

Final Report

INDEPENDENT EXPERT'S REVIEW OF INITIAL DEISION IN ANNUAL RATE PROCEEDINGS (ELECTRICITY)

SUBMITTED TO:

Public Utilities Commission (BELIZE)

Belize Electricity Limied

SUBMITTED BY:

Dr. Virendra Ajodhia

08 September 2020

Contents

1. INTRODUCTION	3
1.1. BACKGROUND.....	3
1.2. SCOPE OF THE INDEPENDENT REVIEW	3
1.3. APPROACH OF THE INDEPENDENT REVIEW	4
1. OBJECTION 1A: ROUTINE INVESTMENTS IN STANDARDS AND SAFETY	6
1.1. BEL'S OBJECTION	6
1.2. EVALUATION	6
1.3. CONCLUSION	7
2. OBJECTION 1B: INVESTMENT IN SMART GRID	8
2.1. BEL'S OBJECTION	8
2.2. EVALUATION	8
2.3. CONCLUSION	9
3. OBJECTION 1C: INVESTMENT IN DEMOCRACIA-DANGRIGA LINE	10
3.1. BEL'S OBJECTION	10
3.2. EVALUATION	10
3.3. CONCLUSION	11
4. OBJECTION 1D: INVESTMENT IN BECOL INTERCONNECTION	12
4.1. BEL'S OBJECTION	12
4.2. REVIEW – PV PENETRATION RATE	12
4.3. REVIEW – BECOL INTERCONNECTION	13
4.4. CONCLUSION	14
5. OBJECTION 1E: INVESTMENT IN MEXICO LINE	16
5.1. BEL'S OBJECTION	16
5.2. EVALUATION	16

5.3.	CONCLUSION	17
6.	OBJECTION 2: COST OF POWER.....	18
6.1.	BEL'S OBJECTION	18
6.2.	EVALUATION - REGULATORY FRAMEWORK.....	18
6.3.	EVALUATION - ENERGY MIX.....	19
6.4.	CONCLUSION	23
7.	OBJECTION 3: PERFORMANCE BASED REGULATION	24
7.1.	DESCRIPTION OF THE OBJECTION.....	24
7.2.	EVALUATION - CONSULTATION	24
7.3.	EVALUATION - SPECIFICATION OF THE PBR SCHEME.....	25
7.4.	CONCLUSION	27
8.	CONCLUSION AND RECOMMENDATIONS.....	28

1. INTRODUCTION

1.1. Background

The Public Utilities Commission of Belize (PUC) is currently conducting a Full Tariff Review Proceeding (FTRP) for the determination of Regulated Values and Tariffs, Fees and Charges and a Mean Electricity Rate (MER) for Belize Electricity Limited (BEL) for the Full Tariff Period (FTP) of July 1, 2020, to June 30, 2024.

BEL presented its Submission to the PUC on 22 January 2020. PUC issued its Initial Decision on 6 March 2020 which consisted of a number of adjustments to BEL's proposals.¹ On 20 March 2020 BEL provided a series of objections on the PUC's Initial Decision.

As per the Electricity (Tariffs, Fees and Charges) Byelaws, in such a case the PUC is required to appoint an Independent Expert. Dr. Viren Ajodhia was consequently appointed as the Independent Expert on 11 August 2020. This Final Report presents the results of the Independent Review.

1.2. Scope of the Independent Review

The RFP mentioned a number of objections brought forward by BEL that are subject to this independent review:

- *III. Regulated Asset Value (RAV) for 2020-24 FTP: BEL objected to the PUC (a) deferring "consideration of BEL investments for interconnecting 30 MW of utility solar pending further analysis"; (b) deferring consideration of BEL's proposal to construct a 2nd transmission line between La Democracia and Dangriga pending an appropriate analysis"; (c) deferring "consideration of communications and smart grid technology*

¹ For reference, details about the PUC's Initial Decisions can be found in the document titled "Comments Related to Initial Decision Issued by the Commission in Respect of the 2020 Full Tariff Review Proceeding (FTRP) for Belize Electricity Limited (BEL)".

investments pending a cost/benefit analysis”; (d) removing “approximately \$10.2 MN of capital expenditures related to standards and safety investments in the distribution network”; (e) introducing “a \$60 MN investment to construct a second transmission line from Mexico, with a \$10 MN provision for grant financing from the Inter-American Development Bank”.

