Commerce Commission
P O Box 2351
Wellington 6140

For the Attention of: Kade Sheely

18th January 2018

Dear Kade

Wellington Electricity CPP – assessment of 2010/21 capex

I am pleased to provide this briefing paper setting out Strata Energy Consulting Limited's (Strata) assessment of the Wellington Electricity Limited (Wellington Electricity) capital expenditure forecast for 2020/21. As required in the contract for this assignment I can confirm that Strata has:

1) developed and agreed with the Commerce Commission (Commission) an approach to assessing the 2020/21 year;
2) developed and populated a dashboard to identify business as usual (BAU) variances;
3) used the dashboard to identify potential capex components that fall outside the applied BAU boundaries in 2020/21;
4) undertaken assessments of information provided by Wellington Electricity in its 2017 asset management plan for any non-BAU items;
5) developed a recommendation on an appropriate capex allowance for the 2020/2021 year; and
6) included recommendations on appropriate expenditure allowance for the 2020/2021 year, by 17th November 2017.

This letter is Strata's briefing paper to the Commission and sets out the findings from the above analysis and assessments including recommendations on appropriate expenditure allowance for the 2020/2021 year.

Establishing a view of Wellington Electricity's BAU capex

When undertaking the assessments, we have considered Wellington Electricity's capex for ten years from 2013. The data was sourced from Wellington Electricity information disclosures sources from the Commission's website. The capex data has been converted to Real 2017 values to enable 'real' variations in expenditure to be seen without the need to take CPI into account.

A base year was set using the average of 2013 to 2017 historical actual capex. In the charts showing total capex, a boundary of +/- 12.5% was applied to the base year value to take into account the normal variability of a capex. The variability boundary value of 25% was chosen as it reflected the variability seen in actual capex between 2013 and 2017. A similar method was applied to generate base year estimates for each capex category.

We initially assessed total capex and followed this with an appraisal of the capex categories that had the greatest variability. Where variability was observed, the dashboard data was used to identify if a driver for the variability could be established. Where the data did not provide an explanation for the observed variation from BAU, and the variation accounted for greater than 3% of total capex, the component was highlighted as non-BAU for further assessment using information provided by Wellington Electricity.

Summary of the results of applying BAU variance assessment

The initial assessment at the total expenditure on assets level is shown in Figure 1.

Wellington Electricity's forecast total expenditure on assets is consistently higher than the average for the 2013 and 2017 years. The expenditure during 2013 and 2017 was quite large and is the grounds for the relatively generous 25% boundary range.

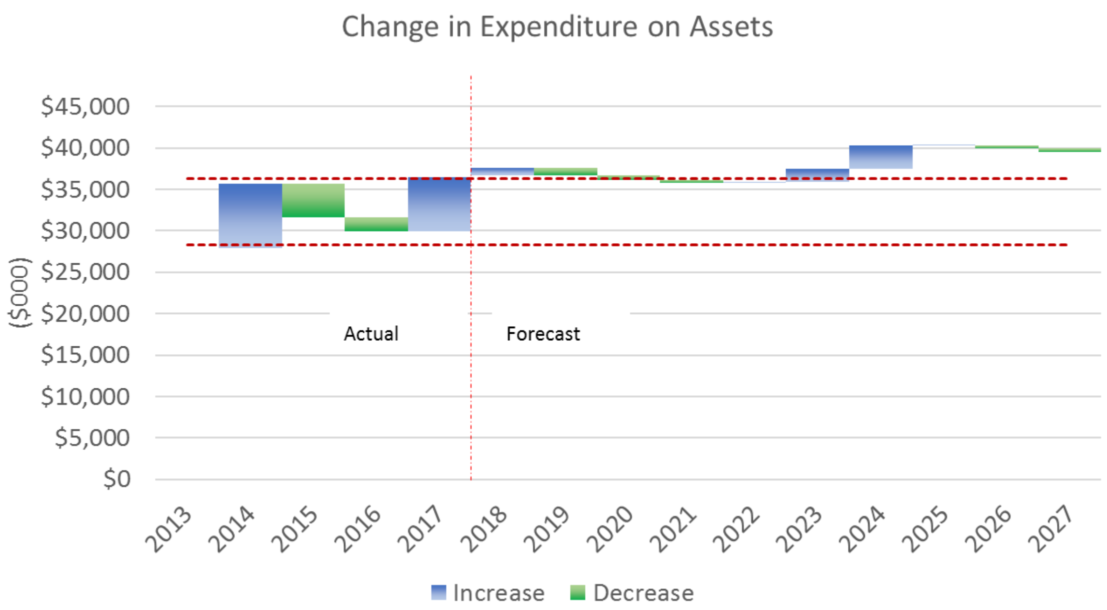


Figure 1

Wellington Electricity's forecast total expenditure on assets for 2020/21 is just under the upper BAU boundary (2013 – 2017 average +12.5%). However, all the forecast expenditure values are near to or above the boundary. In our opinion, this forecast capex profile warrants explanation as it is inconsistent with the profile seen for historical actual capex. To address this, we initially applied metrics to the total capex to identify if a capex growth driver was apparent.

Figure 2 shows individual capex categories' contribution to total forecast expenditure on assets in 2013 to 2027.

The primary contributors to forecast expenditure are seen to be asset replacement and refurbishment and the categories generally aligned with growth (consumer connection and system growth).

