Report to

Energy Consumers Australia

Advice on the Capex Portion of the AER's Revenue Determination for TransGrid

2 January 2018

1 Executive Summary

The key findings of this report on the Capital Expenditure Allowance (Capex) forecast for the TransGrid Revenue Determination 2018-23 are:

1. The probabilistic cost/benefit approach used by TransGrid looks at "worst" case consequences of failure rather than the typical approach of assessing more likely consequences
2. The risks of severe consequences are overstated and not well justified
3. The load forecasts, particularly for the Sydney CBD, are very high and fail to recognise other initiatives in the area
4. There is a poor transparency on the key variables used in TransGrid's cost/benefit analyses
5. The AERs Draft Determination provides a forecast of Capex that is more appropriate than TransGrid's Revised Proposal

2 Scope of the Advice

The scope of this advice is to review the arguments that have been made about the Capex in the TransGrid 2018-23 Revenue Proposal. In its Draft Determination the Australian Energy Regulator (AER) significantly reduced the allowance for Capex. In its Revised Proposal TransGrid has not accepted the bulk of these reductions. This report provides expert advice on the validity of the arguments used by the AER and TransGrid and therefore provides an opinion on the approximate level of Capex that would be prudent to allow TransGrid to safely, securely and efficiently operate the NSW transmission system. The assessment is based wholly on publically available information.

3 Background

As can be seen in Table 1, the AER Draft Determination reduced the Capex forecast by about 38.5% and TransGrid's revised proposal has reinstated most of the Capex so that the reduction from the original proposal is only 4.9%. The replacement and augmentation, excluding Powering Sydney's Future (PSF) actually represent a 0.2% increase from the original proposal.

Table 1: Stages of capital expenditure forecast and rationale ($m June 2018)

Capex Component	Proposal	Draft Determination	Revised Proposal	Comment
Replacement (incl Security & Compliance	961.8	757.9	937.1	AER considered risks overstated and above historic levels / TransGrid disagree
Augmentation (excl-PSF)	160.0	96.6	186.6	AER consider risks overstated and volume of new connections too high / TransGrid disagree
Powering Sydney's Future	331.7	0	252.3	TransGrid argue the project is required immediately and have compromised on the project since the draft with a 2 stage development
Non-network (IT and business support)	158.8	137.7	157.9	AER considered IT forecast was "not well justified" and overstated risks / TransGrid revised their approach to investment analysis
Total	1,612.3	992.2	1,534.0	4.9% lower than initial proposal

Source: Dollar amounts taken from TransGrid Revised Proposal Table 4.2 page 41

This report analyses the reasons given by TransGrid for not accepting the reductions proposed by the AER. The analysis will compare and evaluate the arguments made by the AER for reducing the Capex forecast with the arguments made by TransGrid for retaining the Capex forecast in the revised proposal. It is based on the public information and my experience in the industry.

4 My Experience and Skills

I have been involved in power system planning for most of my 40 years in the energy industry. I have been an Executive General Manager of VENCorp and AEMO and more recently I was Manager Regulation and Network Strategy at AusNet Services, responsible for network planning of the distribution network and the revenue proposals for both the transmission and distribution networks. Probabilistic planning and the development of the current RIT-T economic evaluation process were pioneered in the mid 1980s in the Sate Electricity Commission of Victoria (SECV) and then subsequently in VENCorp. The use of smarter options for adding capacity to the network such as wind monitoring and dynamic line ratings and overload control schemes were also developed during this time I gained significant experience of these matters, which are highly relevant to the current considerations in relation to Transgrid's capex proposals.

I have been involved in load forecasting since the mid 1980s and understand the pitfalls and problems with various processes for forecasting load. I was at AEMO between 2009 and 2012, when the organisation was responsible for the Victorian load forecasts as well as developing forecasts for the other states. This was a very difficult period to forecast because of the energy efficiency initiatives and the roof-top PV installations ramping up beyond anyone's expectations. Again, that experience has proved valuable in informing the analysis below.

5 Arguments by TransGrid to Reject the Proposed Reductions

5.1 Overarching response by TransGrid

TransGrid in their Revised Proposal have only agreed with the AER's reasoning for reducing the Capex forecast by 38% on minor matters so that their revised proposal was only 4.9% below their original proposed capex forecast. The estimation of the appropriate Capex forecast hence becomes a matter of the validity and strength of the arguments raised by the regulator and TransGrid.

