirm the timing and need for this expenditure.

We are satisfied that Powerlink's forecasting methodology for this category is reasonable and likely to produce a forecast of capex requirements which reflects the capex criteria. Importantly, Powerlink has not simply used its actual historical expenditure as a base for its trend modelling, but has applied adjustments to remove abnormal and non-recurrent expenditures from the historical data. This ensures that

[132] NER, cl. 6A.6.7(e)(5).

only underlying, recurrent expenditure in this category is carried forward through the trend model into the forecasting period.

In addition to the trend based forecast of recurrent capex in this category, Powerlink applied a step change for a specific additional project: the Wide Area Network (WAN) stage two deployment project. The WAN stage two project provides for the extension of its existing WAN capability across a further 34 sites across the network.[133] This project is the driver of Powerlink's increased expenditure in the 2017–18 year, with the majority of the $10.1 million ($2016–17) project costs scheduled for the first year of the 2017–22 regulatory control period.

We examined the documentation submitted by Powerlink in support of the WAN stage two project, to assess the justification for the proposed step change expenditure for this project. The WAN stage two project is one of the sixteen 'sample unapproved' capex projects identified by Powerlink to provide some transparency of likely future investment needs. Where Powerlink has included a specific project in its capex forecast as a step change in addition to its trend/predictive modelling based forecast, we would expect Powerlink to provide supporting project documentation that clearly justifies the need, timing and cost of the proposed project.

Powerlink submitted a project proposal document in support of the WAN stage two deployment project.[134] This document did not address key factors which we consider would typically be evident in documentation used to justify the prudence and efficiency of a proposed capex project. While the project proposal provided a high level description of proposed works, costs and delivery timeframes, it did not provide:

- a detailed description of the need for investment, with supporting evidence as to the nature of asset obsolescence, or other specific site condition or capacity issues driving the project scope;
- evidence that a suitable range of alternative options, including a 'do nothing' option, has been considered;
- evidence of a formal risk assessment as part of the need identification or options analysis process;
- evidence that expected benefits have been identified and quantified for all options considered;
- a comparison of costs and benefits for each option considered; and
- evidence that the preferred option is economically justified.

In our view, the absence of detail evaluating the costs, benefits and risks of alternative options for this project is concerning. We would expect that more comprehensive supporting documentation should be available as evidence of Powerlink's capital

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133 Powerlink, *CP.02553 Wide Area Network Deployment Stage 2*, 31 August 2015, p. 3.

134 Powerlink, *CP.02553 Wide Area Network Deployment Stage 2*, 31 August 2015.

approvals process, particularly given Powerlink expects to incur significant expenditure in relation to this project in the first year of the 2017–22 regulatory control period.

Based on the information available, we are not yet satisfied that the forecast capex for the WAN stage two deployment is prudent and efficient or is required to achieve the capex objectives.[135] However, Powerlink's project schedule for the WAN stage two project indicates that it expects full project approval (including business case approval) to occur in September 2016.[136] We will therefore review any updated or additional supporting information relating to this project submitted by Powerlink as part of its revised revenue proposal in making our final decision on Powerlink's other non-load driven capex.

Summary of non-load driven capex

Based on our findings in this section, we have reduced Powerlink's forecast non-load driven capex by $184.5 million ($2016–17). This reduction is due to our conclusions on Powerlink's repex model asset life assumptions. Table 6.10 summarises Powerlink's proposal and our alternative estimate of required non-load driven capex.

Table 6.10 AER draft decision on non-load driven capex ($2016–17)

	2017–18	2018–19	2019–20	2020–21	2021–22	Total
Powerlink's proposal	177.3	171.0	163.6	167.4	163.8	843.2
AER draft decision	135.9	133.5	128.0	132.5	128.8	658.7
Total adjustment	-41.4	-37.5	-35.6	-34.9	-35.0	-184.5
Total adjustment (%)	-23.4%	-22.0%	-21.8%	-20.8%	-21.4%	-21.9%

Network health indicators

Powerlink's proposed capex must be consistent with the amount of capex it considers will be required to maintain the quality, reliability and security of supply of prescribed transmission services.[137] In considering this obligation we have had regard to network health indicators to gauge the likely health or condition of its network assets when considering the total forecast capex.

Powerlink submitted that its capital expenditure forecasts include prudent provision for maintaining the safety of the transmission system.[138] Powerlink also submitted that depending upon the type of asset, a condition assessment and performance appraisal

135 NER, cl. 6A.6.7(c).
136 Powerlink, *CP.02553 Wide Area Network Deployment Stage 2*, 31 August 2015, p. 6.
137 NER, cl. 6A.6.7(3).
138 Powerlink, *Regulatory proposal*, January 2016, p. 43.

process will be applied to develop an overall strategy for ongoing maintenance, operational refurbishment or asset replacement. Powerlink stated that the condition assessment and performance appraisal process for network assets may involve site inspections, analysis of maintenance records, operational performance, engineering data, technical investigations, emerging issues associated with obsolescence and other relevant data to develop a holistic view of the condition of the asset.[139]

Powerlink has also developed a quantitative asset risk management framework to aggregate the key risks for assets approaching the end of their technical or economic life. The key risks relate to a range of disparate consequences of failure, including financial, safety, network and environmental impacts. Powerlink stated that providing a quantitative measure for the key risks in a structured, consistent and transparent manner allows it to make relative comparisons between competing investment needs. Powerlink submitted that the framework is not an economic decision-making framework of itself and is used along with other considerations and factors in the investment decision making process.[140]

Powerlink's asset risk management framework defines the risk cost of an asset as the probability weighted cost of the consequence associated with the risk event and is represented as the product of the likelihood of failure and consequence of failure.[141] The likelihood of failure comprises two components – the probability of failure and the exposure factors. Powerlink stated that the methodology used for deriving failure curves of assets depends on a number of factors:[142]

- where there is a large population of the component within Powerlink's fleet, and there are reliable historical failure records, failure curves can be derived from actual recorded equipment failures; and
- where there are insufficient failure records to develop statistically valid failure models, data from external industry sources, such as research organisations or manufacturers, may be used.

Powerlink submitted that failure models derived from historical failure rates are compared against published data to verify the reasonableness of the failure rates.[143]

Powerlink stated that it bases the calculation of exposure factors from various sources of information, including internal records and/or publically available data and reports such as historical substation attendance logs to determine the probability that field personnel may be present at substations during the year. Where suitable data is not

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139 Powerlink*, Regulatory proposal, 2018-22 Powerlink Queensland Revenue Proposal, Appendix 5.10: Powerlink Queensland Asset Management Plan (Volume 2 - Asset Investment Outlook)*, January 2016, p. 37.

140 Powerlink*, Regulatory proposal, Powerlink Queensland Asset Risk Management - Framework*, January 2016, p. 12.

141 Powerlink*, Regulatory proposal, Powerlink Queensland Asset Risk Management - Framework*, January 2016, p. 6.

142 Powerlink*, Regulatory proposal, Powerlink Queensland Asset Risk Management - Framework*, January 2016, p. 8.

143 Powerlink*, Regulatory proposal, Powerlink Queensland Asset Risk Management - Framework*, January 2016, p. 8.

available, Powerlink submitted that it may be necessary to estimate exposure factors using engineering professional judgement.[144]

Powerlink provided the following risk cost matrix replicated in Table 6.11.[145]

Table 6.11 Powerlink's risk levels and equivalent risk costs

Risk Level	Equivalent Risk Cost
Critical	≥ $629 million
High	≥ $25.2 million
Significant	≥ 1.01 million
Moderate	≥ $40,249
Low	≥ $1,610
Very Low	< $1,610

Powerlink engaged AMCL to review its asset risk and project prioritisation framework.[146] AMCL's conclusions included the following:

- the Powerlink approach aligns with leading industry practice for electricity transmission networks. The development of the risk assessment process is based on sound asset management fundamentals
- Powerlink has developed a risk assessment methodology with quantified risk score in dollars that broadly reflects the real cost and likelihood of asset failures; and
- further work is required to fully develop the process across all asset classes and embed it into the organisation.

In its review, EMCa considered that given the broad range of risk costs in Powerlink's risk matrix (from $29 to $7,031 million) it is likely that only a section of it is actually relevant to the management of key risks associated with assets approaching the end of their technical or economic life. Based on EMCa's advice, we are satisfied that Powerlink's approach for risk assessment of its reinvestment projects is adequate for selecting between identified options. Whilst we have reservations about Powerlink's aggregation of risks to create its total risk cost, we note EMCa's advice that this is not

144 Powerlink, *Regulatory proposal, Powerlink Queensland Asset Risk Management - Framework*, January 2016, p. 8.

145 Powerlink, *Regulatory proposal, Powerlink Queensland Asset Risk Management - Framework*, January 2016, p. 11.

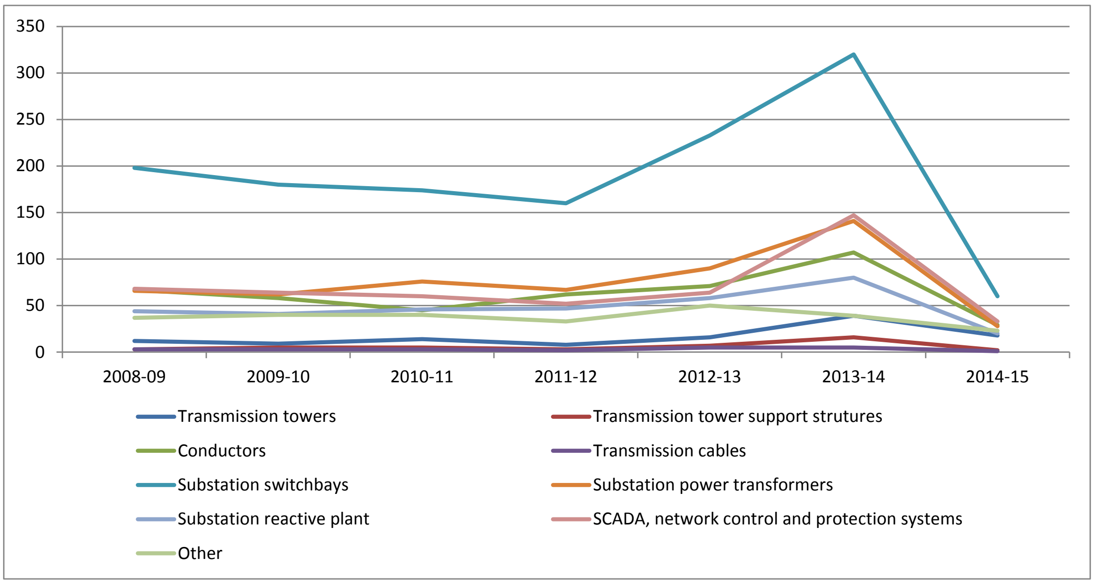
146 Powerlink, *Regulatory proposal, Appendix 5.08 - AMCL Review of Powerlink's Risk and Prioritisation Approach*, December 2015.

a significant issue if the aggregated risk cost is only used to help with portfolio optimisation and (at a project level) to choose between options.[147]

Asset failure and system reliability performance

We have used economic benchmarking and category analysis RIN data provided by Powerlink to provide high level observations regarding overall network health and to identify trends in asset deterioration. In circumstances where the historical trend exhibits a decrease (increase) in asset failures,[148] this may suggest that past expenditure may have been higher (lower) than necessary to achieve the capex objectives, respectively. Figure 6.11 shows our analysis of Powerlink's asset failure performance.

