ELECTRICITY COMMISSION

Acting Chief Executive,
Tonga Power Limited,
Nuku'alofa,
Tonga.

Dear Steven,

ELECTRICITY COMMISSION RESPONSE TO TPL COMMENTS.

As we moving towards the dead line of this reset, Tonga Electricity Commission (TEC) has come up with a list of areas we agreed so far and the outstanding areas/information's we still need to obtained from your good office to complete our checking and computation as well.

Agreed points
We noted that there is now agreement on the following issues:

1. Time period to be set to a period of five years
2. All numbers in TPL Proposal are in nominal terms
3. TPL's demand forecast has been accepted
4. Depreciation periods to be applied as per information provided by TPL
5. Rate of return will be based on a WACC of 8.5% which implies a nominal post tax rate of return 15.53%, after incorporation of inflation and taxes
6. Inflation will be 2.9% per year as per IMF forecast.
7. Renewable energy generation share in line with the government's INDC targets i.e. 50% by 2020 and further towards 70% by 2030.

TEC proposed decisions
With respect to the following points, TEC is minded to decide as follows:

Reliabilities
TPL has indicated in its Progress Report that it has set internal targets as follows:

SAIDI1[1]	-	1,080 minutes per annum
CAIDI2[2]	-	870 minutes per annum
SAIFI3[3]	-	14

Figure 1: Targets applied by TPL. Source: Progress Report January 2020.

It should be mentioned that for CAIDI, TPL has used "minutes per annum" as the dimension whilst this should be "minutes per interruption". For SAIFI, no dimension is provided, but it is assumed that this is "interruptions per year per annum".

The performance for Tonga as a whole was not reported, only for individual islands. In order to arrive at a national figure, the indices for the different islands would need to be weighted by the number of customers. This information was not available. Nevertheless, given the

relatively large size of Tongatapu, the above reported figures can be considered indicative for Tonga as a whole.

The reported performance for Tongatapu the period July 2018 – June 2019 was as follows:[1]

- **SAIDI:** 877
- **CAIDI:** 1179
- **SAIFI:** 10.69

The actual performance as reported by TPL thus seems to be better than the targets currently internally set, except for CAIDI.

It is however observed that there is an internal discrepancy between the three indicators. According to the standard formulas, it should always hold that:[2]

$$SAIDI = SAIFI \times CAIDI$$

When this is applied to the targets and actual performance, the above requirement does not hold. For the targets: $14 \times 870 = 12{,}108 \neq 1{,}080$. Similarly, for the actual performance, $10.69 \times 1178 = 12{,}592 \neq 877$.

Without any further information it is not possible to establish why there is an apparent inconsistency in the indicators used by TPL. This is an issue that should be further investigated before defining the appropriate targets.

Depreciation period 3

TPL had not corrected the depreciation for Period 3 investments as noted by TEC. Therefore, the annual depreciation charges were recomputed by the Independent Expert itself. First, the proposed investments by TPL are shown in Table 1 per category and per year.

Table 1: TPL projected investment in Period 3.

CAPEX		2020-21	2021-22	2022-23	2023-24	2024-25
Generation Capital Expenditure	T$	1,758,125	1,467,837	1,102,000	2,439,721	72,000
Distribution Capital Expenditur	T$	5,105,290	3,983,813	3,606,922	2,457,949	2,684,631
Smart Grid	T$					
Office Computers & Equipment	T$	121,054	124,203	123,814	133,889	119,096
Furniture & Fixtures	T$	3,378	5,490	17,084	5,903	2,970
Tools & Equipment	T$	37,406	61,481	36,646	44,647	120,827
Vehicles	T$	1,090,000	705,000	170,000	185,000	380,000
Other Auxiliary Equipment	T$					
Land & Building	T$	290,000	220,000	50,000	-	-
Renewables	T$	2,097,423	741,600	841,129	448,761	448,761
Total	**T$**	**10,502,677**	**7,309,424**	**5,947,595**	**5,715,870**	**3,828,284**

From the investment summary, the annual depreciation charge per category and per year can be derived. From these annual charges the total depreciation per year can then be established. This is shown in Table 2.

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[1] Progress Report January 2020, p. 9.

[2] See also IEEE, 1366-2012 - IEEE Guide for Electric Power Distribution Reliability Indices.

Table 2: Annual depreciation charge per category and per year for Period 3 investments.

DEPRECIATION			2020-21	2021-22	2022-23	2023-24	2024-25
Generation Capital Expenditure	T$	5.0%	87,906	73,392	55,100	121,986	3,600
Distribution Capital Expenditur	T$	3.3%	170,006	132,661	120,111	81,850	89,398
Smart Grid	T$	8.0%	-	-	-	-	-
Office Computers & Equipment	T$	10.0%	12,105	12,420	12,381	13,389	11,910
Furniture & Fixtures	T$	12.5%	422	686	2,136	738	371
Tools & Equipment	T$	20.0%	7,481	12,296	7,329	8,929	24,165
Vehicles	T$	20.0%	218,002	141,001	34,000	37,000	76,001
Other Auxiliary Equipment	T$	20.0%	-	-	-	-	-
Land & Building	T$	2.0%	5,800	4,400	1,000	-	-
Renewables	T$	3.3%	69,844	24,695	28,010	14,944	14,944
Depreciation for the year	**T$**		**571,567**	**401,552**	**260,066**	**278,836**	**220,389**
Accumulated depreciation	**T$**		**571,567**	**973,119**	**1,233,185**	**1,512,021**	**1,732,410**

It should be mentioned that these computed depreciation charges are based on the version of the investment plan that was presented by TPL. These investments themselves are still to be reviewed in more detail, based on further information to be provided by TPL.