The initial comments by TransGrid in their Revised Proposal are an attempt to generally discredit the arguments and analysis used by the AER and their technical consultant, EMCa. The areas that Transgrid focused on were:

- The capex reduction was largely due to the AER's findings in relation to the quantification of risks, and these findings were in a large part due to errors and misunderstandings by the AER;
- Factual errors in the EMCa report and inconsistency with the AER and EMCa report. Transgrid provided three examples;
    - The use of "trillion" versus "billion", which appears to be an error of significant magnitude;
    - Connection point utilisation; and
    - Risk reduction impact of capex.

5.1.1 Quantification of Risks

The investment assessment process used by TransGrid is significantly better than the "reliability" process previously used and TransGrid should be commended for adopting a very comprehensive process that takes into account the probability of events and monetises all risks so that an overall cost/benefit analysis can be developed.

The methodology allows the business to use its data on the condition of assets to determine their failure modes, probability of occurrence and the consequences of those failures (can be loss of supply to customers or reliability, safety of workers, environmental impact, remediation costs,

reputation). By using agreed values for these consequences such as the Value of Customer Reliability (VCR) and statistical value of life all consequences can have a dollar value applied to them. This then allows the business to build up a list of costs of doing nothing versus projects that reduce the ongoing costs of doing nothing. When the cost of a project becomes lower than the cost of doing nothing in a net present value analysis then the project should go ahead. The methodology also allows all the projects to be compared for effectiveness in reducing the cost of doing nothing and therefore prioritise across all assets.

TransGrid have chosen to use the methodology in a slightly unusual manner, in that it uses not the most likely consequence of a failure or a range of consequences but it concentrates on only the "worst case" consequence and then applies a likelihood of this consequence (LoC) to the calculation[1]. I share the AER and EMCa's concern that the event used in many of the assessments is an extreme event with a probability of event (PoE) (this is the same as probability of failure (PoF)) and likelihood of consequence (LoC) which is too high. In many cases there is no historic data to back up the LoC used in the assessments. In other words, the process looks to cover the required analysis but when scrutinised more closely, the numbers used appear to be overstating the risk.

TransGrid on numerous occasions (on 16 occasions between pages 38 and 82 in the Revised Proposal, 5 of them on page 70, they use the word "misunderstanding" to describe the AER or EMCa's report) suggest that the AER and EMCa don't fully understand or misinterpret the process and numbers. My reading of the AER and EMCa reports and the TransGrid documentation suggest that the AER and EMCa do understand the process and have not misinterpreted the information and have reasonably come to the conclusion that there is an overstating of the risk or a bias towards overstating the risk generally. The bias appears to come from using the worst-case scenario and then assigning a probability which is small but arguably not small enough.

For example, the substation civil structures (project OER/NOS 1358 of $43.17m) for Sydney South substation assign the probability of failure (PoF) of 1% (or 1 in 100 years) and the likelihood of consequence (LoC) of 2% (or 1 in 50 failures of this type)[2]. Both very small and cannot be estimated from experience because the event with this consequence has never happened. TransGrid has modelled the event as a failure of a gantry or steel structure and the consequence being a total shutdown of the substation for 30 days with a load of 1,307MW.

TransGrid argue correctly that the combination of the PoF and LoC result in a probability of 1 in 5,000 years of a failure leading to this consequence. Given there is no history of this event with this consequence happening, there is no way to decide whether a 1 in 1,000 , or even 1 in 100,000 is a better estimate than 1 in 5,000 years. The reliability consequence of failure (CoF) is $36 billion, which is equivalent to 30 days of 1,307MW valued at $38,350/MWh[3&4]. TransGrid use this for a failure of a steel structure and again for a failure of a holding down bolt making the total annualised risk cost of:

Risk cost = PoF x LoC x CoF

Risk cost = 1% x 2% x $36b (for holding down bolt failure)

+ 1% x 2% x $36b (for steel structure failure) = $14.4m per annum

The figure used in TransGrid's OER 1358 is $18.66m which I cannot replicate based on information from TransGrid and EMCa's reports. The EMCa report page 69 states that there is a different annualised risk cost for failure of holding down bolts ($11.1m pa) compared with failure of a steel member (6.2m pa) so that by reverse calaculation the PoFs that must have been used are:

PoF for holding down bolt at Sydney South = 1.5% or 1 in 65 years and

PoF for steel structure at Sydney South = 0.86% or 1 in 116 years

[1] See page 64 & 65 of TranGrid Revised Proposal

[2] See page 71 of TransGrid'd Revised Proposal

[3] See page 67 of TransGrid's Revised Proposal for VCR figure used

[4] These numbers are taken from the EMCa report page 70 as I was unable to find this level of detail in the TransGrid documents.