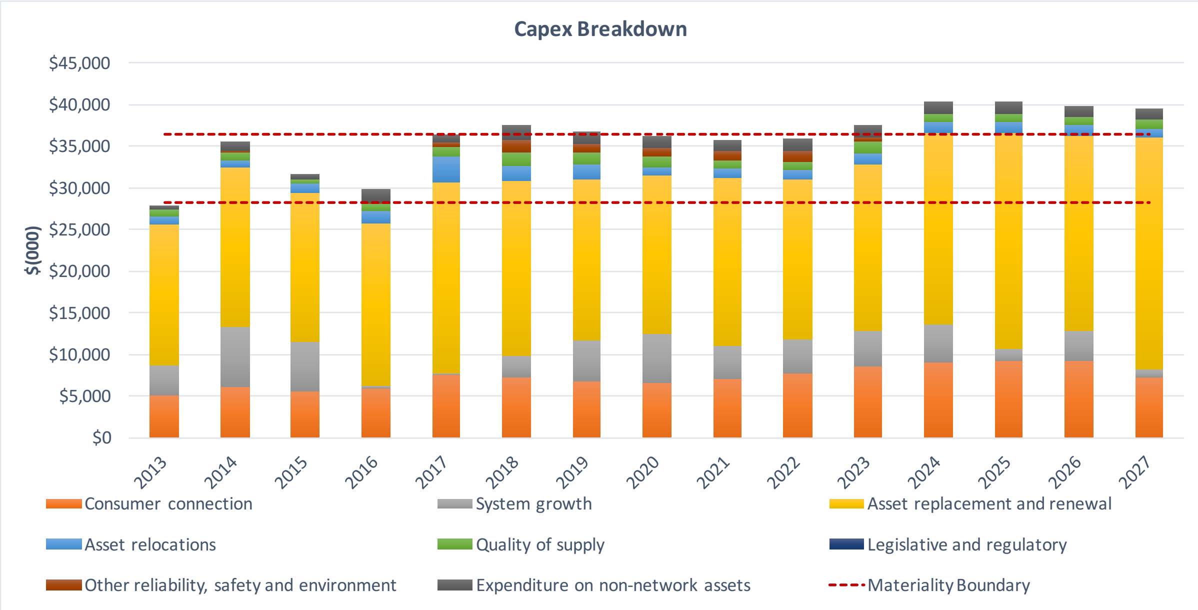


Figure 2

The categories that appear to be contributing most to maintaining forecast capex at or above the upper BAU boundary are consumer connection and system growth. This effect is mainly due to relatively lower actual expenditure levels on these categories in 2016 and 2017.

To identify a potential growth driver for **consumer connection expenditure** we applied the average number of ICPs metric to total expenditure. Figure 3 shows that the increase in total expenditure does not appear to be related to a forecast increase in ICP numbers.
Note, WE only forecast ICP numbers to 2022, for the purposes of assessment, we carried this value forwards to 2027

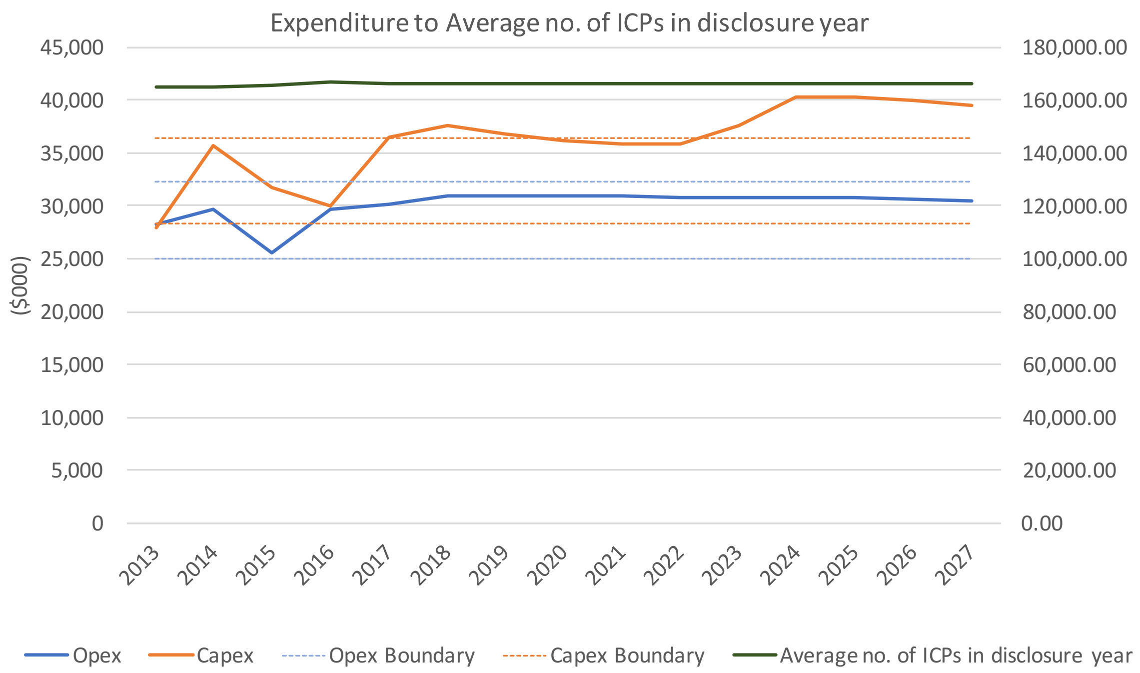


Figure 3

Figure 4 highlights an apparent inconsistency between the consumer connection expenditure forecast for each ICP and the forecast new connections. Such a variation for all forecast years is unlikely to be explained by an increase in unit costs or the change in connection size (i.e. predominantly large new consumer connections). Accordingly, we have been unable to find an explanation in the data to support the BAU forecast expenditure for 2021 as BAU.