Non-Fuel Opex

TPL had noted that the target development for non-fuel opex has taken place based on the cost items separately and not together. It is accepted that there is some degree of substitution between cost items. Following this the opex targets have been revised by splitting these into two components namely for Generation/Distribution/Retail on the one hand, and Indirect/Corporate on the other hand.

Separate targets are developed for each of these two categories. In doing so, the following approach has been followed:

- For each year, an opex target is defined in terms of USD/MWh:
  - The target for year 2020/21 is set equal to TPL's projections
  - The target for year 2024/25 is set as the average of the benchmarking sample
  - In case TPL's proposal is lower than the target, TPL's proposal is used
- Between 2020/21 and 2024/25 each year the opex target is reduced by a fixed percentage

The Caribbean averages, which acts as the targets, are shown in the following Table.

Table 3: Targets for opex in 2024/25 based on benchmarking results. Amounts in USD per MWh.

Caribbean average			
Generation	USD/MWh	28.86	
Distribution	USD/MWh	15.28	55.03
Retail	USD/MWh	10.89	
Indirect/ Corporate	USD/MWh	36.09	36.09

The resulting targets per year are then derived for each of the two components.

Table 4: Development of opex targets for generation/transmission/distribution.

Opex part 1: Generation, Distrubution, Retail			2020-21	2021-22	2022-23	2023-24	2024-25
TPL Proposal	T$		9,719,174	9,081,888	9,701,298	9,633,252	9,764,255
TPL Proposal	USD/MWh		65.07	57.56	59.83	57.80	57.01
Opex in 2020/21	USD/MWh	65.07					
Target in 2024/25	USD/MWh	55.03					
Annual reduction	%	-4.1%					
Target	USD/MWh		65.07	57.56	59.83	57.38	55.03
Target	T$		9,719,174	9,081,888	9,701,298	9,562,825	9,424,884

Table 3: Development of opex targets for indirect/corporate

Opex part 2: Indirect/Corporate			2020-21	2021-22	2022-23	2023-24	2024-25
TPL Proposal	T$		7,521,268	7,569,693	7,721,087	7,875,509	8,133,019
TPL Proposal	USD/MWh		50.35	47.98	47.61	47.26	47.48
Opex in 2020/21	USD/MWh	50.35					
Target in 2024/25	USD/MWh	36.09					
Annual reduction	%	-8.0%					
Target	USD/MWh		50.35	46.33	42.63	39.23	36.09
Target	T$		7,521,268	7,310,086	6,912,997	6,537,479	6,182,359

A comparison between TPL projections and the targets is shown in Table 6. Overall, the recommended opex is 5.5% lower than TPL's proposed opex for the period.

Table 6: Target development for opex.

Total Opex			2020-21	2021-22	2022-23	2023-24	2024-25
TPL Proposal	T$		17,240,442	16,651,582	17,422,385	17,508,761	17,897,275
Opex Target Recommendation	T$		17,240,442	16,391,974	16,614,295	16,100,304	15,607,243
Difference	T$		-	(259,608)	(808,090)	(1,408,457)	(2,290,032)
Difference	%	-5.5%					

Fuel Efficiency Targets

In its response to the 4.5 kWh/l proposal for fuel efficiency by TEC, TPL mentions the following:

> *"TPL has and will continue to strive for fuel efficiency in its generation operation, and TPL's efficiency target revision is determined to be 4.08kWh per litre of diesel. Please refer to the calculation analysis (refer Appendix A). TPL do not see this improving, even with BESS #1 and 2 installed"*

It is noted that no concrete arguments were provided by TPL on why the target of 4.08 kWh/l is suitable.

Further analysis of TPL's actual diesel efficiency performance was carried out on the basis of the most recent available Progress Report from January 2020. The performance data submitted by TPL are shown in Figure 1. As can be seen the performance in the period July 2018 till January 2020 has been hovering around an average, which was computed to be 4.5 kWh/l. If a more recent period of the year 2019 is considered, the average would be 4.51 kWh/l.