If such a consequence were to occur then it is likely that transferring load to other zone substations and temporary structures within the Sydney South substation would allow most if not all load to be restored within 7 days. Having a unserved load profile of 1,307MW for 2 hours, then with transfers to other substations this is reduced to 500MW average for 3 days with some temporary structures reduced to 200MW and then full restoration within 7 days would reduce the consequence of failure to $2.2b and the annualised risk cost to $0.9m. Based on TransGrid's Capex for Sydney South of $10.9m none of the three options would have a positive NPV at 10% discount rate.

Accordingly, my view is that in this case there appears to be both an exaggeration of consequence as well as a bias toward higher probability of both the event and the consequence.

As another example, TransGrid on page 67 of their revised proposal have a Table 4.8 which talks about the likelihood of a loss of life in a substation when there is an explosive failure of equipment. TransGrid state that if there is an explosive event in a substation the likelihood of a loss of life is 4% on average across all substations, an LoC of 4%. They also quote the source of the information being the maintenance records and a note saying that it underestimates the actual exposure because it excluded unplanned and project work.

This is a very high LoC because, in my experience, substations have very few workers on site; an average of maybe 10% of the time at the most. Further, there is generally more secondary work (such as wiring modifications, protection equipment testing or upgrading) than primary work (out in the switchyard) at substations, except for major redevelopments. During secondary work, personnel are not usually exposed to explosive equipment. When primary work is being undertaken, a risk assessment is always done and any potentially explosive plant (e.g. minimum or bulk oil circuit breakers, transformers or suspect bushings) are identified and a mitigation scheme is put in place, usually either barriers or no-go areas. The size of a substation (Sydney South is about 78,000m^2 from Google maps) is generally such that a worker would have to be very unluckly to be near enough to an explosive piece of equipment to be injured. The 6 transformers at Sydney South, possibly equipment of higher explosion risk, all have blast walls on 4 sides of the transformer to protect workers and other equipment. The size of workforce involved in substation work would have to be very large for this LoC to be realistic. So once again there is a bias towards overestimating the risk.

There are other examples given by the EMCa report and the Darryl Biggar report on Powering Sydney's Future which point to a systemic overestimation of the risk. See, for example, EMCa report paragraphs 6, 7, 9, 11, 14, 17, 22, , 98, 99, 101, 126, 192, 223, 225, 263, 297, 300, 302, 315, 316, 319, 321, 364, 377, 380, 388 and 390 and Darryl Biggar report pages 16 to 19 related to assessed cable availabilities.

5.1.2 Factual Errors

TransGrid stated in the revised proposal that they notified the AER in August 2017 of more than 30 factual errors in the EMCa report before publication, but the report was published without these errors corrected. The letter has not been made public by either the AER or TransGrid as far as I can ascertain .

TransGrid goes on to assert that the errors were made by EMCa with regard to total network risk cost and interpretation of a connection utilisation chart. While these do appear to be errors (addressed further below) they do not fundamentally change the arguments on which the majority of the Capex reductions were made by the AER.

5.1.2.1 Connection point utilisation

TransGrid on page 46 of their Revised Proposal state that the average connection point utilisation does not inform you about the likely reliability of a connection point and there is some time spent on whether the AER's estimated reduction in utilisation over the last regulatory period is correct or not. TransGrid misunderstand the issue that the average connection point utilisation provides a top down "big picture" view of how well the capital is employed across the 80 plus substations in TransGrid's network and the trend of this utilisation over time. It is not meant to provide any indication of the reliability of a connection point.

The important point here is that by industry standards TransGrid does have a low average connection point utilisation of 35 percent, with about 25 percent of the connection points having a utilisation which is less than 20 percent according to their 2016 category analysis RIN response[5]. Also 80 percent of connection points have less than a 50 percent utilisation. The table below highlights a few connection points and their maximum loading and rated capacity.