Figure 6.11 Powerlink's asset failures by asset type



Source: Powerlink, *2006–13, 2013–14 and 2014–15 - Economic Benchmarking RIN - Templates*.

In summary, a review of past asset failure performance indicates that:

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147 EMCa, *Review of forecast non-load driven capital expenditure in Powerlink's Regulatory Proposal - Report to Australian Energy Regulator from Energy Market Consulting associates,* July, 2016.

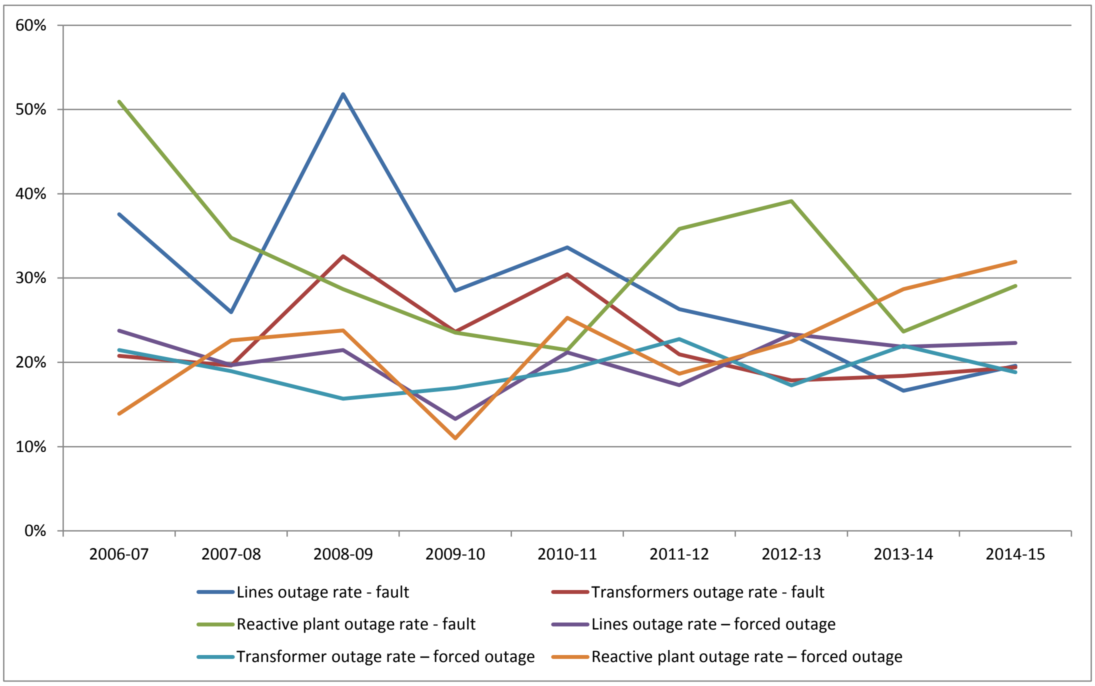
148 In our Explanatory Statement for Category Analysis RINs released in March 2014, we adopted the following definition for asset failure:
The failure of an asset to perform its intended function safely and in compliance with jurisdictional regulations, not as a result of external impacts such as:
• extreme or atypical weather events; or
• third party interference, such as traffic accidents and vandalism; or
• wildlife interference, but only where the wildlife interference directly, clearly and unambiguously influenced asset performance; or
• vegetation interference, but only where the vegetation interference directly, clearly and unambiguously influenced asset performance.
Excludes planned interruptions.

- asset failures by major asset group have been relatively steady over time with transmission towers, support structures and cables experiencing the lowest failures;
- for non-transmission assets, the spread of failure rates between asset groups has reduced and are at their lowest levels over the period based on significant declines in 2014–15; and
- substation switch-bays exhibit the highest asset failures but have experienced the largest decline in 2014–15.

These historical trends of asset failure performance suggest that past expenditure has been sufficient to maintain the quality, reliability and security of supply of prescribed transmission services.

Another asset health indicator we have considered is Powerlink's asset outage rates. Figure 6.12 shows our analysis of Powerlink's asset outage performance.

Figure 6.12 Powerlink's asset outage by asset type



Source: Powerlink, *2008–13, 2013–14 and 2014–15 - Category Analysis RIN - Templates*.

Our review of past asset outage performance indicates that:

- asset outages by major asset group have been reasonably steady over time with reactive plant and lines experiencing the highest outages; and
- the dispersion of outages between asset groups has reduced.

Similar to asset failure rate analysis, historical asset outage trends suggest that past expenditure has been sufficient to maintain the quality, reliability and security of supply of prescribed transmission services. The overall performance and health of Powerlink's network is reinforced by our analysis of Powerlink's reliability performance shown in Figure 6.8 above. Figure 6.8 shows that Powerlink's transmission system reliability has improved during the 2006–15 period. This result, together with our analysis of Powerlink's recent asset failure and outage performance, suggests that Powerlink's recent past expenditure has been sufficient to maintain the quality, reliability and security of supply of its prescribed transmission services.

B.4 Forecast non-network capex

The non-network capex category for Powerlink includes expenditure on information and communications technology (ICT), buildings and property, motor vehicles, and tools and equipment.

B.4.1 Position

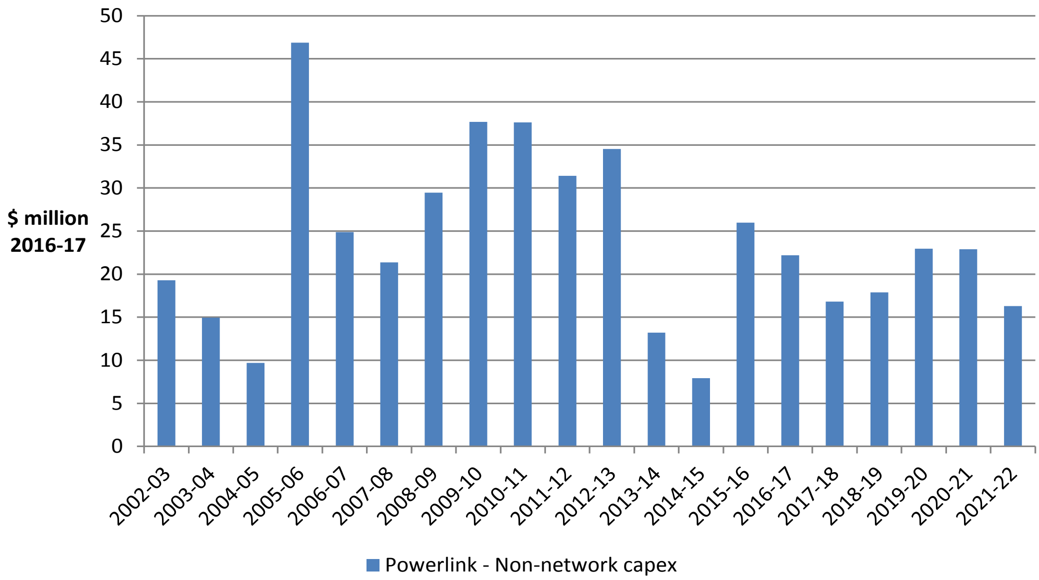
As part of our estimate of the total capex required for the 2017–22 regulatory control period, we accept that Powerlink's forecast for non-network capex of $96.8 million ($2016–17, excluding overheads) is a reasonable estimate of the efficient costs that a prudent operator would require for this capex category. We have included it in our estimate of total capex for the 2017–22 regulatory control period.

Powerlink proposed $96.8 million ($2016–17) for non-network capex in the 2017–22 regulatory control period, compared to $103.8 million in the previous five year period.[149] The majority of the forecast non-network capex ($56.1 million or 58 per cent) is ICT capex.

Figure 6.13 shows Powerlink's actual and expected non-network capex for the period from 2002 to 2017, and forecast capex for the 2017–22 regulatory control period.

[149] Powerlink, *Regulatory information notice*, template 2.6; Powerlink, *Category Analysis RIN 2014–15*, template 2.6; Powerlink, *Category Analysis RIN 2013–14*, template 2.6; Powerlink, *Category Analysis RIN 2008–13*, template 2.6; AER analysis. Excludes overheads.

Figure 6.13 Powerlink's non-network capex 2002 to 2022 ($million, 2016–17)



Source: Powerlink, *Regulatory information notice*, template 2.6; Powerlink, *Category Analysis RIN 2014–15*, template 2.6; Powerlink, *Category Analysis RIN 2013–14*, template 2.6; Powerlink, *Category Analysis RIN 2008–2013*, template 2.5; Powerlink, *2012–2017 regulatory proposal cost data*; Powerlink, *2007–2012 regulatory proposal cost information;* AER analysis.

Powerlink's forecast non-network capex for the 2017–22 regulatory control period is on average 7 per cent lower than actual and expected annual capex in the 2012–17 regulatory control period.

Our analysis of longer term trends in non-network capex suggests that Powerlink has forecast capex for this category at historically low levels. Non-network capex for the 2017–22 regulatory control period is forecast to be lower than the average expenditure in each of the preceding three regulatory control periods. Powerlink's forecast non-network capex continues the declining trend in expenditure in this category evident since the 2009–10 year. In our view, this suggests that Powerlink's forecast of non-network capex requirements in the 2017–22 regulatory control period is likely to be reasonable having regard to past expenditure.[150]

We have also assessed forecast expenditure in each category of non-network capex. Analysis at this level has been used to inform our view of whether forecast capex is reasonable relative to historical rates of expenditure in each category, and to identify trends in the different category forecasts which may warrant specific investigation. Figure 6.14 shows Powerlink's actual and forecast non-network capex by category for the period from 2008–09 to 2021–22.

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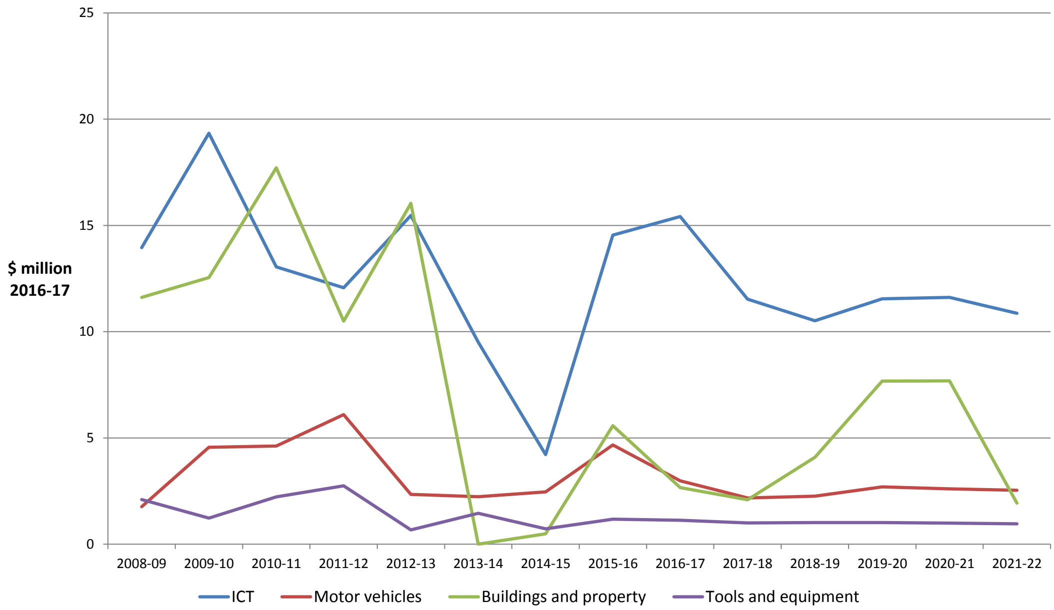
[150] NER, cl. 6A.6.7(e)(5).