- *IV. Reference Cost of Power (R-COP) for 2020-24 FTP: BEL objected to the PUC (a) increasing “the forecasted supply from Hydro Maya, BELCOGEN and SSEL”; (b) reducing “forecast for supply from solar facilities pending consultation”; (c) reducing “the forecast power purchase price for CFE and gaseous fuel generation”; (d) increasing “the quantities sourced from CFE in 2020 and 2021 and gaseous fuel generation in 2022 through to 2024”.*
- *V. Performance-based Regulation (PBR): BEL objected to the PUC’s stated intention to introduce PBR for Economic Dispatching commencing the 2020-24 FTP.*

1.3. Approach of the Independent Review

The purpose of the review is to provide an objective and unbiased opinion about the objections brought forward by BEL. The basis for the review consists of two main elements namely (1) the requirements set forward by the regulatory framework in Belize, and (2) where applicable, the international principles of best-practice regulation.

It should be noted that the nature of this review is not the resolution of a dispute between the PUC and BEL. That is, it is not to be interpreted as a mediation or arbitration exercise. Rather, the purpose is to present a professional and independent view of the objections raised by BEL. The outcome of the review is then to be used by the PUC in its further decision-making process regarding the FTRP.

For the purpose of the review, BEL’s objections have been structured as follow:

- 1A: Routine Investments in Standards & Safety
- 1B: Investment in Smart grid
- 1C: Investment in Democracia-Dangriga line

- 1D: Investment in BECOL interconnection
- 1E: Investment in Mexico line
- 2: Cost of Power
- 3: Performance Based Regulation

In the next sections, each of BEL's objections are reviewed in turn.

1. OBJECTION 1A: ROUTINE INVESTMENTS IN STANDARDS AND SAFETY

1.1. BEL's objection

BEL had proposed an investment amount of 10.2 million BZD related to system improvements for the purpose of meeting standards and safety. These investments were identified in BEL's capex projections under the header "Standards & safety investment in the distribution network". PUC had rejected these investments in its Initial Decision.

1.2. Evaluation

BEL has indicated that *"the PUC furnished no justification in their written comments or at the public hearing held to explain their initial decision"*. As far as could be identified, the PUC indeed did not provide any arguments on why these investments were rejected.

On the other hand, BEL in its submission also did not provide any background or justification for this investment. The said investment was included in the table of Schedule 5 of BEL's submission² which included all of BEL's proposed investments. No further background information was however provided apart from the header "Distribution – Standards & Safety Improvements".

From the header "Standards & Safety Improvements" it could be derived that these investments will allow BEL to improve the safety of the system and meet pre-specified standards. However, which safety standards are to be met and which measures exactly are to be carried out is unclear. Also, no motivations are provided whether the proposed measures will in fact achieve these purposes, and whether these measures are indeed the best feasible alternative.

² BEL Submission letter of 22 January 2020, Schedule 5.

The PUC indicated in a communication³ to the Independent Expert that *“the PUC is willing to reconsider the BZ 10.2 million for system improvement for the purpose of meeting standards of safety, provided BEL provides a proper CAPEX justification as it the norm”*.

On the other hand, BEL indicated in its response to the Fact-Finding Report, that “these investments are routine replacement costs and the budget forecast is based on historical costs as well as BEL’s annual distribution line inspection program. We can supply the financials showing that this sum tracks with historical investment trends.

1.3. Conclusion

It is the Independent Expert’s opinion that any proposed capex to be included in the tariffs should be properly motivated. In that regard the PUC’s willingness to reconsider the investment but only after proper motivation is in line with regulatory best-practice. Furthermore, BEL has indicated its willingness to provide the necessary justification for the investment.

The following recommendations are made:

- BEL develops the appropriate documentation and analysis to justify these routine investments in standards and safety;
- Anticipating this analysis, the PUC allows these investment cost for these routine investments in standards and safety to be provisionally included in the rates;
- In the case that the study results are unsatisfactorily, the PUC removes the provisionally allowed investment through an adjustment in the Regulatory Account Balance.

³ Comments related to the IE Fact Finding Report in respect of the Full Tariff Review Proceeding (FTRP) for Belize Electricity Limited (BEL), received through email on 28 August 2020.

2. OBJECTION 1B: INVESTMENT IN SMART GRID

2.1. BEL's objection

BEL has included an investment of 16.5 million BZD in network communications (further referred to as "Smart Grid"). In its Initial Decision the PUC has deferred the consideration of this investment pending a report on an appropriate analysis to determine the comprehensive cost/benefit attributes.

2.2. Evaluation

In response to queries from the PUC, BEL provided some additional information on the proposed smart grid investment.⁴ Review however indicated that the information cannot be considered sufficient for the PUC to make a determination on whether or not to allow the investment.