Substation	Maximum non-coincident weather corrected POE50 loading	Connection Point Rating Non Coincident	No. of transformers	Utilisation
Beaconsfield	388	750	2*	52%
Balranald	3	30	1*	10%
Broken Hill	35	200	2	18%
Canberra	442	1150	4	38%
Sydney South	1140	2250	6*	51%

*Note: These substations have load transfer capability at the low voltage side of the transformers and therefore are not totally reliant on the transformer capability at the substation
Source: TransGrid 2016 RIN Category Analysis[5]

Substations with 6 transformers are able to have two faulted transformers at peak demand and still meet the full demand as long as its utilisation is below 66 percent. Therefore, a utilisation of 51 percent is quite low for Sydney South (which also has load transfer ability at 132kV). This represents an n-3 reliability level. Broken Hill, which has two large transformers has a much lower utilisation at 18 percent but can still provide the full demand with one of the transformers out of service.

My conclusion on the connection point disagreement between the AER and TransGrid is that it is largely non-consequential, because the utilisation is not changing significantly at present; it is the low level of utilisation that is an issue that has built up over a number of years. It still requires each substation to be reviewed on its merit in terms of additional capacity. There is further discussion in section 5.3.2 about this issue.

5.1.2.2 Risk reduction impact of capex

EMCa's chart on page 40 of their report in relation to the cumulative risk cost of the Capex does not look credible because the Repex portion of Capex has the same cumulative risk cost savings as the total Capex. TransGrid does make a good argument about the issues with this chart and conclusions drawn from it. It is difficult to know what the correct answer is because, as far as I am aware, the information requests and responses given by TransGrid have not been released publicly.

5.2 Replacement (incl Security & Compliance)

The issue of a bias towards overstating risk is covered in section 4.1.1 above. TransGrid states on page 66 of their Revised Proposal that,

> "Use of a "worst case" LoC does not mean that we are overly conservative nor does it mean that risk is overstated. When "worst case" CoF is multiplied by an appropriately small LoC it is realistic and credible."

The problem is the "worst case" used in the assessments are events that have never happened and therefore there is no data to assess the LoC. Reverse engineering the examples show an unrealistic level of likelihood used as shown in section 4.1.1.

[5] TransGrid 2015-16 – Category Analysis RIN – Templates, excel spreadsheet exracted on 10Dec17 from AER website https://www.aer.gov.au/system/files/Copy%20of%20D16%20146640%20%20TransGrid%202015-16%20-%20Category%20Analysis%20RIN%20Response%20-Consolidated%20public%20-%2031%20October%202016%20-%20PUBLIC.xlsm

Another example is the bushfire risk where the consequence cost of $400m was based on 10% of the Royal Commission's estimate of the community cost of the Victorian Black Saturday fires which was an event of extreme, indeed unprecedented nature. Project 1523 Transmission Line Grillage Condition looks at 2,361 towers with grillage foots that are rusting below ground level. The major risk identified is bushfire risk and there are two categories of soil condition with 2048 towers in mildly corrosive soil and 313 towers in moderately corrosive soil. The table which forms Attachment 1 of the Needs/Opportunity Statement for this project shows the LoCxCoF for the 2048 towers is $3.52m per annum and the PoF is 0.09% (or 1 in 1111 tower years) making an annual risk of 2048*3,520,000*0.009 = $6.49m (the TransGrid figure is $6.12m probably due to rounding of failure rate etc).

This figure does not look out of proportion until you consider that the probability of failure means that 2 towers per annum should fail and the probability of failure for the moderate soil category is 0.94% which suggests that 3 towers per year should be failing in this category. Accordingly, the PoF for this project does appear to be overestimated as in the last two years there has been no tower failures[6] on TransGrid's assets according to their data. This project has a capital cost of $62.2m and had a positive NPV but even with a negative NPV it would have achieved the go-ahead on the SFAIRP/ALARP evaluation which is a new but valid method of treating health and safety obligations of a network business.

There are too many projects and programs to assess in this report for Energy Consumers Australia, but I consider that the 20% reduction in Capex the AER Draft Determination is a reasonable approach and I do not consider that TransGrid's Revised Proposal has addressed the concerns about a bias to overestimate the risk of most projects and programs.

5.3 Augmentation capital expenditure excluding PSF

5.3.1 Economic benefit driven

The AER Draft Determination reduced TransGrid's proposed Capex in this category of $62.7m by $31.5m. In its Revised Proposal TransGrid has increased its forecast by $18.1m over its original proposal, which is $49.6m above the Draft Determination. TransGrid included the Network Capacity Incentive Paramenter Action Plan (NCIPAP) projects in this category of Capex because the AER had rejected the list ($20.9m) from the incentive part of Capex because they did not meet the objective of the NCIPAP scheme – to increase network capability in response to an identified network limitation. They also stated, more generally, that the AER was mistaken when it considered the risks were systematically overstated.