Figure 6.14 Powerlink's non-network capex by category ($million, 2016–17)



Source: Powerlink, *Regulatory information notice*, template 2.6; Powerlink, *Category Analysis RIN 2014–15*, template 2.6; Powerlink, *Category Analysis RIN 2013–14*, template 2.6; Powerlink, *Category Analysis RIN 2008–2013*, template 2.5; AER analysis.

Powerlink has forecast reductions in each category of non-network capex in the 2017–22 regulatory control period, ranging from a decline of 3 per cent for tools and equipment capex up to 16 per cent for motor vehicles capex. Forecast expenditure for each category is relatively stable and at historically low levels in the 2017–22 regulatory control period, with the exception of the buildings and property category which peaks in the 2019–20 and 2020–21 years. This profile of buildings and property capex explains the increase in total non-network capex for those years observed in Figure 6.13 above.

Given the forecast decline in non-network capex in the 2017–22 regulatory control period, we have considered whether Powerlink's forecast reduction in non-network capex reflects the substitution possibilities between opex and capex for this category of expenditure.[151] For example, to some extent it is possible to substitute building or motor vehicle asset replacement capex with increased opex for ongoing asset maintenance. However, despite the forecast reductions in non-network capex, Powerlink's non-network opex is also forecast to decrease by approximately 6 per cent in real terms compared to the 2012–17 regulatory control period. Taking this into account, we are satisfied that Powerlink's forecast reduction in non-network capex does not simply reflect a reallocation of expenditure from capex to opex.

[151] NER, cl. 6A.6.7(e)(7).

Our review of the different categories of non-network capex is set out in more detail below. In summary, we are satisfied that the reduction in forecast expenditure for each category of non-network capex reflects the high level drivers of expenditure in these categories and is therefore likely to reasonably reflect efficient costs. Having considered Powerlink's regulatory proposal and had regard to the capex factors,[152] we are satisfied that total capex which reasonably reflects the capex criteria should include a forecast of $96.8 million for non-network capex (excluding overheads). Our estimate of total capex for the 2017–22 regulatory control period reflects this conclusion.

B.4.2 ICT capex

Powerlink has forecast $56.1 million ($2016–17, excluding overheads) for total information and communications technology (ICT) capex for the 2017–22 regulatory control period. This is a decrease of 5 per cent from the $59.2 million spent in the current period. It is also a decrease of 32 per cent from the forecast for the current regulatory period (2012–2017) period where the allowance for IT was set at $83 million.[153]

Powerlink's ICT capex in the current regulatory period (2012–17) was lower than expected due to internal business restructuring and adjustments to resource levels to match demand for services. Powerlink deferred a number of ICT investment programs in the beginning of the period because of organisational changes and subsequently focused on the replacement and maintenance of existing ICT systems. Powerlink submitted that ICT capex in the remainder of the 2012–17 regulatory period and then in the 2017–22 regulatory period will be in line with its allowance for 2012–17 and its current proposal.

Powerlink submitted that forecasting of ICT requirements had been undertaken through a planning process that combined a top-down assessment of Powerlink's ICT needs aligned to support the Powerlink Business Strategy, and bottom-up program planning that considered the overall state of Powerlink's existing business ICT base and the investments required to achieve the business objectives. Powerlink's ICT includes digital technology infrastructure and applications which support the operation of the business. Powerlink identified 11 programs which would be necessary for the achievement of Powerlink's business objectives in the next regulatory control period.[154]

CCP members Hugh Grant and David Headberry recommended that the AER undertake analysis of business cases for significant projects and programs relating to ICT capex. The CCP members' submission criticised Powerlink's increased spending on ICT capex compared to the 2002–2007 regulatory period. The CCP members submitted that Powerlink's ICT capex is higher than other transmission networks and

[152] Most relevantly, NER, cll. 6A.6.7(e)(5) and 6A.6.7(e)(7).
[153] Powerlink, *2018–22 Revenue Proposal*, January 2016, p. 25.
[154] Powerlink, *Non-network Plan*, January 2016, p.17.

without proper justification.[155] The CCP members submitted that Powerlink had made requests for "once in a generation" funding for ICT in previous regulatory periods and has, since then, sought to maintain these artificially high levels set for this purpose. Powerlink explained that it had previously expressed that it foreshadowed a potential for ongoing higher levels of ICT capex and its need for ICT repex.

We had regard to Powerlink's actual and expected capex during the 2012–17 and preceding regulatory control periods in assessing its proposed ICT forecast. Powerlink's proposed expenditure of an average $11.2 million/year is lower than spending in the last regulatory period. It is also than that of other transmission providers, with AusNet Services' ICT spending of $14.7 million/year and TransGrid's ICT spending of $20.8 million/year.[156] Given that Powerlink's ICT capex is decreasing and is lower than other transmission providers, we have not conducted a more detailed review of its ICT capex. We are satisfied with the trend in ICT capex expenditure as being in line with capex drivers.[157]

We accept Powerlink's forecast for ICT capex. In our view, the forecast reflects the efficient costs of a prudent operator. We are satisfied that the decrease in non-network ICT capex reflects the underlying drivers of expenditure in this category.

B.4.3 Motor vehicles capex

Powerlink forecast total motor vehicle capex for the 2017–22 regulatory control period of $12.3 million ($2016–17).[158] Powerlink's motor vehicle fleet and specialised mobile plant supports its maintenance and project activities. Powerlink submitted that since 2010 its fleet has decreased from 453 units to 402 in 2015, and is forecast to be 324 at the commencement of 2017–18 and remain relatively static during the 2017–22 regulatory control period. Powerlink expects to replace 274 motor vehicles and mobile plant assets during the 2017–22 regulatory control period.[159]

Powerlink submitted that its procurement of new vehicles is undertaken in compliance with its procurement standard. Powerlink utilises its contracted fleet services provider to obtain three quotes for the required vehicle specification. Motor vehicles and mobile plant are replaced at the end of their economic lives, which is determined by age and usage and varies by vehicle type.[160]

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155 CCP (Hugh Grant and David Headberry), *Submission to the AER, Powerlink Queensland 2018–22 revenue proposal*, 20 June 2016, p. 5.

156 AER, Draft decision: AusNet Services transmission determination 2017–22: Attachment 6 - Capital Expenditure, July 2016, p. 6-70. AER, Final decision TransGrid transmission determination 2014–18: Attachment 6 - Capital Expenditure, April 2015, p. 6-71.

157 Powerlink, *Response to issues raised at AER public forum by Mr Hugh Grant*, 28 April 2016, pp.3-5.

158 Powerlink, *RIN response, template 2.6*. Excludes overheads.

159 Powerlink, *2018-22 Revenue Proposal Supporting Document: Non-Network Plan*, January 2016, p. 49.

160 Powerlink, *Regulatory proposal, 2018-22 Powerlink Queensland Revenue Proposal Supporting Document: Powerlink Queensland Non-Network Plan*, January 2016, p. 49.

We have reviewed Powerlink's regulatory proposal in respect of its proposed motor vehicle capex for the 2017–22 regulatory control period and consider that Powerlink's forecast fleet capex of $12.3 million ($2016–17) reasonably reflects the efficient costs that a prudent operator would require to meet the capex criteria.[161] We have come to this conclusion on the basis that:

- our trend analysis shows that Powerlink's proposed motor vehicle capex is approximately 16 per cent less than its actual and estimated motor vehicle capex for the 2012–17 regulatory control period and is low relative to historical levels of expenditure in this category;[162]
- Powerlink's proposed motor vehicle capex reflects the drivers of expenditure in this category, including the resourcing strategy required to deliver its reducing network capex program; and
- Powerlink's motor vehicle procurement practices, including utilising an external fleet services provider to obtain competitive quotes for required vehicle specifications, is in line with good industry practice.

B.4.4 Buildings and property capex

Powerlink forecast buildings and property capex for the 2017–22 regulatory control period of $23.5 million ($2016–17).[163] This category of capex includes expenditure to replace building fabric and fittings, air conditioning, lifts and electrical plant at end of life, as well as replacing fire system and lighting components to maintain a safe working environment. Powerlink's forecast buildings and property capex also takes into account the need for specific office fitout projects to renew building assets based on asset condition and forecast building requirements.[164]

The peak in forecast buildings and property capex in the 2019–20 and 2020–21 years identified in Figure 6.14 is driven by an office fitout replacement project. Powerlink submitted that the existing office fitout in three buildings at its Virginia head office has or soon will reach end of life. Powerlink's office redevelopment project is expected to promote efficient and flexible work practices, while supporting technological change, staff safety and culture.[165]

We have reviewed Powerlink's regulatory proposal in respect of its buildings and property capex for the 2017–22 regulatory control period and consider that Powerlink's forecast buildings and property capex of $23.5 million ($2016–17) reasonably reflects

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161 NER, cl. 6A.6.7(c).

162 Powerlink, *Regulatory information notice*, template 2.6; Powerlink, *Category Analysis RIN 2014-15*, template 2.6; Powerlink, *Category Analysis RIN 2013-14*, template 2.6; Powerlink, *Category Analysis RIN 2008-2013*, template 2.5; AER analysis.

163 Powerlink, *RIN response, template 2.6*. Excludes overheads.

164 Powerlink, *Revenue proposal*, January 2016, p. 47; and Powerlink, *Revenue Proposal Supporting Document: Non-Network Plan*, January 2016, p. 47.

165 Powerlink, *Revenue Proposal Supporting Document: Non-Network Plan*, January 2016, p. 48.

the efficient costs that a prudent operator would require to meet the capex criteria.[166] We have come to this conclusion on the basis that:

- our trend analysis shows that Powerlink's proposed buildings and property capex is approximately 5 per cent less in real terms than its actual and estimated buildings and property capex for the 2012–17 regulatory control period and is low relative to longer term historical levels of expenditure in this category;[167] and
- the scope and timing of Powerlink's proposed office fitout redevelopment project appears reasonable given the age of the existing office fitouts and the prospect of future efficiencies in office design and workplace practices.[168]

B.4.5 Tools and equipment capex

Powerlink forecast tools and equipment capex for the 2017–22 regulatory control period of $5.0 million ($2016–17).[169] Powerlink's forecast tools and equipment capex is based on the average recurrent historical expenditure in this category. Powerlink's tools and equipment capex includes expenditure on a diverse range of minor physical equipment required to operate the network in a safe and efficient manner, including digital test equipment, contour lasers and GPS units.[170]

We have reviewed Powerlink's regulatory proposal in respect of its tools and equipment capex for the 2017–22 regulatory control period and consider that Powerlink's forecast tools and equipment capex of $5.0 million ($2016–17) reasonably reflects the efficient costs that a prudent operator would require to meet the capex criteria.[171] We have come to this conclusion on the basis that:

- our trend analysis shows that Powerlink's proposed tools and equipment capex is approximately 3 per cent less in real terms than its actual and estimated tools and equipment capex for the 2012–17 regulatory control period and is low relative to longer term historical levels of expenditure in this category;[172] and
- Powerlink's forecasting methodology for this category of expenditure, based on actual recurrent historical capex, is appropriate for this category of capex which is typically stable over time.