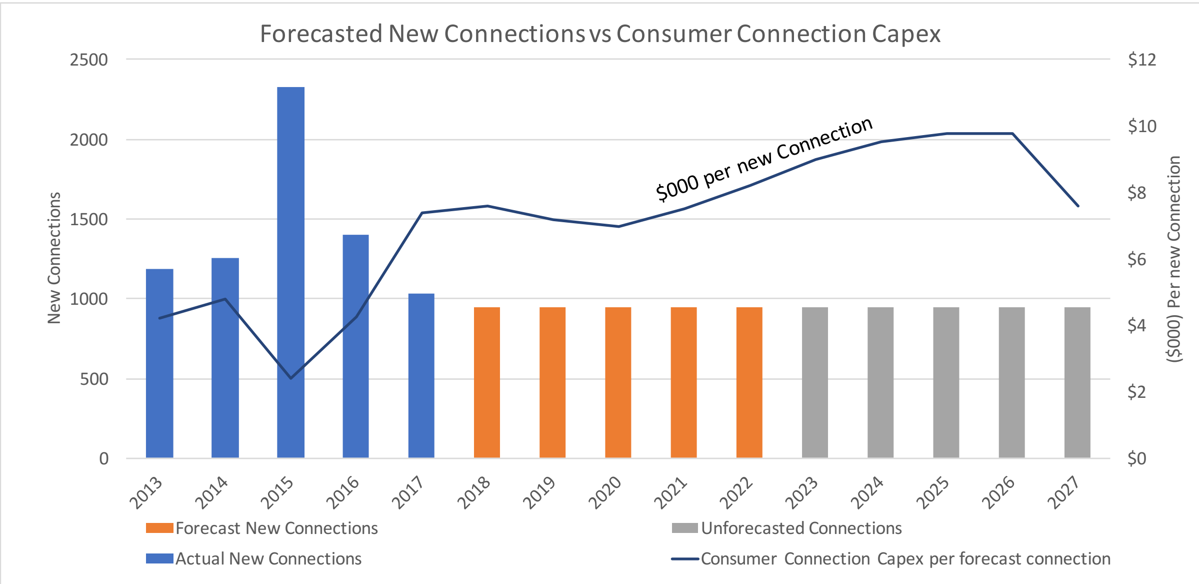


Figure 4 – Grey bars indicate where we have applied WE's 2022 forecast to future years

BAU assessment finding - we have been unable to find an explanation in the data to support the forecast consumer connection expenditure for 2021 as BAU.

For **system growth capex** we applied energy delivered to ICPs, coincident system demand and circuit length metrics to total capex. Figures 5, 6 and 7 provide the results of viewing system growth capex against these metrics.