The arguments of TransGrid do not overcome the concern about the overstated risk assessments. There is a lack of transparency in the assessment provided in the public documents as there is little or no explanation in the Needs/Opportunity Report of the various parameters and estimates used in the assessment. The document provides a combined LoCxCoF so that it is unclear what LoC or CoF has been used. The risk has been split, by some unknown method, into reliability, operational, financial, environmental, people and reputation risk costs.

The addition of the NCIPAP projects to this category of Capex would appear justified, even though there is no detailed cost/benefit analysis included, as AEMO has endorsed the list of projects and the market benefits associated with them.

The dynamic voltage support projects should only be approved once AEMO defines the requirements under the new National Electricity Rules (NER) change ERC0211 published by the Australian Energy Market Commission on 19 September 2017. The documentation put up for the TransGrid Proposal for project 1650 (capital cost of $38.9m) is now superseded by the rule change and therefore should not go ahead in its current form. There is considerable uncertainty about the size and timing of any such Capex to be spent in this area anyway. It is my understanding that were the requirement to materialise TransGrid is able to seek recovery as a Cost Pass Through event under Rule 6A.7.3.

[6] TransGrid-Outage List 2014_2015-2016.xlsx in TransGrid – RIN Supporting Documentation – January 2017 B_0_0 from the AER website

5.3.2 Reliability Driven

The reliability projects at Stockdill switching station and Molong and Mudgee substations have been accepted by the AER but further questions were asked for the Molong and Mudgee projects.

The AER has indicated that the failure rates assumed in the analysis of the level of expected unserved energy are atypically high. The cost of the projects to meet the new reliability standard suggest to me that further work should be done on these projects.

For Molong the load is at risk because there is no support provided from the distribution network. There is a single 132/66kV transformer of 30MVA, a maximum demand of 5MVA and an average demand of 2.4MW. Review of the total list of projects from the TransGrid Capital Accumulation Model shows that there are three projects each of about $3.5m at Molong early in the period; replace secondary systems (project 1267), replace the 132/66kV transformer for noise compliance (project 1454) and install a second 132/66kV transformer for reliability (project 1696). This suggests that over $10m is being spent to sustain 2.4MW of load which could probably be supplied from Essential Energy during a significant transformer outage with some temporary support within the distribution network. The TransGrid NOS report quotes Essential Energy stating:

> "Whilst informal back-up is available via Essential Energy's distribution network it cannot be permanently relied upon for an extended duration (catastrophic) single transformer outage."

This project and Mudgee, which is also only a small MW exposure, appear to me to be able to be solved with smarter, less costly solutions, but it will require TransGrid and the distribution companies to work together and plan the grid as if it was one entity and for them to truly look at smart control and non-network options.

The option of applying for a new reliability standard for these stations should be considered or a demonstrable firm plan to instigate a non-network demand side solution put forward to the Independent Pricing and Regulatory Tribunal (IPART), which sets transmission reliability standards in NSW. I note that TransGrid on page 86 of their Revised Proposal have argued that there is not enough time to implement such a solution.

5.3.3 Connection Driven

TransGrid proposed $36m for its forecast of this area of Capex but the AER reduced it to $8m in the Draft Determination. TransGrid has proposed $0.5m above its initial proposal.

Mining projects are notoriously volatile in their ability to finance a project and so a connection application can sit on the table for years before either being dropped by the proponents or taken through to commissioning. I think the rigour that the AER is requiring here is reasonable and alternative lower cost options do not appear to have been explored.

The AER has raised issues with regard to the probability of connections and the analysis of options which have not been adequately responded to by TransGrid. Unless further information is provided by TransGrid, the AER Draft Determination forecast in this area appears to be appropriate.

5.3.4 Localised Demand Driven

It would appear that the TransGrid proposed forecast of around $20m should be accepted in the final determination as the only issue raised by the AER, that the new switch-bay at Macarthur was to duplicate another 66kV line that had spare capacity (see page 91 of the Revised Proposal), has been adequately responded to by TransGrid.