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166 NER, cl. 6A.6.7(c).

167 Powerlink, *Regulatory information notice*, template 2.6; Powerlink, *Category Analysis RIN 2014-15*, template 2.6; Powerlink, *Category Analysis RIN 2013-14*, template 2.6; Powerlink, *Category Analysis RIN 2008-2013*, template 2.5; AER analysis.

168 Powerlink, *Revenue Proposal Supporting Document: Non-Network Plan*, January 2016, p. 47.

169 Powerlink, *RIN response, template 2.6*. Excludes overheads.

170 Powerlink, *2018-22 Revenue Proposal Supporting Document: Non-Network Plan*, January 2016, p. 49.

171 NER, cl. 6A.6.7(c).

172 Powerlink, *Regulatory information notice*, template 2.6; Powerlink, *Category Analysis RIN 2014-15*, template 2.6; Powerlink, *Category Analysis RIN 2013-14*, template 2.6; Powerlink, *Category Analysis RIN 2008-2013*, template 2.5; AER analysis.

C Demand

Powerlink has produced a maximum demand forecast to help determine its forecast capex and opex. We have reviewed Powerlink's maximum demand forecast in order to determine whether or not the proposed capex and opex forecasts reasonably reflect a realistic expectation of demand. Accurate, or at least unbiased, demand forecasts are important inputs to ensuring efficient levels of investment in the network.

This section sets out our decision on Powerlink's forecast network maximum demand for the 2017–22 regulatory control period. System demand represents total demand in the Powerlink transmission network. System demand trends give a high level indication of the need for expenditure on the network to meet changes in demand. Forecasts of increasing system demand generally signal an increased network utilisation which may, once any spare capacity in the network is used up, lead to a requirement for augmentation capex or augex. Conversely forecasts of stagnant or falling system demand will generally signal falling network utilisation, a more limited requirement for augex, and the potential for the network to be rationalised in some locations.

In our consideration of Powerlink's demand forecast, we had regard to:

- Powerlink's proposal;
- independent maximum demand forecasts from AEMO;[173] and
- stakeholder submissions in response to Powerlink's proposal.[174]

C.1 AER draft decision

We are satisfied that Powerlink's demand forecast reasonably reflects a realistic expectation of demand over the 2017–22 regulatory control period. In determining a realistic expectation of demand over the 2017–22 period, we have had regard to the following factors:

- Powerlink proposed almost zero growth in maximum demand (at 0.2 per cent per annum) across the 2017–22 period. This is lower than the Australian Energy Market Operator's (AEMO) independent forecast of 1 per cent annual growth in maximum demand over the same period. This suggests that Powerlink's forecast is not overly ambitious or biased upwards, and therefore provides us with confidence in Powerlink's forecast being a realistic expectation of demand.
- Powerlink's demand forecast is approximately 2000 MW higher than AEMO's forecast. However, Powerlink states that this is likely due to different estimates of maximum demand from large direct connect end users. We are satisfied that

173 AEMO, *Transmission Connection Point Forecasting Report –for Queensland*, June 2015.

174 See AER, http://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/powerlink-determination-2017-2022/proposal.

Powerlink's explanations show at least some of the differences between its demand figures and those of AEMO.

- Powerlink's demand forecast shows a continuation of the recent actual demand trend.

We have also received a number of consumer submissions that note the trend of falling demand. We consider these below.

Powerlink's maximum demand forecast does not have a significant direct impact on Powerlink's capex proposal given the very small amounts of proposed augex. Because of this, our review of Powerlink's forecast maximum demand is relatively high-level.

C.2 Powerlink's proposal

Powerlink provided historical and forecast demand figures in their proposal and in the reset Regulatory Information Notice (RIN).[175] Powerlink proposed approximately 0.2 per cent annual growth in maximum demand across the 2017–22 period. Powerlink forecasted demand to grow slightly over the first two years of the 2017–22 period, and then flatten out over the remainder of 2017–22.

Powerlink submitted that its forecast of an initial demand growth reflects forecasts of positive growth in the Gross State Product (GSP) over the early years of the 2017–22 period. The flattening of demand over the later years of this period reflects expectations of subdued economic growth and slowing growth in resource sector investment.[176]

Powerlink submitted that its demand forecast reflects feedback received on its forecasting process at a Demand and Energy Forecasting Forum it held in March 2015. Powerlink submitted that its demand forecasting methodology reflects the impact of new and emerging technologies and trends such as solar PV, battery storage, energy efficiency initiatives and electric vehicles.[177]

Powerlink engaged the consultants, KPMG, to provide an opinion on its demand forecasting methodologies, processes and key inputs and assumptions. KPMG considered that Powerlink's demand forecasting model meets the AER's criteria for best practice forecasting. However, KPMG also identified several shortcomings of Powerlink's forecasting model such as insufficient data regarding the weather correction process, the forecasting model produced a relatively low R-squared for winter maximum demand and there is a lack of information on in-sample and out-of-sample forecast performance.[178]

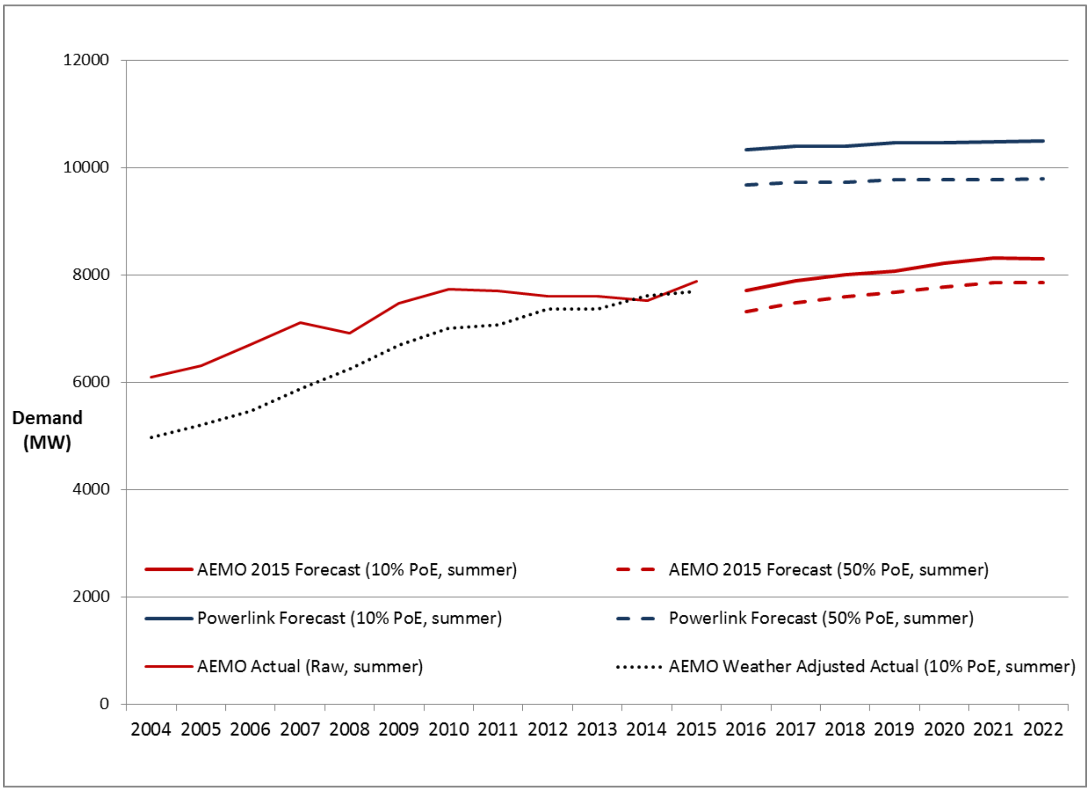
C.3 AER assessment of Powerlink's forecast

175 Powerlink, Reset RINs; Powerlink, *Regulatory Proposal 2017–22*, January 2016, p.III.
176 Powerlink, *Regulatory Proposal 2017–22*, January 2016, p. 6.
177 Powerlink, *Regulatory Proposal 2017–22*, January 2016, p. 48.
178 Powerlink, *Regulatory Proposal 2017–22*, January 2016, p. 48.

Our first step in examining Powerlink's forecast of maximum demand is to look at whether the forecast is consistent with, or explained by, the long term underlying demand trend which occurred on the network historically.

Figure 6.15 shows that the path of actual weather adjusted maximum demand on Powerlink's network grew from 2004 to 2015 at 4.1 per cent per annum. Powerlink’s forecast broadly shows a continuation of the recent actual demand trend (with a slight uplift over the forthcoming regulatory period).[179]

Figure 6.15 Comparison of peak demand forecasts of Powerlink and AEMO (MW, non-coincident, summated connection point forecasts)



Source: Powerlink, *Response to AER information request #3, PQ0093*, public, 29 February 2016, p. 5; AEMO, *Dynamic interface for connection points in Queensland*, June 2015; AER analysis.

We compared Powerlink's forecast growth rates of maximum demand with AEMO's Connection Point Forecast for the Powerlink network, published in June 2015.[180] Powerlink forecasts growth of 0.2 per cent per annum over the 2017–22 period, which

179 It is more accurate to compare forecast demand with weather adjusted historical demand (because this better reflects the underlying trend in demand over time). However, Powerlink has not reported weather corrected demand in its RINs. Given the relative insignificance of Powerlink’s demand forecast on capex, and the low forecast growth rate, we consider that seeking historical weather corrected data from Powerlink (which may be onerous) was not necessary.

180 AEMO, *Transmission Connection Point Forecasting Report –for Queensland*, June 2015.

is lower than AEMO's forecast 1 per cent per annum growth rate over the same period. The fact that the growth rate of Powerlink's demand forecast is lower than AEMO's shows Powerlink's forecast is not overly ambitious or biased upwards. This provides us with some confidence in Powerlink's forecast being a realistic expectation of demand.

While the growth trend for Powerlink's demand forecast is below AEMO's growth forecast for the 2017–22 period, Powerlink's forecast is above AEMO's connection point forecast by approximately 2000 MW per annum over the 2017–22 period. We sought Powerlink's views on the reasons for this difference.[181] Powerlink stated that this difference is driven by different treatments of large direct connect end users. In particular, Powerlink's forecast includes loads at the NSW and Queensland interconnects (that AEMO does not include) and additional loads at the Boyne Smelters and Wotonga connection points. The different treatments of large users result in Powerlink's forecast appearing higher than AEMO's forecast.[182]

We are broadly satisfied that Powerlink's response adequately explains at least some of the differences between its demand figures and those of AEMO. Having said that, because the maximum demand forecast is not a significant driver of Powerlink's capex program for 2017–22, we have not assessed these claims in detail. In future periods, if maximum demand becomes a more significant capex driver, we will assess the forecast in more detail to determine whether these differences in load estimates between Powerlink and AEMO can be reconciled.