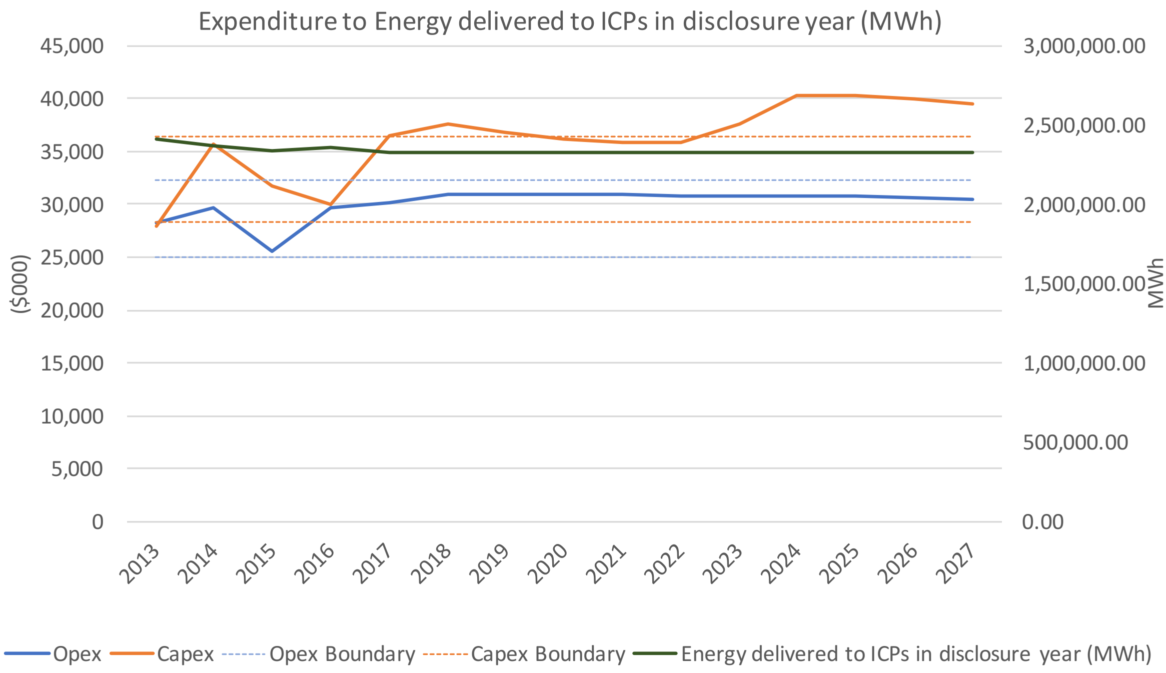


Figure 5

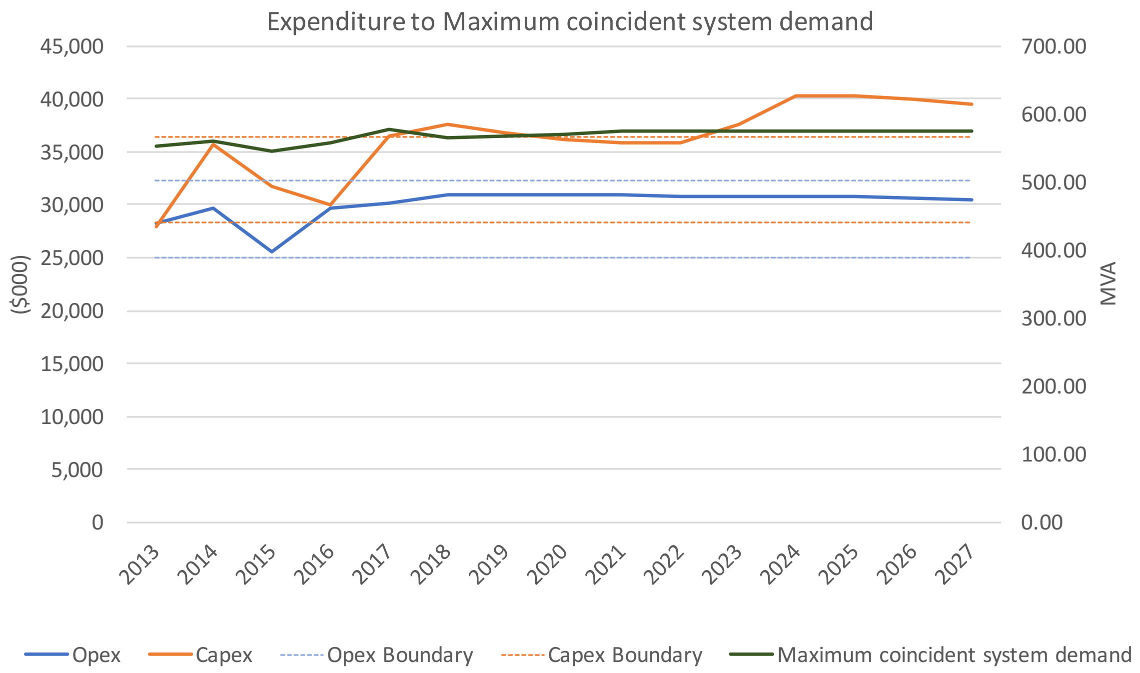


Figure 6

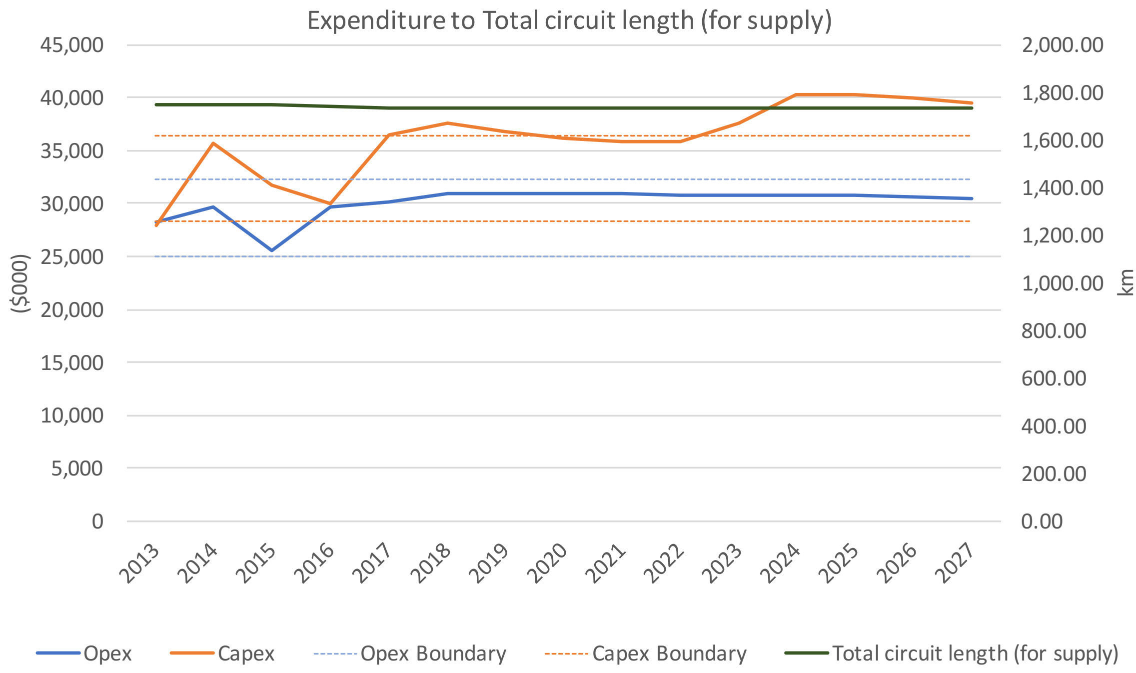


Figure 7

Each of the growth-related metrics showed that, whilst Wellington Electricity is forecasting flat to falling growth drivers, it is forecasting increasing total capex.

Figure 8 provides the breakdown of system growth expenditure. The data indicates that, between 2014 and 2020, Wellington Electricity's focus for system growth capex is on the development of subtransmission capacity. In 2021, the focus changes to zone substations. This could be a return to BAU (e.g. like 2013) following the push to build subtransmission capacity. Whilst this may be true, there is no indication in the data that this is needed to support system growth drivers.