5.4 Powering Sydney's Future capital expenditure

TransGrid has, after significant opposition to the original plan and a very good report by Daryl Biggar[7], compromised by staging the project so that only one cable is built from Holyrood to Beaconsfield initially and conduits placed at the time of construction of this cable to allow a second cable to fast tracked at a later date. This allows flexibility in the timing for the second cable and

[7] An Assessment of Modelling Conducted by TrnasGrid and AusGrid for the "Powering Sydney's Future" Program, Darryl Biggar, May 2017

reduces the community interruption by not having to uncover the complete route when the second cable is installed.

I have concerns even with the latest proposal for Power Sydney's Future (PSF) project and they are around the following aspects of the project:

- Use of AusGrid's development forecast, and
- The cable availability modelling and source data that underpins it.

5.4.1 Demand Forecasts

My concern with the demand forecasts is related to the development of the forecasts and the use of AusGrid's 2016 development forecast. Development forecasts basically take past trend information modified for econometric drivers and then apply post-model adjustments and in particular what TransGrid call spot loads. My assessment of the post model adjustments in the AusGrid forecasts is that there has been a small adjustment for energy efficiency but a major adjustment for new spot loads.

The incentive for network businesses to over forecast is financial as well as a bias to overinvest for reliability. On the financial side; the more connections a network business has, the more augmentation and connection related Capex can be justified. On the reputation and security side; no network wants to be "caught short" in its ability to supply load.

With these incentives, the forecasts will fully account for spot loads and some of these loads will not eventuate (because they were part of a feasibility study or suchlike that never received signoff) or will not eventuate at the level in the early proposals (as businesses are incentivised to over-forecast electrical load because of network connection tariff policies and also ensuring they have enough capacity for their project). The other issue is that often when capacities are not known at early enquiry stage of a connection process the network owner will assume historically equivalent loadings which will overestimate the demand because these historic loadings do not use modern efficient appliances and building design. On page 57 of the Revised Proposal TransGrid argue that a probability weighting is applied to all spot loads based on recent history but I am sceptical of the process and particularly the quantum where 340MW of spot loads are assumed to add to the base load by 2022/23.

The other issue about using development forecasts is that they double count some aspects because the trend information already includes spot loads and then you add all known future loads to your forecast.

The GHD report attached to the TransGrid proposal has two charts that show the past performance of the AusGrid forecasts for inner Sydney, Figure 1, and the makeup of the AusGrid 2016 development forecast, Figure 2. The first figure shows the base forecasts and not development forecasts. It shows that the forecasts prior to 2014 were similar to other forecasters over this period, perhaps even worse than some, and then they were improved significantly. These forecasts would appear reasonable.

However, it is the development forecast in Figure 2 which has been used in the regulatory Investment Test for Transmission (RIT-T) for PSF. There is a 200MW increase over the base forecast by 2019/20 which is massive; effectively a 6.5% annual growth rate. Most of the new buildings have a 5 star NABERS rating compared to the old stock which would be 2 or 3 star rated and the estimated reduction in energy cost going from a 2 star building to a 5 star building is about 55%[8]. This would imply that there is significant growth, well in excess of the already high 6.5% in order to get the demand change predicted.

[8] Allens Nabers CBD program review final report page 62

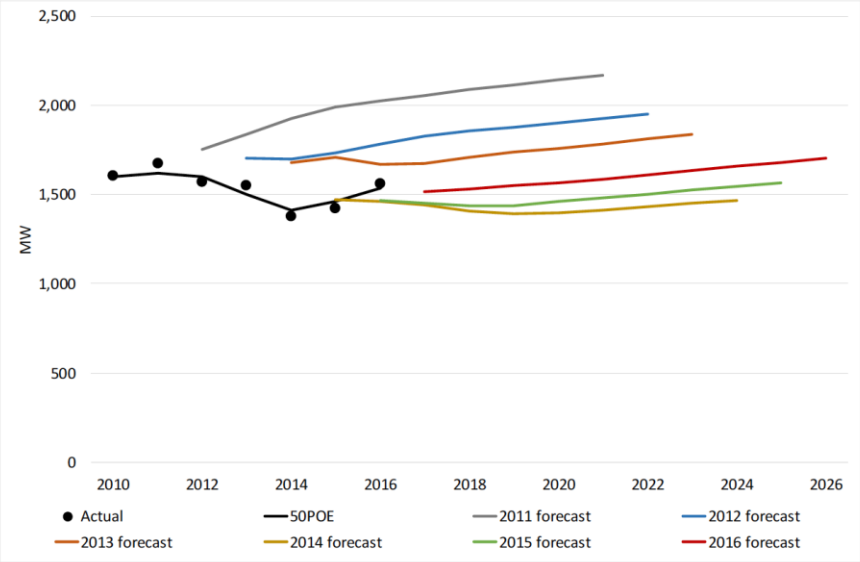

Figure 1: AusGrid's Historic Base Forecast for Inner Sydney
(Source TransGrid Revenue Proposal 2018/19 – 2022/23 Appendix I GHD: Review and test of AusGrid's connection point demand forecast pg 32)