At the same time, it is noted that BEL mentioned in the above-mentioned response to the PUC also that:

"Internally, the Company was able to conclude a cursory cost-benefit analysis (CBA) for AMI deployment countrywide and is in the process of contracting international consultants to complete a more detailed CBA in the context of BEL's Smart Grid requirements."⁵

From this it can be concluded that BEL is presently still in the process of finalizing the cost benefit analysis. This is to be based, among others, on the pilot project in Caye Caulker. It is only after such analysis that the economics of investment in other parts of the grid could be justified. In that regard, it is important that the results of this study are produced first, after which the PUC can make a final determination on the inclusion of the investment.

⁴ Response to Queries FTRP 2020|2024, February 20, 2020, p. 2-4.

⁵ Idem, p. 3.

2.3. Conclusion

It is the Independent Expert's opinion that any proposed capex to be included in the tariffs should be properly motivated.

The following recommendations are made:

- BEL develops the appropriate documentation and analysis to justify the extension of the pilot project to the greater system. Notably, BEL has already developed the RFP for this study;
- Anticipating this analysis, the PUC allows the cost of the smart grid investment to be provisionally included in the rates;
- In the case that the study results are unsatisfactorily, the PUC removes the provisionally allowed investment through an adjustment in the Regulatory Account Balance.

3. OBJECTION 1C: INVESTMENT IN DEMOCRACIA-DANGRIGA LINE

3.1. BEL's objection

BEL included an investment of 20 million BZD to build a second transmission line between La Democracia and Dangriga. This line is intended to enhance the power transfer capacity to southern Belize and accommodate supply from a 25 MW LPG plant that will come on stream by the close of 2022. The PUC deferred consideration of the investment of the second transmission line, pending a report on an appropriate analysis to determine its need.

3.2. Evaluation

BEL indicated two arguments for constructing the new transmission line. First, the need to interconnect the new 25 MW plant. According to BEL, the PUC indicated that the existing line (further referred to as 62L) has sufficient capacity to accommodate this. BEL did not dispute this but argued that the reason for a new line is necessary improvement in reliability.

To support this claim, BEL provided statistical data on 62L outages. From this information, it could be confirmed that the frequency of interruptions occurring in 62L is much higher than other lines (average of 9.5 outages per year for 62L versus 1.5 for other lines).

Further it is noted that introducing the new line will also reduce network losses. With the presence of two lines, the loading per line will reduce and hence losses will be lower. Also, if a higher voltage level is chosen, this will further reduce losses.

There are thus two main benefits stemming from the second line namely increased reliability and reduced losses. Whether these benefits, when expressed in monetary terms, would exceed the cost of the line is however still to be determined. From experience it is the Independent Expert's opinion that this is likely to be the case. However, this is only a *prima facie* observation and further quantitative analysis is needed to confirm this. Such evidence could be in the form of a detailed network study.

BEL provided the results of the DNV GL study⁶ in which the modeling of the new transmission line was also incorporated. This study however only focused on the issue of thermal limits under different scenarios. The Independent Expert was informed that a follow-up report is to be issued by DNVGL, where the economic aspects will also be included. This report is expected to become available within a few weeks.

3.3. Conclusion

It is the Independent Expert's opinion that any proposed capex to be included in the tariffs should be properly motivated.

The following recommendations are made:

- BEL develops the appropriate documentation and analysis to justify the second transmission line;
- Anticipating this analysis, the PUC allows the investment cost of the second line provisionally included in the rates;
- In the case that the study results are unsatisfactorily, the PUC removes the provisionally allowed investment through an adjustment in the Regulatory Account Balance.

⁶ DNV GL, Belize PV Penetration Assessment. Phase I - Technical Feasibility Assessment, 1 September 2020.

4. OBJECTION 1D: INVESTMENT IN BECOL INTERCONNECTION

4.1. BEL's objection

BEL had included investment of interconnecting 30 MW of utility solar to the grid. The Commission deferred this investment, pending BEL's undertaking to hire a consultant to advise on the take-up of such generation.

4.2. Review – PV Penetration rate

Based on the information collected by the Independent Expert, the differences in view between the PUC and BEL is the following:

- Whether the penetration level of PV in the system is limited to 20 MW (PUC view) or 45 MW (BEL view);
- Assuming this is 45 MW, specifically then whether this should then include 30 MW to be procured from BECOL as 20MW near La Democracia Village (Belize District) and 10 MW near Chalillo Dam (Cayo District).
- The extent to which one can introduce renewable energy sources into the system is limited due to the intermittent nature of such generation sources. If the RE penetration is too high, this can cause stability issues. The PUC's view is that the extent to which the national grid can absorb renewable energy resources (particularly PV) is limited to a maximum of 20 MW split between 15 MW utility level and 5 MW distributed. This view stems from a previous consultancy study.