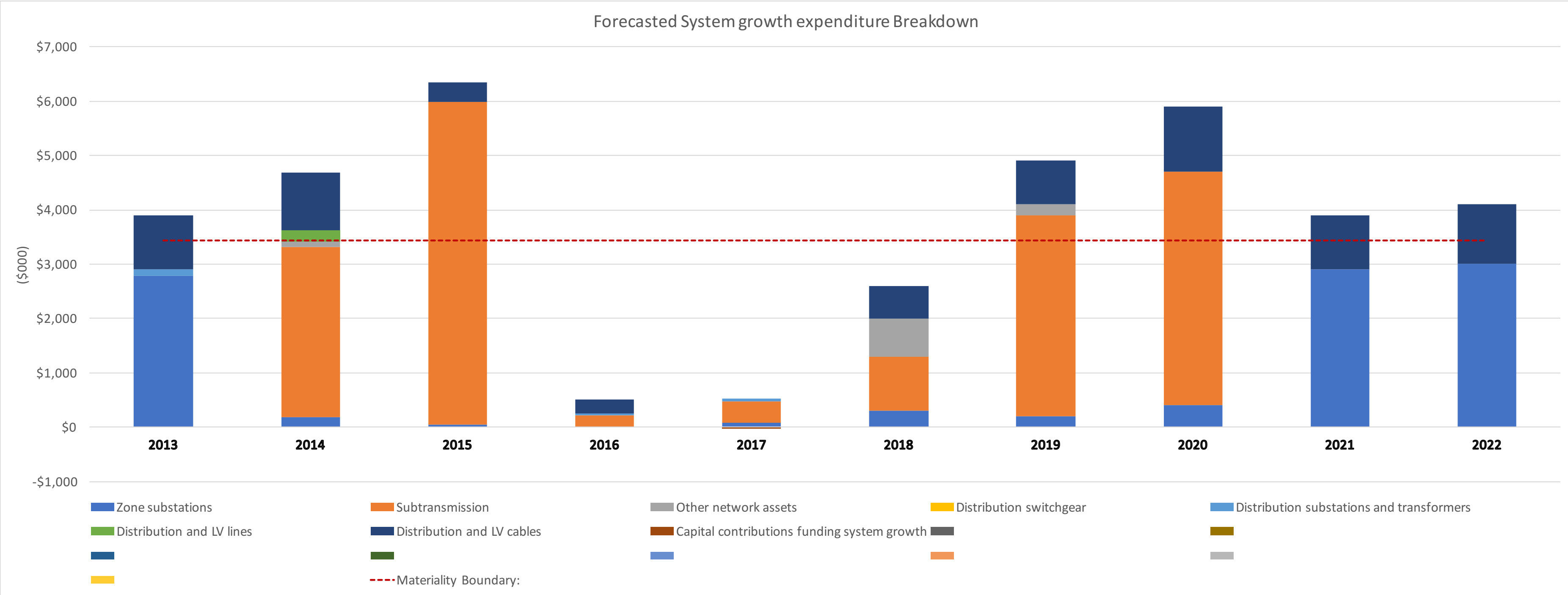

Forecasted System growth expenditure Breakdown
$7,000
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
-$1,000
($000)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Zone substations
Subtransmission
Other network assets
Distribution switchgear
Distribution substations and transformers
Distribution and LV lines
Distribution and LV cables
Capital contributions funding system growth
Materiality Boundary:

Figure 8

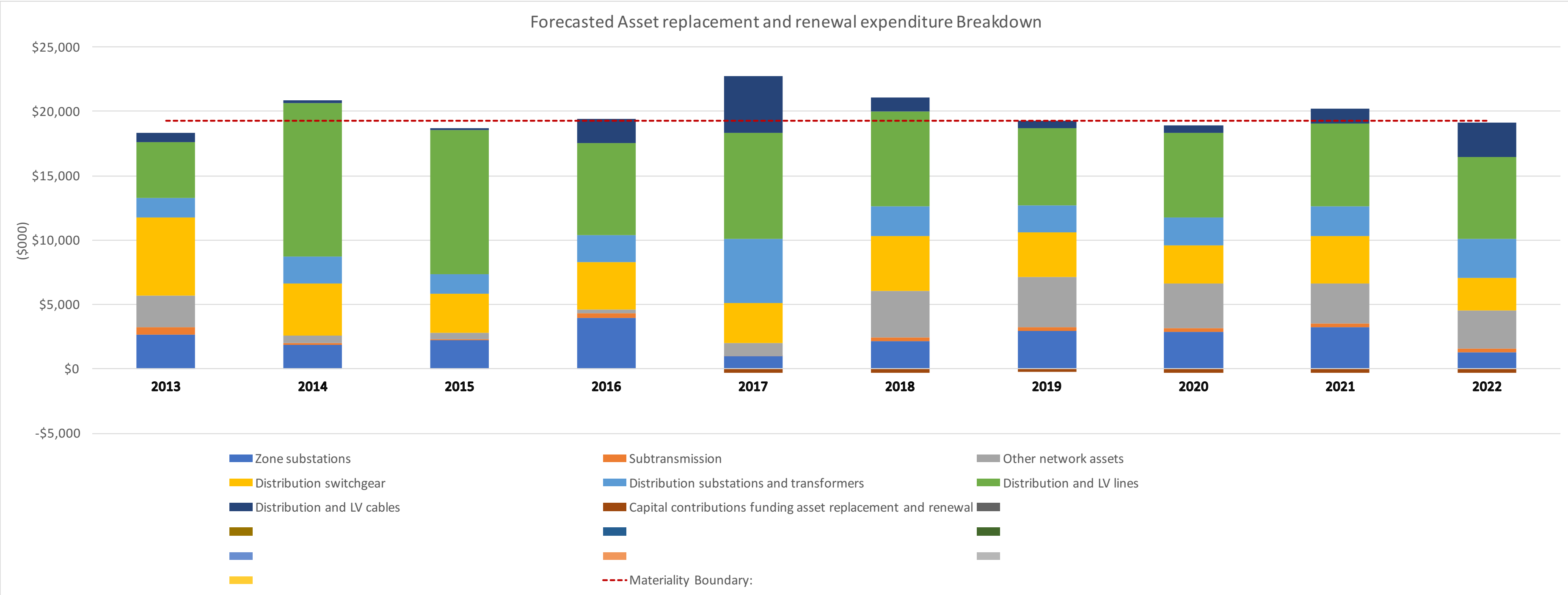
BAU assessment finding - we have been unable to find an explanation in the data to support the forecast system growth expenditure for 2021 as BAU. However, the forecast for 2021 is close to the boundary. Assessment of additional information will be required to support the growth expenditure forecast for 2021 as BAU.

The 2021 capex forecast in Figure 9 shows that the **asset replacement and renewal expenditure** category is above the boundary. This appears to be due to a relatively small forecast increase in distribution switchgear and zone substations. We have reviewed the asset age profiles for these asset categories and confirmed that the expenditure forecast for 2021 aligns with expenditure that would be expected to be incurred against the asset age profiles.

BAU assessment finding – we consider that the asset replacement and renewal forecast for 2021 is consistent with BAU.

Under the other **reliability and environment expenditure** category, the increase in capex for seismic improvement investment can be seen in Figure 10 to commence in 2017 and continue to 2022. This is expenditure on a specific programme and not BAU. However, as 2021 fits within the timeframe for this programme, it can, in our opinion, be considered as consistent with expenditure for a five-year period, and therefore BAU for the period.

BAU assessment finding – the 2021 other reliability and environment expenditure forecast can be considered as BAU.