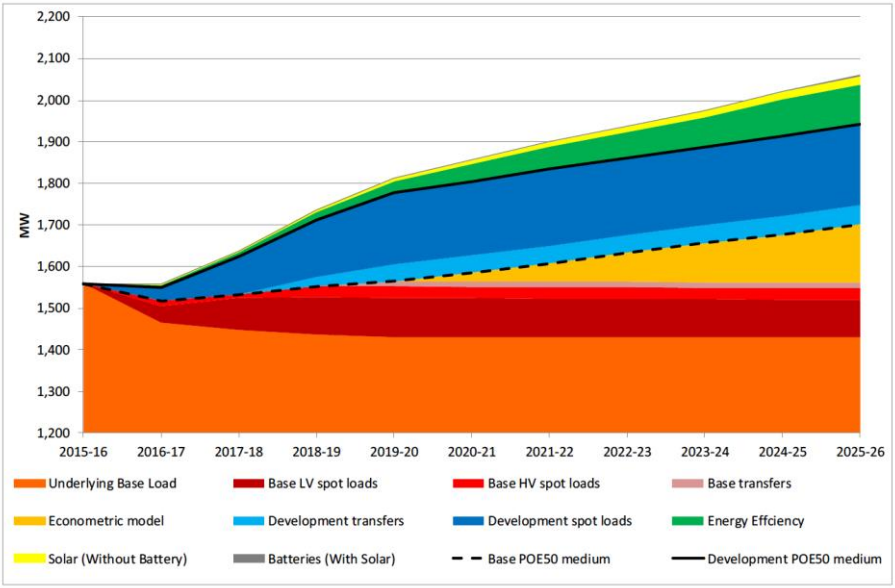

Figure 2: AusGrid's 2016 Developmental Forecast and Constituent Parts
(Source TransGrid Revenue Proposal 2018/19 – 2022/23 Appendix I GHD: Review and test of AusGrid's connection point demand forecast pg 25)

There is a significant change occurring in high rise building energy efficiency around the country at present in terms of building design and retro-fitting of trigeneration and other measures. For example, the City of Sydney established the Sustainable Sydney 2030 program in 2008 and one of the targets was to reduce the Green House Gas (GHG) emissions by 70% by 2030 in the City of Sydney. A large part of that reduction is to come from projects such as the mandatory NABERS ratings of all commercial building and the promotion of trigeneration for upgrading the efficiency of buildings. Figure 1 shows the past and forecast GHG emissions taken from the statutory GHG reporting and future programs. It can be seen that a 26% reduction has already been achieved and further programs are forecast to cut the levels further. The results achieved so far are with a background of growth in the Sydney CBD and surrounds. This does not appear to be adequately factored into the demand forecasts of AusGrid.