We have received four consumer submissions that note the trend of falling demand. CCP members Hugh Grant and David Headberry submitted that Powerlink's demand forecast has been significantly overstated.[183] The CCP members noted that studies into Powerlink's demand forecasting record by the Energy Users' Association of Australia (EUAA) and the Queensland Government Independent Review Panel on Network Costs showed that Powerlink has consistently over-forecasted demand over the 2006–12 period.[184] As we discuss above, we are satisfied that Powerlink's forecast growth in maximum demand is likely to be realistic when compared to credible independent forecasts developed by AEMO.

CCP member Jo De Silva submitted that Powerlink's customer and consumer perception research showed that stakeholders consider falling demand to be a response to higher prices.[185] Cotton Australia also noted that the significant drop in forecast capex compared to the current regulatory period is a reflection of the demand

181 AER, *Information Request to Powerlink, IR#001*, 23 February 2016.

182 Powerlink, *Response to AER information request*, 29 February 2016, pp. 3-4.

183 CCP (Hugh Grant and David Headberry), *Submission to the AER, Powerlink Queensland 2018–22 revenue proposal*, 20 June 2016, p. 22.

184 CCP (Hugh Grant and David Headberry), *Submission to the AER, Powerlink Queensland 2018–22 revenue proposal*, 20 June 2016, p. 26.

185 CCP (Jo De Silva), *Submission to the Australian Energy Regulator on Powerlink's Regulatory Proposal 2017–19*, April 2016, p. 7.

that will materialise.[186] As we have discussed, Powerlink has significantly reduced its forecast augex and Powerlink's maximum demand forecast is not a significant driver of capex for Powerlink's 2017–22 forecast.

[186] Cotton Australia, *Submission on Powerlink Regulatory Proposal 2017-22*, May 2016, p. 3.

D Contingent projects

Powerlink proposed $590 million for seven contingent projects for the 2017–22 period. Powerlink submitted that the proposed projects are for managing the risk of significant network investments which may be triggered by material changes in demand or new connections (including new coal mines and LNG production projects).[187] Powerlink submitted the proposed projects are probable or plausible to occur by 2022.[188]

The seven proposed contingent projects are:[189]

- North West Surat Basin Area ($147.2 million)
- Central to North Queensland Reinforcement ($55.1 million)
- Southern Galilee Basin connection shared network works ($116.9 million)
- Northern Bowen Basin area ($55.7 million)
- Bowen Industrial Estate ($42.9 million)
- QNI upgrade (Queensland component) ($66.7 million)
- Gladstone area reinforcement ($105.5 million).

Generally, contingent projects are significant network augmentation projects that are reasonably required to be undertaken in order to achieve the capex objectives. However, unlike other proposed capex projects, the need for the project within the regulatory period and the associated costs are not sufficiently certain. Consequently, expenditure for such projects does not form a part of the total forecast capex that we approve in this determination. Such projects are linked to unique investment drivers (rather than general investment drivers such as expectations of load growth in a region) and are triggered by defined 'trigger events'. The occurrence of the trigger event must be probable during the relevant regulatory control period. [190]

If, during the regulatory control period, Powerlink considers that the trigger event for an approved contingent project has occurred, then it may apply to us. At that time, we will assess whether the trigger event has occurred and the project meets the threshold. If satisfied of both, we would determine the efficient incremental revenue which is likely to be required in each remaining year of the regulatory control period as a result of the contingent project, and amend the revenue determination accordingly.[191]

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187 Powerlink, *Revenue Proposal 2017-22*, January 2016, p. 57.

188 Powerlink, *Revenue Proposal 2017-22*, January 2016, p. 57.

189 Powerlink, *Revenue Proposal 2017-22*, January 2016, pp. 56–57; Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.12, Contingent Project and Triggers Ernst and Young*, January 2016. Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016.

190 NER, cl. 6A.8.1(c)(5).

191 NER, cl. 6A.8.2.

D.1 Assessment approach

We reviewed each of Powerlink's proposed contingent projects against the assessment criteria in the NER.[192] We considered whether:

- the proposed contingent project is reasonably required to be undertaken in order to achieve any of the capex objectives;[193]
- the proposed contingent project capital expenditure is not otherwise provided for in the capex proposal;[194]
- the proposed contingent project capital expenditure reasonably reflects the capex criteria, taking into account the capex factors;[195]
- the proposed contingent project capital expenditure exceeds the defined threshold;[196] and
- the trigger events in relation to the proposed contingent project are appropriate.[197]

Powerlink provided us with preliminary technical analysis for each proposed contingent project, including an assessment of existing network constraints and how these constraints may be affected by potential future demand and new connections scenarios, and preliminary costs.[198] This was supported by advice from Powerlink's consultants, Ernst and Young, about the likelihood and plausibility of a number of major connections projects proceeding in the near future and the impact on maximum demand.[199] However, Powerlink stated that "the precise timing, scope and scale of the trigger conditions are still uncertain" and for each project it will conduct regulatory investment tests for transmission (RIT-T) including an assessment of alternative network and non-network options.[200]

We reviewed each project based on Powerlink's analysis, the Ernst and Young report and our own analysis. Given the uncertainty about the timing and requirements for each project, at this stage, it is not necessary to assess the costs and technical scope of each project in detail. Rather, we reviewed whether each contingent project is reasonably likely to be required in the 2017–22 regulatory period based on the materiality and plausibility of the trigger conditions. This gives us a high-level view of

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192 NER, cl. 6A.8.1.

193 NER, cl. 6A.8.1(b)(1).

194 NER, cl. 6A.8.1(b)(2)(i). Relevantly, a TNSP must include forecast capex in its revenue proposal which it considers is required in order to meet or manage expected demand for prescribed transmission services over the regulatory control period (see NER, cl. 6A.6.7(a)(1)).

195 NER, cl. 6A.8.1(b)(2)(ii).

196 NER, cl. 6A.8.1(b)(2)(iii).

197 NER, cl. 6A.8.1(b)(4).

198 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016; Powerlink, *Response to AER information request 005*, 7 June 2016; Powerlink, *Response to AER information request 017*, 8 and 9 August 2016.

199 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.12, Contingent Project and Triggers Ernst and Young*, January 2016.

200 Powerlink, *Response to AER information request 005*, 7 June 2016, p. 3.

whether each project is reasonably required to be undertaken in the regulatory control period in order to achieve any of the capex objectives and reflect the capex criteria.

We also considered whether the proposed trigger events for each project are appropriate. This includes having regard to the need for the trigger event:

- to be reasonably specific and capable of objective verification;[201]
- to be a condition or event which, if it occurs, makes the project reasonably necessary in order to achieve any of the capex objectives;[202]
- to be a condition or event that generates increased costs or categories of costs that relate to a specific location rather than a condition or event that affects the transmission network as a whole;[203]
- is described in such terms that it is all that is required for the revenue determination to be amended;[204]
- is probable during the 2017–22 period but the inclusion of capex in relation to it (in the total forecast capex) is not appropriate because either it is not sufficiently certain that the event or condition will occur during the regulatory control period or if it may occur after that period or not at all; or (and assuming it meets the threshold) the costs associated with the event or condition are not sufficiently certain.[205]

D.2 Position

D.2.1 Position on contingent projects

We consider that five of Powerlink's proposed contingent projects should be classified as contingent projects for the 2017–22 period. These five projects are:

- Central to North Queensland Reinforcement
- Northern Bowen Basin area
- Bowen Industrial Estate
- QNI upgrade (Queensland component)
- Gladstone area reinforcement

These five projects may be reasonably required to be undertaken in order to meet or manage the expected demand for transmission services, and/or maintain reliability, over the 2017–22 regulatory period. This is because these projects will be triggered by identifiable connections projects which will add significant load to the transmission

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201 NER, cl. 6A.8.1(c)(1).
202 NER, cl. 6A.8.1(c)(2).
203 NER, cl. 6A.8.1(c)(3).
204 NER, cl. 6A.8.1(c)(4).
205 NER, cl. 6A.8.1(c)(5).

network (e.g. coal mines and LNG expansions), and the likelihood that the specific connection projects will proceed over the 2017–22 period is reasonable or plausible.

However, we consider that the North West Surat Basin Area and Southern Galilee Basin contingent projects are not reasonably required to be undertaken over the 2017–22 period. These two projects are triggered by the establishment of major customer connections from new coal mines and LNG expansions. However, our analysis suggests that these major connections are very unlikely to occur over the 2017–22. This means it is not reasonably likely that Powerlink will need to upgrade the capacity of its network to satisfy additional load from these connections. On this basis, we do not accept these two projects as contingent projects.

Our review of the requirements for each proposed contingent project is set out in section D.3 below.

D.2.2 Review of trigger events

Powerlink's trigger events for each contingent project have three common elements:

- the commitment of additional load that will require an upgrade of capacity
- the successful completion of a RIT-T
- Powerlink Board commitment to proceed with the project.

Broadly, these triggers are appropriate because they are specific and verifiable. It is likely that the first element will increase costs in a specific location due to additional load requiring capacity upgrades. The successful completion of a RIT-T process may demonstrate that a project is reasonably necessary in order to achieve the capex objectives and the capex criteria.

We consider that Powerlink's proposed trigger events are not sufficient. In particular, the occurrence of the trigger event should make the undertaking of the proposed contingent project reasonably necessary in order to achieve any of the capex objectives,[206] specifically to meet or manage expected demand for prescribed transmission services. We consider the following indicative trigger events are required in order to be satisfied that a project should be included as a contingent project:

1. Specific detail about the amount and location of additional load required to trigger the contingent project;
2. Successful completion of the regulatory investment test for transmission (RIT-T) demonstrating positive net market benefits;
3. Determination by the AER under clause 5.16.6 of the NER that the proposed investment satisfies the regulatory investment test for transmission (compliance review); and

206 NER, cl. 6A.8.1(c)(2).

4. Powerlink Board commitment to proceed with the project prior to submitting an application to the AER seeking an amendment to the revenue determination pursuant to the NER.

Broadly, the first and fourth triggers above are appropriate because they are specific and verifiable. Additionally the first trigger will increase costs in a specific location due to additional load requiring capacity upgrades. The successful completion of a RIT-T process is an important step to ensuring that the capex for a project will achieve the capex objectives and the capex criteria. However, the completion of a RIT-T will not automatically ensure that the cost and scope of the proposed contingent project will satisfy the capex objectives and capex criteria. Clause 5.16.6 of the NER provides an option for a TNSP to request the AER to make a determination as to whether the preferred project option within a RIT-T satisfies the regulatory investment test for transmission. This provides an independent assessment that the RIT-T is successfully completed, and gives us greater confidence that the resulting project will satisfy the capex objectives.

Powerlink's contingent projects include some, but not all, of the four triggers required in order for us to be satisfied that a project should be included as a contingent project. Therefore, we are not satisfied that each trigger event for the contingent projects satisfies the criteria required for the trigger event to be considered appropriate.[207] This is for two reasons.

Successful completion of RIT-T

Firstly, as noted above, the successful completion of a RIT-T is an important step to ensure that the capex for a project will achieve the capex objectives and the capex criteria. However, the RIT-T involves some level of judgement and discretion as to the assessment of credible options and applying economic cost-benefit analysis. This means that its completion will not automatically ensure that the cost and scope of the proposed contingent project will satisfy the capex objectives and capex criteria.