Forecasted Asset replacement and renewal expenditure Breakdown
$25,000
$20,000
$15,000
$10,000
$5,000
$0
-$5,000
($000)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Zone substations
Subtransmission
Other network assets
Distribution switchgear
Distribution substations and transformers
Distribution and LV lines
Distribution and LV cables
Capital contributions funding asset replacement and renewal
Materiality Boundary:

Figure 9

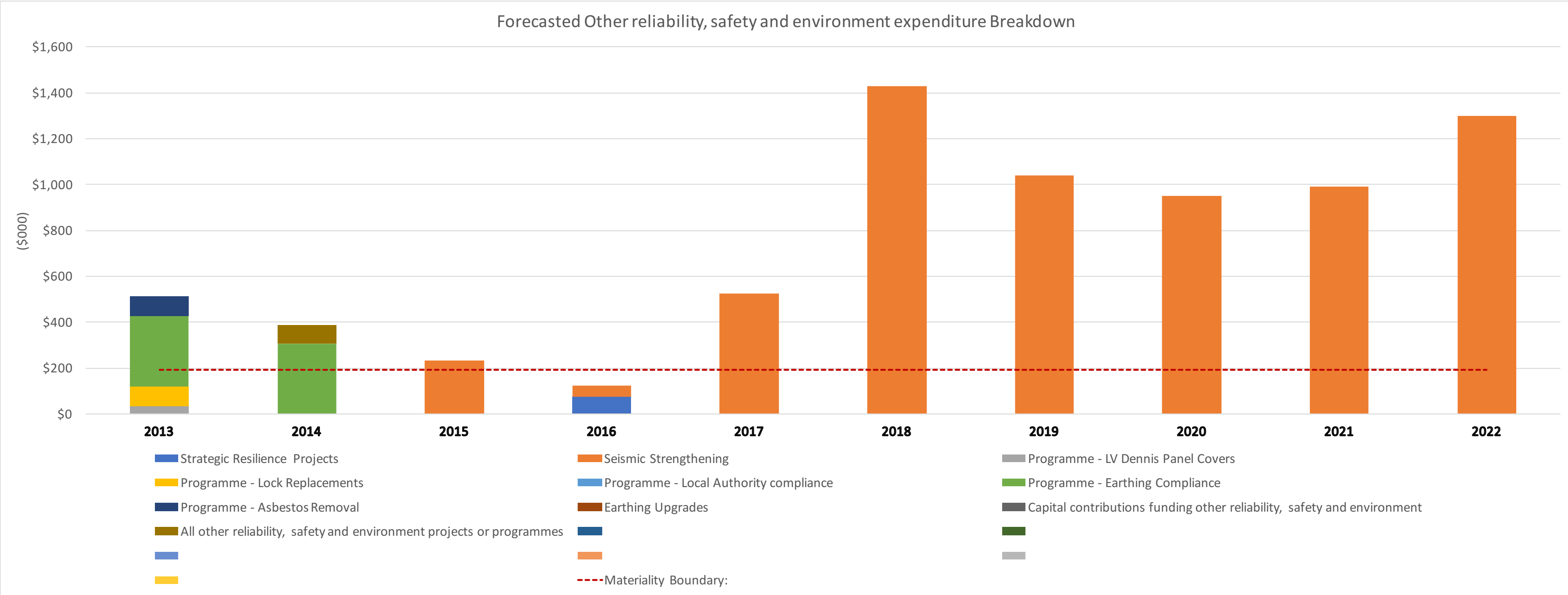

Forecasted Other reliability, safety and environment expenditure Breakdown
($000)
$1,600
$1,400
$1,200
$1,000
$800
$600
$400
$200
$0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Strategic Resilience Projects
Seismic Strengthening
Programme - LV Dennis Panel Covers
Programme - Lock Replacements
Programme - Local Authority compliance
Programme - Earthing Compliance
Programme - Asbestos Removal
Earthing Upgrades
Capital contributions funding other reliability, safety and environment
All other reliability, safety and environment projects or programmes
Materiality Boundary:

Figure 10

Summary of the results of applying BAU variance check

At a total capex level, the forecast from 2018 to 2021 remains close to the maximum of the four previous years' actual capex. The year to year variability in actual capex is not seen in the forecast. Analysis of the data has confirmed that the growth-related forecast capex for 2020/2021 is not supported as BAU based on that data alone.

Accordingly, additional information assessment was undertaken to provide supporting justification for the consumer connection and system growth capex 2020/2021 forecasts to be accepted as BAU.

Summary of the results of AMP information assessment

To seek explanations and supporting justification for the consumer connection and system growth expenditure we reviewed the relevant sections of Wellington Electricity's 2017 Asset Management Plan (AMP). In addition, we reviewed information provided to Strata by Wellington Electricity during the 2015 post breach review.

Consumer Connection capex

In its 2017 AMP, Wellington Electricity forecasts no change in its expectation of consumer connection numbers through to 2027. The step change 34% increase in the cost per connection above the average cost per connection for 2013/16 continues into future years, yet Wellington Electricity are forecasting that annual consumer connections will remain level across all consumer categories (see Figure 11 below).