BEL's position is that the 20 MW amount is incorrect as this does not consider the fact that the BEL grid is connected to Mexico, and hence part of a larger and more stable network system. BEL's position is that the grid should be able to accommodate more and in particular an amount of 45 MW.

For this purpose, BEL had initiated a system study by DNV GL⁷ to investigate the impact of the introduction of 45 MW of PV into the grid. The study adopted a planning horizon of five years and considered four different scenarios. The study result is that, with the exception of some minor local issues (which can be addressed without significant reinforcement of the system), all of the scenarios are technically feasible.

From the DNVGL report it can thus be concluded that the BEL grid is able to accommodate more than the 20 MW assumed by the PUC. It is the Independent Expert's view therefore that there is no reason not to allow cost for the interconnection of PV capacity to the BEL system.

4.3. Review – BECOL interconnection

Given that the DNV GL study shows that PV penetration can be extended up to 45 MW, the next question is whether this should then include 30 MW to be procured from BECOL as 20MW near La Democracia Village (Belize District) and 10 MW near Chalillo Dam (Cayo District). The PUC indicated that there are a number of issues with this:

First, BECOL does not have a licence for the supply of the 30 MW PV. BECOL only has a permit to supply hydroelectricity to BEL, but this falls under arrangements with the government that were made prior to the establishment of the PUC.

Second, the PUC notes that there has been no competitive process through which BECOL was selected. Therefore, no cost can be approved for that specific interconnection.

It is the Independent Expert's view that the fact that BECOL presently has no licence, is not an argument to reject the investment to interconnect. Such a licence could be issued to BECOL by the PUC after the PUC is of the opinion that all applicable conditions have been met.

On the other hand, it is also true that the PUC is responsible for promoting competition in the generation and supply of electricity (Section 6(2) of the Electricity Act).

⁷ DNV GL, Belize PV Penetration Assessment. Phase I - Technical Feasibility Assessment, 1 September 2020.

It is therefore important to clearly distinguish two separate issues: (1) Should BEL be allowed an investment for the interconnection of new PV capacity *in general*, and (2) should that interconnection cost be associated with BECOL *in particular*.

It is the Independent Expert's view that the first question should be answered in the positive. Given that it is confirmed that the grid can accommodate 45 MW of PV capacity, there is no reason not to allow BEL to interconnect such PV capacity.

The second question on the other hand is to be answered in the negative. There are no arguments to assume that, if there is to be a PV interconnection, this then should be specifically with BECOL for 30 MW proposed as 20MW near La Democracia Village (Belize District) and 10 MW near Chalillo Dam (Cayo District). Given that there has been no competitive bidding process (yet) it would be premature to assume that BECOL would be selected as the supplier of PV energy rather than some other entity, who could also possibly be located at some other location.

In fact, the DNV GL study also does not indicate that there are any specific advantages to locate the interconnection at the BEL proposed sites. It is not excluded that such advantages may exist, but this then needs to be investigated and proven in the second phase of the DNV GL study.

4.4. Conclusion

It is the Independent Expert's view that there are no reasons not to allow BEL the cost of PV interconnection. However, such allowances should be in general and not targeted at a specific PV supplier, as long as the optimal location and sizing as well as selection of the bidder through a competitive process is still pending.

The following recommendations are made:

- BEL finalizes the DNV GL study in order to identify the technical/economical optimal location for connecting PV;
- BEL undertakes a competitive bidding process to select the successful bidder(s) after which the applicable licenses and permits are issued by the PUC, and the interconnection is constructed;

- Anticipating the above process, the PUC allows the investment cost of the PV interconnection to be included in the rates.

5. OBJECTION 1E: INVESTMENT IN MEXICO LINE

5.1. BEL's objection

The PUC introduced a 60 million BZD investment to construct a second transmission line from Mexico, with a 10 million BZD provision for grant funding from the Inter-American Development Bank (IADB).

5.2. Evaluation

BEL stated in its Objections that:

“the energy imports from CFE maximally serve the country’s energy needs when market prices are low and BEL can capitalize on the imports as a cost savings opportunity. As such, it agrees that a second line to Mexico is useful but not urgent compared to building in-country generation. This investment can be deferred to the next business cycle/FTP.”