Clause 5.16.6 of the NER provides an option for a TNSP to request the AER to make a determination as to whether the preferred project option within a RIT-T satisfies the regulatory investment test for transmission. This provides an independent assessment that the RIT-T is successfully completed, and gives us greater confidence that the resulting project will satisfy the capex objectives. Therefore, we consider that each project should include the following additional trigger:

> "a determination by the AER (under Clause 5.16.6 of the National Electricity Rules) that the proposed investment satisfies the regulatory investment test for transmission".

Powerlink includes this requirement for an AER determination under Clause 5.16.6 of the NER for three of its contingent projects: the Central to North Queensland

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207 NER, cl. 6A.8.1(c).

Reinforcement project, the QNI upgrade project (Queensland component), and the Central West to Gladstone Area Reinforcement project. We require that Powerlink modify the trigger events for the Northern Bowen Basin area project and the Bowen Industrial Estate project to include this trigger.

Commitment of additional load

Second, each project includes a trigger event which specifies that the project will be triggered by the commitment of additional load onto the network (thereby adding constraints to the network). However, several of the contingent projects are only broadly specified in terms of “additional load” rather than a specific amount of additional load. This means that this trigger is not specific and verifiable.

To be reasonably specific and variable, Powerlink should amend the triggers for the following projects to specify the amount and location of additional load required to trigger the project:

- Queensland/NSW Interconnector
- Central to North Queensland Reinforcement
- Central West to Gladstone.

The proposed trigger events for each contingent project are set out in section D.3.

D.2.3 Capital contributions

Across all projects Powerlink has not provided any estimates or information about the associated customer contribution amounts for each project and the boundary between new connection assets and the existing shared network. A capital contribution reflects a contribution from the customer (e.g. monetary or contributed asset) towards the cost of the new connection assets. These contributions are subtracted from total gross capex and as such decrease the revenue that is recoverable from all consumers.

We asked Powerlink about its assumptions about capital contributions for its proposed contingent projects. In response, Powerlink stated:

> Powerlink’s proposed contingent projects relate only to transmission network investments that augment the capacity of the network for the benefit of all network users in the relevant areas. Consistent with the framework set out in the National Electricity Rules, customers connecting to Powerlink’s transmission network pay shallow connection charges and separate charges for the use of the shared network. As a result there are no capital contributions from customers attributable to Powerlink’s proposed contingent projects.[208]

The process for customers connecting to transmission networks is determined through Chapter 5 of the NER. This specifies that the terms and conditions of a connection

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[208] Powerlink, *Response to Information Request 017*, 8 August 2016, pp. 1-2

(including any relevant capital contribution and other charges) will be negotiated and agreed to between the TNSP and the connecting customer.[209] These clauses do not specify precise terms for the level or amount of capital contributions, or how these costs will be allocated between different customers.

Powerlink appears to assume that all customers should pay for the costs of increased capacity because they will benefit from increased capacity in the network. However, the need for increased capacity for most of these contingent projects is triggered by increased demand from specific major customers (e.g. coal mines). The benefit of additional capacity for each customer should be weighed against the costs faced or incurred by each customer, and Powerlink has not demonstrated that the proposed costs will be shared efficiently among the new customer and existing customers.

In addition, the capital contributions amounts that Powerlink will require from some of these major connecting customers may also be significant if they reflect large single block loads (e.g. a new mine or port). This may alter the decision (e.g. timing) for the connection customers to apply for the connection to the transmission network.

We encourage Powerlink to provide us with more information in its revised proposal about the capital contributions it can expect for each of its contingent projects. We will take this into account in our final decision.

D.2.4 Additional requirements

We find that all projects exceed the defined threshold in the NER ($30 million or 5 per cent of maximum allowable revenue) and are not otherwise provided for in the ex-ante capex forecasts. Therefore each project satisfies these requirements in the NER.[210]

D.3 Contingent project assessments

D.3.1 North West Surat Basin Area

Powerlink submitted that the North West region of the Surat Basin in South West Queensland is an area where significant increases in demand and energy are plausible during the 2017–22 regulatory control period. Powerlink submitted that if additional loads need to be connected to this area, it would be unable to meet the reliability of supply obligations.[211]

Powerlink proposed $147.2 million for this project to establish a double circuit 275kV transmission line with one side strung between Western Downs and Columboola substations and one side strung between Columboola and Wandoan South substations.[212]

209 See NER, cl. 6,3,6(b) and Schedule 5.6.

210 NER, cl. 6A.8.1(b)(2)(iii).

211 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.3.

212 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.3.

Powerlink proposed the following trigger events for this proposed contingent project: [213]

- Commitment of additional load in the North West Surat Basin area that results in forecast net transfer on the transmission system that exceeds the thermal and/or voltage stability limits.
- Successful completion of the Regulatory Investment Test for Transmission (RIT-T), including a comprehensive assessment of credible options, that demonstrates a network investment by Powerlink maximises the net market benefits while meeting Powerlink's reliability of supply obligations to the North West Surat Basin area.
- Powerlink Board commitment to proceed with the project subject to the AER amending Powerlink's revenue determination pursuant to the Rules.

AER considerations

We consider that the North West Surat Basin ($147 million) project is not reasonably required to be undertaken during the regulatory period and therefore it is not reasonable to assume that these projects would meet the capex criteria. On this basis, we do not consider that this project satisfies the requirements to be included as a contingent project.

Based on the information provided by Powerlink, the contingent project required two connection projects to proceed and generate sufficient additional load to require an increase in capacity.[214] The proposed connection projects are:

- Wandoan Coal Project – development of an open cut thermal coal mine and associated infrastructure near the town of Wandoan (forecast demand of 150 MW);
- GLNG Field Expansion – extending the approved GLNG Project's gas fields (forecast demand of up to 200 MW).

Both projects are identified by Ernst and Young as 'plausible' within the 2017–22 period. The GLNG field expansion is also identified in the 2015 and 2016 Powerlink Transmission Annual Planning Report, while the Wandoan Coal project is not identified. However, Ernst and Young state that the:

> Wandoan Coal Project has not received final approvals from either federal or state governments. In 2013 the proponents, Xstrata, shelved the project and in early 2014 considered the project to be delayed indefinitely. The price of coal may need to return to higher levels for this thermal coal project to proceed during the review period.[215]

While both projects may be plausible, it is clear that the Wandoan Coal Project is very unlikely to go ahead within the 2017–22 period given the lack of government approval and the indefinite delay in the project. This suggests that the likelihood that both the

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[213] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.4.

[214] Powerlink, *RR18-22 PQ0133 North West Surat Basin Area Contingent Project.pdf*.

[215] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.12, Contingent Project and Triggers Ernst and Young*, p17.

coal and LNG connection projects will proceed in the 2017–22 period is very low. Given this, it cannot be said that the North West Surat Basin contingent project is reasonably likely as is required by the NER.[216] Therefore, we do not accept the North West Surat Basin project as a contingent project based on the low likelihood that the project triggers (the Wandoan Coal project and the GLNG Field Expansion) will occur during the 2017–22 period.

D.3.2 Central to North Queensland Reinforcement

Powerlink submitted that the Central West and North Queensland zones are areas where significant increases in demand and energy are plausible during the 2017–22 regulatory control period.[217] Powerlink submitted that if demand increases in northern Queensland, transmission congestion may occur. Powerlink estimates the additional load which will trigger network augmentation is approximately 340MW.[218]

Powerlink proposed $55.1 million to install a second side circuit to an existing one-sided double circuit line between Stanwell and Broadsound. [219]

Powerlink proposed the following trigger event for this proposed contingent project: [220]

- Commitment of additional load to be connected to the Central West and/or North Queensland zones that requires the dispatch of higher cost generation in northern Queensland to maintain power transfers within limits;
- Successful completion of the RIT-T, including a comprehensive assessment of credible options, that demonstrates a network investment by Powerlink maximises the net market benefits while meeting Powerlink's reliability of supply obligations to North Queensland;
- Determination by the AER under clause 5.16.6 of the Rules that the proposed investment satisfies the RIT-T; and
- Powerlink Board commitment to proceed with the project subject to the AER amending Powerlink's revenue determination pursuant to the Rules.

AER considerations

We consider that the Central to North Queensland Reinforcement project ($55.1 million) may be reasonably required to be undertaken in order to achieve the capital expenditure objectives. However, we consider that the trigger events should be amended in order for us to be satisfied that each trigger event is appropriate.

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216 NER, cl. 6A.8.1(b).

217 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.6.

218 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.6.

219 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.6.

220 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.7.

Powerlink stated that the demand for its transmission network services could exceed current capacity at the Central to North Queensland region once the following coal and rail projects are triggered: [221]

- The Arrow Energy LNG facility project (up to 80MW)
- The Carmichael Coal and Rail project (up to 200MW)
- The Alpha Coal project (up to 135MW)
- The Kevin's Corner Mine project (up to 250MW)
- The China First Project (up to 150MW).

Based on information submitted by Powerlink, including the Ernst and Young Report,[222] our analysis indicates that at least two of the rail and coal projects will need to occur for capacity constraint to occur on this section of Powerlink's network. While the probability of any individual project proceeding is not high, there are 10 possible combinations by which 2 of the above projects proceed. This increases the likelihood of the generation constraint occurring over the 2017–22 period. Given this, the Central to North Queensland Reinforcement project may be reasonably required to be undertaken in order to satisfy demand for transmission services and/or maintain network reliability by alleviating capacity constraints.[223]

As set out in section D.2.2, we consider that there are four trigger events required in order for us to be satisfied that a project should be included as a contingent project. For this specific contingent project, Powerlink included three of these four required triggers. However, it did not include specific detail about the amount and location of additional load required to trigger the contingent project. Therefore, for us to be fully satisfied that this project should be a contingent project, Powerlink should amend its trigger events to include:

- additional detail about the 340MW additional load required at the Central West and/or North Queensland zones to trigger the Central to North Queensland Reinforcement project.

We require this additional information because it will ensure that the trigger event is:

- reasonably specific and capable of objective verification; [224] and
- a condition or event that generates increased costs or categories of costs that relate to a specific location rather than a condition or event that affects the transmission network as a whole.[225]

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[221] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.7.

[222] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.12, Contingent Project Scenarios and Triggers Ernst and Young, January 2016.*

[223] NER, cl. 6A.8.1(b)(1).

[224] NER, cl. 6A.8.1(c)(1)

[225] NER, cl. 6A.8.1(c)(3)

As we state in section D.2.2, this will give us greater confidence that the resulting project will satisfy the capex objectives and criteria. This will ensure that the trigger event is 'a condition or event which, if it occurs, makes the project reasonably necessary in order to achieve any of the capex objectives'. [226]

D.3.3 Southern Galilee Basin connection shared network works

Powerlink submitted that the southern area of the Galilee Basin is emerging with significant energy related proposals including multiple coal mines, underground coal gasification and oil and gas exploration.[227] In particular, Powerlink submitted that one or more of the following mining projects will drive the need for additional network assets:

- Alpha Coal Project (joint venture GVK and Hancock Prospecting Pty Ltd);
- Kevin's Corner Mine (joint venture GVK and Hancock Prospecting Pty Ltd); and
- China First Project (Waratah Coal).