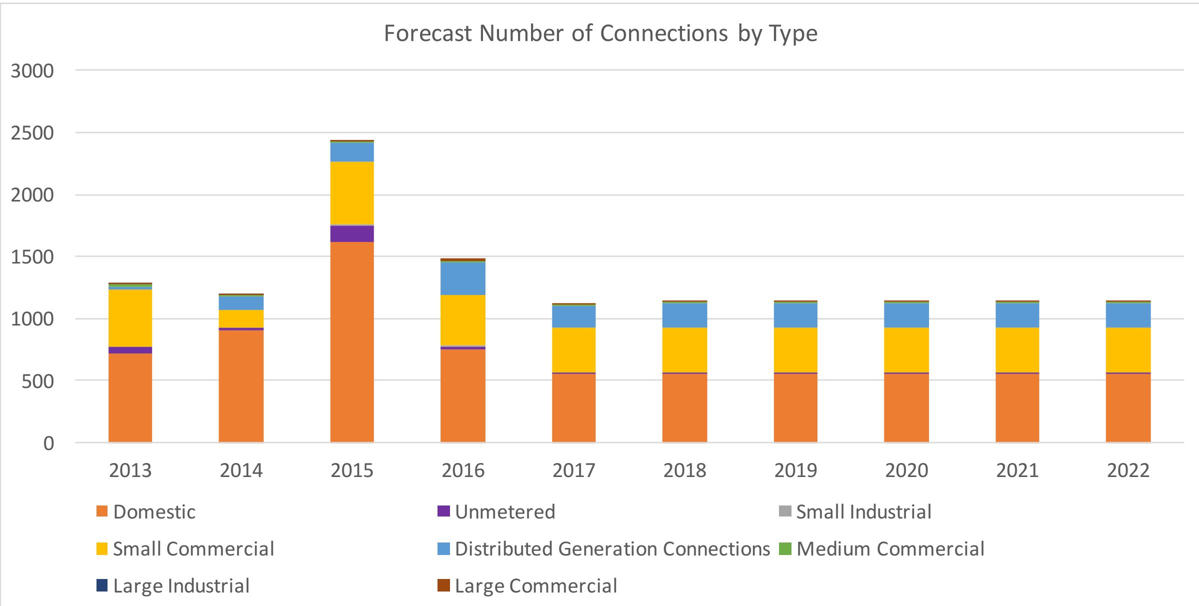


Figure 11

We found no explanation in the 2017 AMP for the 34% increase in the cost of each consumer connection in 2017 above the average of the four preceding years. We found no explanation in the 2017 AMP as to why the increase in 2017 is continued at that level through to 2027 (see Figure 4).

Accordingly, we considered that, for the purposes of setting an appropriate DPP, the consumer capex forecast for 2020/21 is applied at the average of the four years 2013/16. This adjustment will reduce the forecast total capex for 2020/21 by $1.44m. The calculation for this is provided below:

A = Forecast consumer connection capex for 2020/21= $7.103m
B = Average consumer connection capex 2013 to 2014 = $5.663m
C = Proposed adjustment to 2020/21 consumer connection capex

A – B = C
$7.103m - $5.663m = $1.44m

The above values are the forecast total expenditure on customer connection and include contributions that Wellington Electricity receives from customers to cover some of these costs. By using the total customer connection value, we have brought both the Wellington Electricity and customer contributions components back to historical levels. We consider that it is appropriate to adjust the Wellington Electricity and customer contributions values as both are based on the expected number of connections and the average cost per connection.

The Commission should note that the customer contributions component, included in the above calculations, is significant. The numbers excluding customer contributions are:

A = Forecast consumer connection capex (excluding customer contributions) for 2020/21= $1.835m
B = Average consumer connection capex (excluding customer contributions) 2013 to 2014 = $1.597m
C = Proposed adjustment to 2020/21 consumer connection capex

A – B = C
$1.835m - $1.597m = $238,000

Given the relatively low value of the forecast the Commission may consider that it is not sufficiently material to warrant an adjustment.

System growth capex

Section 7 of Wellington Electricity's 2017 AMP provides clear information on the process that it applies to produce its network development plans and the system growth capex forecast.

The subtransmission and distribution security criteria Wellington Electricity uses to assess its network capacity and capability are consistent with the Electricity Engineers' Association Guide for Security of Supply (August 2013)1. At both the subtransmission and distribution level, Wellington Electricity has set and applied its security criteria to a range of load types, e.g. CBD, industrial/commercial, residential). The range of load types used is appropriate for the mix of loads seen in the Wellington region. The security criteria exclude peak demand times on the load duration curve, which demonstrates that Wellington Electricity has applied a risk based approach when setting the criteria.

Section 7.2 of the 2017 AMP provides a detailed description of Wellington Electricity's demand forecast. This includes a description of the forecasting methodology and the

[1] Wellington Electricity 2017 AMP section 7.1.1 page 199

assumptions that have been applied when forming the forecast. Wellington Electricity has considered the uncertainty of demand growth and has applied logical analysis based on knowledge of potential future loads. The methodology is sound and the input assumptions are reasonable.

The key assumptions for the demand forecast are:

- *the use of load control is assumed to remain constant as per current practice;*
- *removal of trolley buses will not have a material impact;*
- *no allowance is made for any significant demand changes due to a major weather events or unforeseen network condition causing significant outages or abnormal operation of the network; and*
- *no significant impact is assumed from disruptive technologies such as PV or distributed generation.*[2]

The following sources of input information used to determine the sustained peak demand forecast are listed in the AMP:

- *half-hourly demand data per zone substation feeder is captured by the SCADA system. The demand at each GXP is metered through the time-of-use revenue metering;*
- *temperature volatility is based on historical temperature data recorded at three NIWA measurement sites based within the three areas of the Wellington network, the Southern, Northwest and Northeast coverage areas;*
- *highly likely or confirmed step change loads, based on consumer connection requests, are included in the forecast;*
- *diversity factors that provide peak coincident demand are calculated from historical recorded data;*
- *typical demand profiles based on the majority load type in the zone; and*
- *population forecasts from Statistics New Zealand are used as a benchmark for comparison with the long-term demand forecast.*[3]

Use of credible and reliable sources of inputs and the use of only highly likely or confirmed step change loads, provide confidence in the reasonableness of the forecast.

The 2017 AMP provides a structured assessment of each of three regions of the network. Table 1 shows the forecast system growth and reinforcement capex in 2020/21 that will be needed for projects in the Southern and North western Areas.

[2] 2017 AMP section 7.2.1.1
[3] 2017 AMP section 7.2.1.1

Category	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Southern Area	1,300	4,100	5,500	400	1,100	1,300	2,200	0	3,000	0
Northwestern Area	1,300	800	0	3,500	3,000	2,500	1,900	1,000	0	0
Northeastern Area	0	0	400	0	0	500	500	500	500	1,000
System Growth & Reinforcement Total	**2,600**	**4,900**	**5,900**	**3,900**	**4,100**	**4,300**	**4,600**	**1,500**	**3,500**	**1,000**

Figure 7-77 Capital Expenditure Forecasts – 2017 to 2027 ($K in constant prices)

Source: Wellington Electricity 2017 AMP section 7.8

For the Southern region, the projects that Wellington Electricity intends to spend capex on in 2020/21 include the projects listed for the two calendar years 2020 and 2021 in the table below.