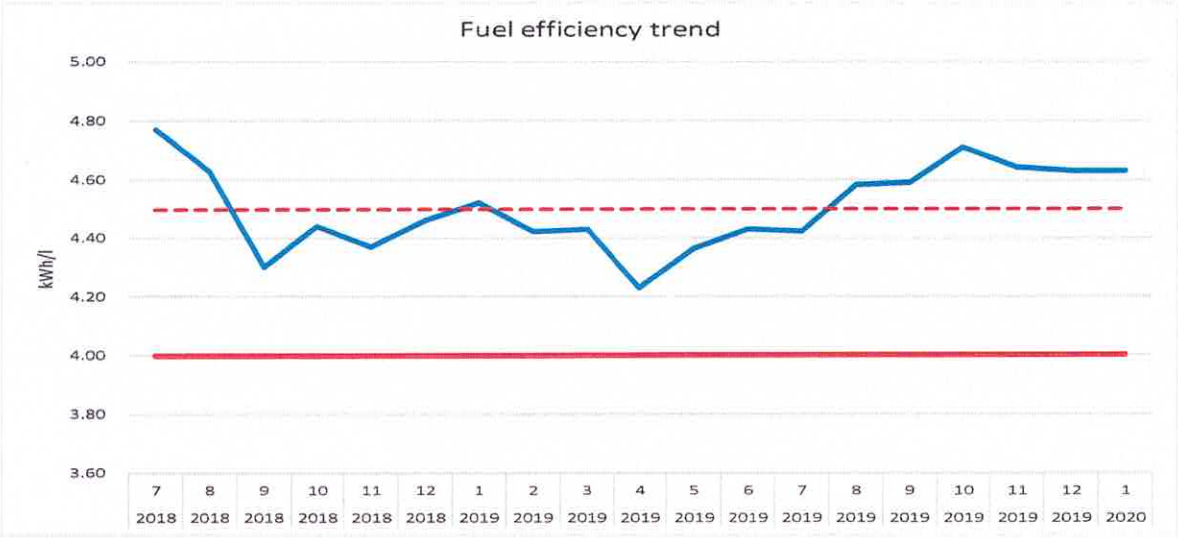

Figure 1: Actual fuel efficiency achieved by TPL (source: TPL Progress Report for January 2020, 27 March 2020). For reference the current target (4.0 kWh/l) and recommended target (4.5 kWh/l) are also shown.

On the basis of the actual performance data, a target of 4.5 kWh/l seems to be suitable. This is a level that has before already been achieved by TPL. If a lower level were to be adopted, then this would mean that TPL would be performing structurally better than this target, and hence receive financial benefits simply due to the fact that the performance target would not reflect a realistic level of performance.

Parasitic Losses Targets

TPL indicated that it considers a total level of parasitic losses to be 11.5%. This number consists of line losses, generation losses, and battery losses. Implicitly thus TPL has proposed a level of 1.5% for the additional battery losses due to increased introduction of RE.
In its Proposals, TPL had initially proposed a figure of 1.8% for battery losses. The updated proposal of 1.5% can be considered reasonable. It is a fact that due to increase RE the use of batteries will be necessary in order to assure system stability given the relatively small size of the Tonga power system. An increase of 1.5% (from 10% to 11.5%) due to batteries is in line with international experiences and as such acceptable.

Information Request

In order to further inform TEC's decision-making process, we ask to provide the following information:

1. Reliability performance (SAIDI, CAIDI, SAIFI)

    - Can you please provide the underlying data that was used to report the reliability indicators in the Progress Reports. For example, the underlying spreadsheets.

    - What are the formulas/definitions used by TPL in the reporting of the indicators? For example, a specific document or international standard.

    - Can you please explain why in your reported figures as well as mentioned targets (see Progress Reports), it does not hold that SAIDI = SAIFI x CAIDI, as per the standard definition of the indicators according to IEEE (IEEE, 1366-2012 - IEEE Guide for Electric Power Distribution Reliability Indices). For reference, I also attach this IEEE standard.

- Insofar the definitions applied by TPL are not in line with IEEE 1366, are you willing to discuss options to do so in future?

2. Investment

   - As mentioned in your response you would provide background information on the investment plan of TPL. Can you please provide this information?

   - Can you confirm that any investment which is financed through grants or similar sources (i.e. without bearing any interest or repayment obligation), is not included in the proposed investment plan?

   - Can you please provide a list of these above investments: type, date of construction, amount, financing source?

3. Fuel efficiency

   - In your response document you mention on page 23: "Please refer to the calculation analysis (refer Appendix A)." It is not clear to what Appendix A you refer. Can you please provide these separately?

4. Parasitic losses

   - In your response document you mention on page 27: "TPL would appreciate EC's endorsement of the calculation method Figure 1 and Table 7." It is not clear to what Figure/Table you refer. Can you please provide these separately?

   - For the line losses, historical performance has in some cases been down to 5%. Can you please explain the wide variation in line losses.

   - Can you please provide additional analysis on why 1.5% battery losses are appropriate? For example, did TPL conduct any simulations or load flow analysis?

We kindly ask that you provide the above information **one week** after the reception of this request.

Teleconference with independent expert

We kindly ask if you are available on Wednesday 27 May to conduct a teleconference call with the independent expert. The topics for discussion are the above points mentioned under the data request.

Yours faithfully,

ELECTRICITY COMMISSION
KINGDOM OF TONGA

Kilisimasi Ma'asi,
Acting CEO,
Electricity Commission.