Powerlink proposed $116.9 million to establish a double circuit 275kV transmission line between Broadsound and Lilyvale substations.[228]

Powerlink proposed the following trigger event for this proposed contingent project: [229]

- Commitment of additional load in excess of 195 MW to be supplied from the Lilyvale Substation;
- Successful completion of the RIT-T, including a comprehensive assessment of credible options, that demonstrates a network investment by Powerlink maximises the net market benefits while meeting reliability of supply obligations to North Queensland; and
- Powerlink Board commitment to proceed with the project subject to the AER amending Powerlink's revenue determination pursuant to the Rules.

AER considerations

We consider that the Southern Galilee Basin ($116.9 million) project is not reasonably required to be undertaken during the regulatory period and therefore it is not reasonable to assume that these projects would meet the capex criteria. On this basis, we do not consider that this project satisfies the requirements to be included as a contingent project.

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[226] NER, cl. 6A.8.1(c)(2).

[227] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.9.

[228] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.10.

[229] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.10.

Powerlink stated that there is sufficient network capacity in the southern area of the Galilee Basin to meet the coincident peak loads (as forecast in the 2015 Transmission Annual Planning Report). However, its analysis showed that an additional load in excess of 145MW supplied from Lilyvale Substation will exceed the firm thermal capacity of this substation. Based on analysis by Ernst and Young, this additional load will be exceeded by either two or more of the following three major export coal mine proposals located in the southern area of the Galilee Basin proceeding or Kevin's Corner Mine project proceeding:

- Alpha Coal Project (joint venture GVK and Hancock Prospecting Pty Ltd);
- Kevin's Corner Mine (joint venture GVK and Hancock Prospecting Pty Ltd); and
- China First Project (Waratah Coal).

These three mines secured Federal and State environmental approvals in 2012 and 2013, but have yet to be constructed.[230] However, these mines are subject to disputes about environmental concerns which are delaying the projects and reducing their financial viability.[231] Because of these delays, Ernst and Young advised that:

> Construction may very well begin within the review period if they proceed, although the timing of the projects, and the potential electrical loading on the Powerlink network during the period of interest, is subject to significant uncertainty.[232]

In relation to these delays, Powerlink stated:

> Powerlink is aware that some of the original environmental approvals for these projects have been the subject of appeals to the Queensland Land Court, the Queensland Supreme Court and the Queensland Court of Appeal. In the case of GVKHancock, the project proponents have determined to contest the appeal. Based on the statements made by the project proponents Powerlink does not consider there has been a material change in the likelihood of these projects proceeding, though naturally there may have been some slippage in timeframes as a result of the ongoing legal actions.[233]

We consider that the financial and timing uncertainty generated by the environmental concerns driven by these mines, and the associated legal actions, mean that it is unlikely that these mining projects will proceed within the 2017–22 period. This suggests that the proposed Southern Galilee Basin contingent project is not

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230 Queensland Government, Department of State Development, Galilee Coal Project (Northern Export Facility), available at http://www.statedevelopment.qld.gov.au/assessments-and-approvals/galilee-coal-project.html; Queensland Government, Department of State Development, Alpha Coal Project, available at http://www.statedevelopment.qld.gov.au/assessments-and-approvals/alpha-coal-project.html; Queensland Government, Department of State Development, Kevin's Corner Project, available at http://www.statedevelopment.qld.gov.au/assessments-and-approvals/kevin-s-corner-project.html.

231 Powerlink, *Appendix 5.12 - Contingent Project Scenarios and Triggers Ernst & Young*, January 2016, p. 6.

232 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.12, Contingent Project and Triggers Ernst and Young*, p. 14.

233 Powerlink, *Response to Information Request 017, 9 August 2016*, pp. 1-2.

reasonably likely as is required by the NER.[234] Therefore, we do not accept the Southern Galilee Basin connection shared network works as a contingent project based on the low likelihood that the project triggers (related to the three coal mine projects) will occur during the 2017–22 period.

D.3.4 Northern Bowen Basin area

Powerlink submitted that the existing load in the Northern Bowen Basin in the Moranbah area primarily relates to the mining and transportation of coal. With the establishment of LNG export facilities at Gladstone there is increased interest in further developing the coal seam gas reserves in the Northern Bowen Basin to supply the export market and/or sell domestically. [235]

Powerlink proposed $55.7 million to establish a second transformer at Strathmore Substation, phase shifting transformers on the circuits between Moranbah and Collinsville substations, and additional line switching at Strathmore to establish a second Strathmore to Collinsville 132kV circuit.[236]

Powerlink proposed the following trigger events for this contingent project: [237]

- Commitment of additional load in excess of 30MW to be supplied from the network between Moranbah and Collinsville 132kV substations, including supply directly from either of these substations;
- Successful completion of the RIT-T, including a comprehensive assessment of the credible options, that demonstrates a network investment by Powerlink maximises the net market benefits while meeting reliability of supply obligations to the Northern Bowen Basin area; and
- Powerlink Board commitment to proceed with the project subject to the AER amending Powerlink's revenue determination pursuant to the Rules.

AER considerations

We consider that the Northern Bowen Basin area project ($55.7 million) may be reasonably required to be undertaken in order to achieve the capital expenditure objectives. However, we consider that the trigger events should be amended in order for us to be satisfied that each trigger event is appropriate.

Powerlink stated that the demand for its transmission network services could exceed current capacity at the Northern Bowen Basin once additional load in excess of 30MW between Moranbah and Collinsville is triggered.[238] Ernst and Young identified a plausible connection that may trigger the need for this additional capacity — an

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234 NER, cl. 6A.8.1(b).

235 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.12.

236 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.14.

237 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.13.

238 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.13.

expansion of coal seam gas operations by Arrow Energy.[239] This project was forecast in Powerlink's 2015 Transmission Annual Planning Report.

We have limited information to determine the likelihood of this coal expansion proceeding within the 2017–22 period. However, Arrow Energy's coal seam project received environmental approval from the Queensland and Federal Governments in 2014.[240] If the project proceeds, it will very likely trigger the need to upgrade network capacity. On this basis, we are satisfied that the Northern Bowen Basin project may be reasonably required to be undertaken in order to satisfy demand for transmission services and/or maintain network reliability by alleviating capacity constraints.

As set out in section D.2.2, we consider that there are four trigger events required in order for us to be satisfied that a project should be included as a contingent project. For this specific contingent project, Powerlink included three of these four required triggers. However, it did not include a requirement for Powerlink to request the AER to make a determination as to whether the preferred project option within a RIT-T satisfies the regulatory investment test for transmission. Therefore, for us to be fully satisfied that this project should be a contingent project, Powerlink should amend its trigger events to include the following additional trigger:

> "a determination by the AER (under Clause 5.16.6 of the National Electricity Rules) that the proposed investment satisfies the regulatory investment test for transmission".

We require this additional information because it will provide an independent assessment that the RIT-T is successfully completed, and gives us greater confidence that the resulting project will satisfy the capex objectives.

D.3.5 Bowen Industrial Estate

Powerlink submitted that the Abbot Point connection point, located approximately 20 kilometres west of Bowen, forms a key part of the infrastructure that will be necessary to support the development of coal exports from the northern part of the Galilee Basin. The Abbot Point area is supplied at 66kV from Powerlink's Bowen North substation. During outages of the single supply to Bowen North the load is supplied via the Ergon Energy 66kV network from Proserpine, some 60km to the south. [241]

Powerlink proposed $42.9 million to undertake the following programs: [242]

- installation of a second 132/66kV transformer at Bowen North Substation;
- connection of the second Strathmore to Bowen North 132kV circuit;

[239] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.12, Ernst and Young, Contingent Project Scenarios and Triggers*, January 2016, p.13.

[240] See https://www.arrowenergy.com.au/projects/project-assessment-eis/bowen-gas-project-eis; accessed 16 August 2016.

[241] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.15.

[242] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.15.

- establishment of a second 275/132kV transformer at Strathmore Substation; and
- switching the Collinsville to Clare South 132kV circuit at Strathmore Substation to provide a second Strathmore to Collinsville 132kV circuit.

Powerlink proposed the following trigger events for this proposed contingent project: [243]

- Commitment of additional load in excess of 10MW to be supplied from Bowen North Substation;
- Successful completion of the RIT-T, including a comprehensive assessment of the credible options, that demonstrates a network investment by Powerlink maximises the net market benefits while meeting reliability of supply obligations to the Bowen area; and
- Powerlink Board commitment to proceed with the project subject to the AER amending Powerlink's revenue determination pursuant to the Rules.

AER considerations

We consider that the Bowen Industrial Estate project ($42.9 million) may be reasonably required to be undertaken in order to achieve the capital expenditure objectives. However, we consider that the trigger events should be amended in order for us to be satisfied that each trigger event is appropriate.

Powerlink stated that the demand for its transmission network services could exceed current capacity for the Bowen Industrial Estate once additional load in excess of 10MW at the Bowen North Substation is triggered.[244] Ernst and Young identified a plausible connection that may trigger the need for this additional capacity — an expansion of capacity at the Abbot Point coal port terminal.[245] This project was forecast in Powerlink's 2015 Transmission Annual Planning Report.

We have limited information to determine the likelihood of this coal expansion proceeding within the 2017–22 period. However, the expansion of Abbot Point coal port received environmental approval (with conditions) from the Federal Government in December 2015.[246] If the project proceeds, it will very likely trigger the need to upgrade network capacity. On this basis, we are satisfied that the Bowen Industrial Estate project may be reasonably required to be undertaken in order to satisfy demand for transmission services and/or maintain network reliability by alleviating capacity constraints.

As set out in section D.2.2, we consider that there are four trigger events required in order for us to be satisfied that a project should be included as a contingent project.

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[243] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.19.

[244] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.15.

[245] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.12, Ernst and Young, Contingent Project Scenarios and Triggers*, January 2016, p.13.

[246] See http://epbcnotices.environment.gov.au/_entity/annotation/2f828db4-2fa8-e511-9621-005056ba00a7/a71d58ad-4cba-48b6-8dab-f3091fc31cd5?t=1450740730681; accessed 16 August 2016.

For this specific contingent project, Powerlink included three of these four required triggers. However, it did not include a requirement for Powerlink to request the AER to make a determination as to whether the preferred project option within a RIT-T satisfies the regulatory investment test for transmission. Therefore, for us to be fully satisfied that this project should be a contingent project, Powerlink should amend its trigger events to include the following additional trigger:

> “a determination by the AER (under Clause 5.16.6 of the National Electricity Rules) that the proposed investment satisfies the regulatory investment test for transmission”.

We require this additional information because it will provide an independent assessment that the RIT-T is successfully completed, and gives us greater confidence that the resulting project will satisfy the capex objectives.

D.3.6 QNI upgrade (Queensland component)

The existing Queensland to NSW Interconnector (QNI) comprises double circuit 330 and 275 kV transmission lines from Armidale (NSW) to Tarong (Qld). The transfer capacity of QNI is constrained on occasions in both directions, and the number of hours of constraint is increasing. Transfer capability across QNI is limited by a number of factors: voltage, transient stability and oscillatory stability.