Year	Project	Estimated cost
2020	Balance loading on Kaiwharawhara bus	$100,000
2020	Bus-tie changeover implementation (3-4 sites per year)	$300,000
2021	Palm Grove 2/3/6 Ring Reinforcement - Stage 1	$1,100,000

Source: Wellington Electricity 2017 AMP Figure 7-36

The system growth capex included in the 2020/21 forecast are components of much larger overarching system development and reinforcement projects in these two regions. The 2017 APM includes a good level of detail on process and analysis that Wellington Electricity has undertaken to form these projects. The information covers the need for the developments and key input information. The discussion on options analysis demonstrates that Wellington Electricity has applied good industry practice planning methodologies.

In the Southern region, the forecast demand growth due to both step change loads and organic growth, investment in the subtransmission and parts of the distribution network will be needed to avoid breaches of the security limits. Wellington Electricity considers two network development options that will resolve the potential constraints. These options are:

- Option 1: Installation of a new zone substation supplied from Central Park GXP with distribution level interconnections to The Terrace, Frederick Street and Palm Grove; and
- Option 2: Augmentation of the existing sub transmission and distribution infrastructure to alleviate constraints and improve transfer capacity.

Option 2 was chosen because it was the most cost effective option and effective at mitigating all the identified issues. It also provided some network balancing benefits.

We consider that the decision framework used by Wellington Electricity to develop and assess the options was appropriate.

For the Northwestern region, the projects that Wellington Electricity intends to spend capex on in 2020/21 include the projects listed for the years 2020 and 2021 in the table below.

Year	Project	Estimated cost
2020	New Pauatahanui Zone Substation – Stage 1	$1,000,000
2020	Reinforce the Porirua CBD Ring - Stage 2	$1,000,000
2020	Replace the Ngauranga Transformers – Stage 1	$1,500,000
2021	New Pauatahanui Zone Substation – Stage 2	$1,000,000
2021	Replace the Ngauranga Transformers – Stage 2	$2,000,000

Source: Wellington Electricity 2017 AMP Figure 7.64

The network development subtransmission projects in the Northwestern region are driven by:

- step change loads that will lead to the security limits being exceeded for part of the load; and
- load growth due to development at residential subdivisions in the Whitby and Aotea area.

At the distribution level, issues requiring investment are those associated with overload of the meshed ring feeder supplying a high number of consumers or links between zones. The links between zones can be for load transfer. An example provided in the 217 AMP is the meshed ring feeder supplying the Porirua CBD which is shown to exceed the security criteria.

As with the Southern region, the options addressing the potential security criteria breaches in the Northern region have been developed as an integrated suite of projects. Non-network and four network options were presented in the 2017 AMP. The option to install a new zone substation in the North and network augmentation in the South was the chosen option because it was calculated to be the most cost effective solution that mitigated the identified issues and optimised network capacity and security of supply.

Summary of findings from the information review

We consider that the forecast for consumer connection capex 2020/21 is not supported because it is not consistent with the forecast number of connections. We found no explanation for this in the 2017 AMP. However, we consider that the reduction excluding customer contributions would not be sufficiently material to warrant an adjustment.

We consider that the process through which Wellington Electricity developed the regional development, described in the 2017 AMP, is sound and the options assessment process is robust.

We have no concerns with the planning criteria applied. Whilst deterministic in nature, it also allows for peak half hours on the load duration curve to remain at risk. A compact network and good distribution-level inter-ties between adjacent zone substations enables this approach.

Forecast demand is at a low level (0.2 – 0.4% pa) and appears appropriate for the modest level of new-technology embedded generation installations that Wellington Electricity is experiencing on the network. Energy efficiency is offsetting underlying organic and step-change demand increases. Therefore, Wellington Electricity's focus remains on security issues.

To address Southern area growth/security issues, Wellington Electricity has taken a holistic overview of sub-transmission and related distribution issues. This approach is appropriate in that it avoids addressing many smaller issues in a piecemeal way. We consider that this is the best way to approach planning in a compact network. The two short-listed options reviewed provided a clear decision in favour of one option. Wellington Electricity has a significant level of projects to complete through to 2025, delivery of the suite of projects may become challenging. It is therefore possible, but not inevitable, that the forecast capex profile may change as some work is deferred. This effect is unlikely to reduce capex in 2020/21 as this year falls in the middle of the high capex period; any deferral of forecast 2020/21 capex would likely be offset by capex deferred from earlier years rolling into 2020/21.

To address North-western growth/security issues, as with the above, Wellington Electricity has taken a holistic overview of sub-transmission and related distribution issues, which again, avoids addressing many smaller issues in a piecemeal way, and is appropriate. Options analysis again appears relevant with a clear decision in favour of one option. As for the Southern region, there are several sub-projects to complete in the period through to 2024 and good programme and project management will be critical to successful delivery.

We noted that whilst there is currently no forecast expenditure for the Northeastern region in the 2017 AMP, Wellington Electricity states that it will develop a plan for that region in 2017. We expect that these projects will be included in the 2018 AMP. This could be an issue for setting a DPP based on the 2017 AMP; however, our relatively high level review suggests that the planning issues in the Northeastern region appear to be lower priority and less complex than the other two areas. Accordingly, and capex projects should be manageable within the DPP based on the 2017 AMP.

Appropriate expenditure allowance for the 2020/2021 year

We recommend that the total capex for 2020/21 is accepted at Wellington Electricity's information disclosure forecast of $29.470m. This value is in 2017 dollars and is exclusive of all customer contributions.

Concluding comments

Thank you for the opportunity to undertake this assessment of Wellington Electricity forecast expenditure. Please contact me if you require any additional information.

Regards

Bill Heaps
Managing Director
Strata Energy Consulting Limited