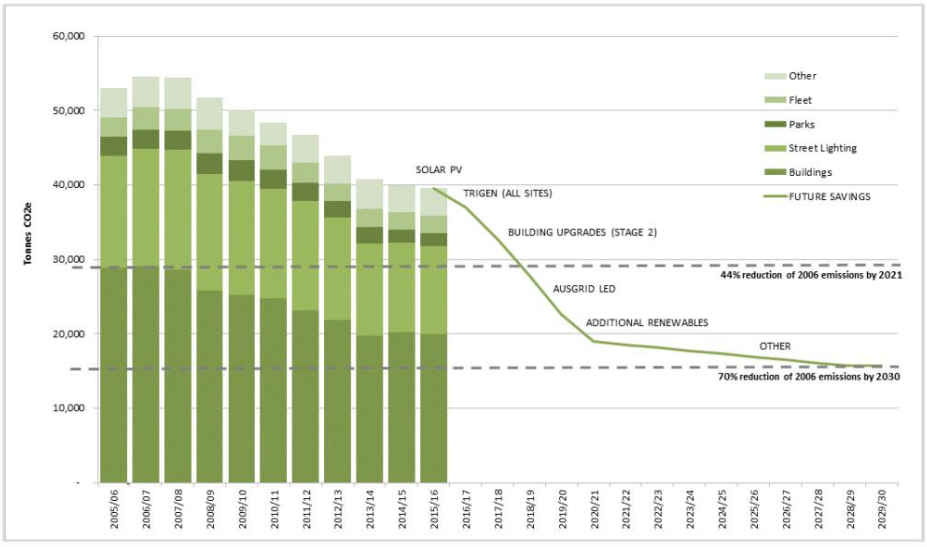

Figure 3: City of Sydney: GHG Emissions Past and Forecast[9]

There would appear to be a great opportunity here for TransGrid and AusGrid to work with the City of Sydney to support the Sustainable Sydney 2030 initiative by reducing redtape for distributed energy resources and demand side management within the Sudney CBD area.

My assessment of the demand forecasts used for the PSF project are that they are too high, meaning the need for the project on this basis is overstated.

5.4.2 Cable Availability

The report by Darryl Biggar provides an excellent analysis of the previous version of the PSF project and in particular the use of "corrective actions" in the modelling of cable unavailability. TransGrid's revised proposal has defended using all corrective actions as effectively forced outages but then says that even with 60% of corrective actions moving into the "planned" category the resultant optimal timing does not change.

The availability of circuits 41 and 42 are the major drivers for reliability in the Sydney CBD and review of TransGrid's supporting information for their reset Regulatory Information Notice (RIN) (shows an outage list for all forced and faulted outages between July 2014 and June 2016 or two years) where there were four outages of the cables:

- 29-May-14 7:03am to 29-May-14 8:09am Cable 41 forced outage due to a series reactor problem
- 09-Dec-14 7:45am to 09-Dec-14 8:26am Cable 42 forced outage due to a series reactor problem
- 24-Aug-15 11:55pm to 25-Aug-15 9:48pm Cable 41 outage due to series reactor bypass CB
- 24-Feb-16 3:40pm to 24-Feb-16 6:41pm Cable 42 outage due to cable temperature monitoring system failure

I know that past performance does not necessarily predict the condition of a cable but given the extremely poor state of the cable in circuit 42 I would have expected to see some outages due to the primary cable issues discussed in the RIT-T.

5.4.3 Conclusion on PSF Project

The sensitivity studies carried out by TransGrid and charted on page 60 of their revised proposal suggest to me that the correct timing is more like 2026/27 given the conservative input data used for their analysis. The need for the second cable should be reconsidered as it is likely that the load shape in 2030 will be much flatter than at present and the load density even in the Sydney CBD will be much lower than at present.

[9] City of Sydney: State of the Environment June 2016 page 10

5.5 Non-network (IT and business support)

TransGrid's proposed non-network Capex of $158.8 million was reduced to $137.7m by the AER on the basis of the non-network ICT Capex of $102.7 million not reflecting the efficient costs of a prudent operator and therefore being cut by 20%. TransGrid has revised its evaluation methodology to better match the network process and returned the forecast in this are to its proposal numbers.

The revised Options Evaluation Reports (OER) provided with the Revised Proposal have modified the initial proposal OERs which included a "do nothing" and an Option A for all ICT projects where there was a significant risk cost for the do nothing option. The Revised Proposal OERs now have an Option A which is replace at end of life, Option B which is delay replacement for 2 years and Option C which is delay replacement by 5 years. The annual risk cost during the delay period is not well justified and the outcome is for the eight projects included they are all recommending Option A.

The projects do not consider that in IT if you delay a project by 2 years the cost will reduce and productivity of the devices will increase making it a real tradeoff between implementing at end of life and waiting for the next generation of products.

I think TransGrid has not fundamentally changed its evaluation process but rather created a more impressive evaluation process to justify the original forecast. For this reason I consider the AER Draft Determination forecast to be sufficient.

6 Conclusion

The Revised Proposal from TransGrid has rejected most of the reductions made by the AER in its Draft Determination. While TransGrid have sought to better explain and justify their original proposal forecast capital expenditure, many of the points made by the AER have not been adequately addressed leaving the Draft Determination by the AER the better estimate of the forecast Capex that should be sufficient for a prudent and efficient service provider in TransGrid's circumstances to be able to maintain the safety, service quality, security and reliability of its network consistent with its current obligations.

John Howarth

JWH Consulting