Powerlink submitted that assessment into the market benefits of upgrading the QNI was made with TransGrid jointly in late 2012. The assessment resulted in a formal RIT-T consultation process that was finalised in December 2014. However, AEMO's assessment of the QNI upgrade under various scenarios showed that "doing nothing" results in a similar outcome to any options to upgrade. On this basis, Powerlink and TransGrid have decided to not undertake any upgrade of the QNI, but to continue monitoring market developments which may result in upgrades of the QNI.[247] Powerlink proposed $66.7 million for upgrading the QNI in case this project goes ahead. [248]

Powerlink proposed the following trigger events for this proposed contingent project: [249]

- Successful completion of the RIT-T demonstrating a network investment by Powerlink maximises the net market benefits from increasing the capacity of QNI either northward or southward or in both directions;
- Determination by the AER under clause 5.16.6 of the Rules that the proposed investment satisfies the RIT-T; and
- Powerlink Board commitment to proceed with the project subject to the AER amending Powerlink’s revenue determination pursuant to the Rules.

AER considerations

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[247] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.17.

[248] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.17.

[249] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.19.

We consider that the QNI upgrade (Queensland component) project ($66.7 million) may be reasonably required to be undertaken in order to achieve the capital expenditure objectives. However, we consider that the trigger events should be amended in order for us to be satisfied that each trigger event is appropriate.

While the project is not currently planned, a material change in market conditions (e.g. load and energy growth across the NEM, future gas prices within Queensland, and development of wind farms within the northern NSW area) may justify one of the project scenarios considered in the RIT-T. This would then result in the project being reasonably required to satisfy demand for transmission services and/or maintain network reliability by alleviating capacity constraints.

Powerlink has proposed a solution for this contingent project that is not one of the options identified or assessed in the RIT-T process. Although this option falls within the range of costs of the identified options, it is not clear what the market benefits associated within this option are. It is possible that this new option is superior in some aspects to the existing RIT-T option, but Powerlink has not provided any analysis to support this. On this basis, it is not clear that the option proposed by Powerlink would meet the capex criteria. We will consider this closely in the event that Powerlink applies to us to trigger this contingent project in the future.

As set out in section D.2.2, we consider that there are four trigger events required in order for us to be satisfied that a project should be included as a contingent project. For this specific contingent project, Powerlink included three of these four required triggers. However, it did not include specific detail about the amount and location of additional load required to trigger the contingent project. Therefore, for us to be fully satisfied that this project should be a contingent project, Powerlink should amend its trigger events to include:

- additional detail which specifies the amount and location of additional load required to trigger the QNI upgrade (Queensland component) project.

We require this additional information because it will ensure that the trigger event is:

- reasonably specific and capable of objective verification;[250] and
- a condition or event that generates increased costs or categories of costs that relate to a specific location rather than a condition or event that affects the transmission network as a whole.[251]

The existing trigger as it is currently written is broadly defined as "plausible developments in the Queensland region that may impact the demand for services on QNI",[252] which may make it difficult to assess unambiguously whether or not the proposed contingent project has been triggered. In contrast, specifying the precise amount of load required to trigger the contingent project will ensure that the trigger

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[250] NER, cl. 6A.8.1(c)(1)

[251] NER, cl. 6A.8.1(c)(3)

[252] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p.19.

event is unambiguous and objective. As we state in section D.2.2, this will give us greater confidence that the resulting project will satisfy the capex objectives and criteria. This will ensure that the trigger event is 'a condition or event which, if it occurs, makes the project reasonably necessary in order to achieve any of the capex objectives'.[253]

D.3.7 Central West to Gladstone Area Reinforcement

Powerlink submitted that possible developments around the Central West and Gladstone zones of its network could affect the capacity loading around this region of its network.[254] Powerlink proposed $105.5 million to construct a double circuit 275kV line between Calvale and Larcom Creek substations. The proposed project will also include rebuilding the single circuit low capacity 275kV line between Larcom Creek and Calliope River substations. [255]

Powerlink proposed the following trigger events for this proposed contingent project: [256]

- Successful completion of the RIT-T demonstrating a network investment by Powerlink maximises the net market benefits from increasing the capacity the 275kV network between the Central West and Gladstone zones;
- Determination by the AER under clause 5.16.6 of the Rules that the proposed investment satisfies the RIT-T; and
- Powerlink Board commitment to proceed with the project subject to the AER amending Powerlink’s revenue determination pursuant to the Rules.

AER considerations

We consider that the Central West to Gladstone Area Reinforcement project ($105.5 million) may be reasonably required to be undertaken in order to achieve the capital expenditure objectives. However, we consider that the trigger events should be amended in order for us to be satisfied that each trigger event is appropriate.

Powerlink stated that the demand for its transmission network services at the Central West to Gladstone Area could be impacted once developments in the Queensland region are triggered. Ernst and Young, and Powerlink's 2015 Transmission Annual Planning Report, identified three LNG projects that may trigger additional load:[257]

- QCLNG liquefaction facilities
- APLNG liquefaction facilities
- GLNG liquefaction facilities.

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[253] NER, cl. 6A.8.1(c)(2).

[254] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p. 21.

[255] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p. 21.

[256] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p. 22.

[257] Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.12, Ernst and Young, Contingent Project Scenarios and Triggers, January 2016,* p. 15.

Based on information submitted by Powerlink including the Ernst and Young Report, these projects will only proceed if market conditions improve.[258] However, Powerlink has stated that it is in discussions with a number of customers and potential customers for the supply of additional load and capacity.[259] On this basis, we are satisfied that this project will be reasonably required to satisfy demand for transmission services and/or maintain network reliability by alleviating capacity constraints.

As set out in section D.2.2, we consider that there are four trigger events required in order for us to be satisfied that a project should be included as a contingent project. For this specific contingent project, Powerlink included three of these four required triggers. However, it did not include specific detail about the amount and location of additional load required to trigger the contingent project. Therefore, for us to be fully satisfied that this project should be a contingent project, Powerlink should amend its trigger events to include:

- additional detail which specifies the amount and location of additional load required to trigger the Central West to Gladstone Area Reinforcement project.

We require this additional information because it will ensure that the trigger event is:

- reasonably specific and capable of objective verification; [260] and
- a condition or event that generates increased costs or categories of costs that relate to a specific location rather than a condition or event that affects the transmission network as a whole. [261]

The existing trigger as it is currently written is broadly defined as “plausible developments in the Queensland region"[262], which may make it difficult to assess unambiguously whether or not the proposed contingent project has been triggered. In contrast, specifying the precise amount of load required to trigger the contingent project will ensure that the trigger event is unambiguous and objective. As we state in section D.2.2, this will give us greater confidence that the resulting project will satisfy the capex objectives and criteria. This will ensure that the trigger event is 'a condition or event which, if it occurs, makes the project reasonably necessary in order to achieve any of the capex objectives'.[263]

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258 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.12, Contingent Project Scenarios and Triggers Ernst and Young, January 2016,* p.16*.*

259 Powerlink, *Response to information request 005*, 8 June 2016.

260 NER, cl. 6A.8.1(c)(1)

261 NER, cl. 6A.8.1(c)(3)

262 Powerlink, *Revenue Proposal 2017-22*, *Appendix 5.13, Contingent Projects*, January 2016, p. 22.

263 NER, cl. 6A.8.1(c)(2).

E Ex post review - 2014–15 capex

We are required to provide a statement on whether roll forward of the regulatory asset base from the previous period contributes to the achievement of the capital expenditure incentive objective.[264] The capital expenditure incentive objective is to ensure requires that where the regulatory asset base is subject to adjustment in accordance with the NER, only expenditure that reasonably reflects the capex criteria is included in any increase in value of the regulatory asset base.[265]

The NER requires that the last two years of the previous regulatory control period (for the purposes of this decision, the 2012–17 regulatory control period) are excluded from the ex-post assessment of past capex.[266] Further, the NER prescribes that the review period does not include the regulatory year in which the first Capital Expenditure Incentive Guideline was published (2013–14) or any regulatory year that precedes that regulatory year.[267] Accordingly, our ex-post assessment only applies to the 2014–15 regulatory year.

We may exclude capex from being rolled into the RAB in three circumstances:[268]

1. Where the TNSP has spent more than its capex allowance;
2. Where the TNSP has incurred capex that represents a margin paid by the TNSP, where the margin refers to arrangements that do not reflect arm's length terms; and
3. Where the TNSP capex includes expenditure that should have been classified as opex as part of a TNSP's capitalisation policy.

E.1 Position

We are satisfied that Powerlink's capital expenditure in the 2014–15 regulatory year should be rolled into the RAB.

E.2 AER approach

We have conducted our assessment of past capex consistent with the approach set out in our Capital Expenditure Incentive Guideline (the Guideline). In our Guideline we outlined a two stage process for undertaking an ex-post assessment of capital expenditure:[269]

- Stage one - initial consideration of actual capex performance;

264 NER, cl. 6A.14.2(b).
265 NER, cl. 6A.5A(a).
266 NER, cl. S6A.2.2A(a).
267 NER, cl. 11.59.4(a).
268 NER, cl. S6A.2.2A.
269 AER, *Capital Expenditure Incentive Guideline*, November 2013, pp. 19-22.

- Stage two - detailed assessment of drivers of capex and management and planning tools and practices.

The first stage considers whether the TNSP has overspent against its allowance and past capex performance. In accordance with our Guideline, we would only proceed to a more detailed assessment (stage two) if a TNSP had overspent against its allowance, the overspend was significant, and its capex performance in the period of our ex-post assessment suggests that levels of capex may not be efficient or do not compare favourably to other TNSPs.

E.3 AER assessment

We have reviewed Powerlink's capex performance for the 2014–15 regulatory year. This assessment has considered Powerlink's out-turn capex relative to the regulatory allowance given the incentive properties of the regulatory regime for a TNSP to minimise costs.

Powerlink incurred capex below its forecast regulatory allowance in the 2014–15 regulatory year. Therefore, the overspending requirement for an efficiency review of past capex is not satisfied.[270] Accordingly, this supports the view that this expenditure is consistent with the capital expenditure incentive objective.

We have also had regard to some measures of input cost efficiency as published in our latest annual benchmarking report.[271] We recognise that there is no perfect benchmarking model, and as noted by Powerlink we have been cautious in our initial application of these techniques for assessing the efficiency of expenditure in recent transmission determinations.[272] However, we consider that our benchmarking models are the most robust measures of economic efficiency available and we can use this measure to draw conclusions regarding a TNSP's efficiency over time.

Under the NER, we are able to exclude capex only where a TNSP has overspent its allowance. Powerlink considerably underspent its allowance for 2014–15. However, this does not necessarily mean that the expenditure was prudent and efficient. Powerlink submitted that significant reductions in forecast demand growth led it to cancel or defer large amounts of load driven capex and also to change its planned replacement program.[273] In 2014–15, Powerlink spent less than $5 million on load driven capex and spent $100 million less on non-load driven capex than in 2012–13. Therefore, it is clear that Powerlink considered its changing operating environment over the 2012–17 regulatory control period, consistent with a prudent and efficient service provider. This indicates that Powerlink is improving its processes and expenditure practices. On this basis, we consider that the capex for 2014–15 reasonably reflects the capital expenditure incentive criteria.

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270 NER, cl. S6.2.2A(c).

271 AER, *Annual benchmarking report: Electricity transmission network service providers*, November 2015.

272 Powerlink, *Revenue Proposal 2017-22*, January 2016, p. 28.

273 Powerlink, *Revenue Proposal 2017-22*, January 2016, p. 25.