From this it can be concluded that BEL has no principle objections against the construction of the second transmission line, but rather does not consider this to be a priority. Instead, BEL prioritizes the addition of indigenous PV to the system. BEL however does not provide any arguments why the second Mexico line is not a priority. In particular, given that the financial resources to undertake the investment are available as these are to be allowed by the PUC.

At the same time, it is uncommon for regulators to “impose” certain investments on the utility. This issue was therefore further investigated by the Independent Expert. The PUC indicated that the transmission line should be viewed from a national development perspective. The line will result in opening up the West-South corridor and introduce a North-West access road. The transmission line is thus not only relevant in the context of electricity but has a broader development dimension. This is also guided by Government policy, which the PUC aims to embed into BEL’s investment planning.

Furthermore, BEL’s has not objected to the introduction of the second line per se, but rather the timing of this. The argument that the priority should be on indigenous PV does not hold as PV and the second transmission line are not mutually excluding alternatives. Rather on the

contrary, increased connection size with Mexico will allow for even further penetration of PV in the BEL system.

5.3. Conclusion

It is the Independent Expert's view that it is appropriate for the PUC to include the investment of the second Mexico line given that (1) there are national policy considerations for building the new transmission line and (2) BEL will be provided the financial resources anyhow.

It is therefore recommended that:

- The cost (after netting for applicable capital contributions) of the second Mexico transmission line is included in BEL's investment program

6. OBJECTION 2: COST OF POWER

6.1. BEL's objection

BEL had submitted a projection for the COP of around 730 million BZD during the next FTP. The PUC revised this forecast downwards by a total of 59 million BZD; this constitutes a reduction of around 8%. This adjustment is the combined effect of (1) adjustment of generation volumes by Hydro Maya, BELCOGEN, and SSEL, (2) reduction of solar generation, (3) adjustment in CFE volumes and prices, and (4) adjustments in fuel generation volumes and prices.

6.2. Evaluation - Regulatory framework

The framework under which BEL is regulated by the PUC allows BEL to be remunerated all the cost it incurs in producing or purchasing electricity. The Tariff Byelaw Section 15(1) requires that forecast for the COP should be made during the FTRP. In practice, the outturn COP will of course be different from the forecast. Therefore, Tariff Byelaw Section 28(2) specifies that such forecast differences are corrected for during an Annual Tariff Review Proceeding (ATRP). Furthermore, Section 15(2) of the Tariff Byelaw specifies that any balance as of the commencement of the FTP shall be reduced to zero as of the termination of the FTP.

The basic logic of the COP mechanism thus is to first develop a forecast and then after the fact adjust future forecasts to make up as much as possible for previous differences between forecast and outturn COP. As such, the COP mechanism is intended to be a continuously self-correcting mechanism.

Previously, differences between the forecast and outturn COP were entered into a Cost of Power Rate Stabilization Account (the "CPRSA"). In practice, the CPRSA is no longer being used and the reconciliation is done between the forecasted Revenue Requirement and Actual Revenues. Internally within BEL the term "Regulatory Account Balance" is used to reflect these differences.

As the Regulatory Account Balance is targeted to be reduced to zero, forecast errors are in principle relevant only in the sense that they affect BEL's working capital requirements. If forecasts are too optimistic (COP turns out to be higher) then this will increase BEL's working

capital cost. Conversely, too pessimistic forecasts (COP turns out to be lower) result in lower working capital requirements for BEL.

In theory the balance should be expected to dynamically fluctuate around zero. However, according to BEL data by June 2020 the FTP 2016-2020 balance stood at 53.6 million BZD. From this it can be concluded that the requirement from the Byelaw to continuously correct for forecast errors is not met in practice.

It is to be noted that historical trends that have resulted in the present balance are not subject of the review here. The balance of 53.6 million BZD is a “legacy issue” that will need to be resolved separately and in principle does not play a role in the review of the COP forecasts.

A general recommendation is however in place that the PUC and BEL should work towards the gradual reduction of this balance over time. Clearly, any reduction in the balance will result in a tariff increase. The higher the balance, the higher the tariff increase and therefore the more the socio-political reluctance to do so. At the same time however this in turn results in an ever-increasing balance and hence the risk of entering a viscous circle of ever-increasing balance and reluctance.

6.3. Evaluation - Energy mix

BEL’s objection related to the energy mix is that (1) the PUC has increased the supply from Hydro Maya, SSEL (Santander), and BELCOGEN, and (2) reduced forecast supply from solar facilities pending consultation.

Both the PUC and BEL indicated that the reason for the difference in forecast for hydro production is in the assumptions on the available generation capacity within the context of drought situations in the last years. From the table it can be seen that the total difference for hydro generation (Chalilo-Mollejon, VACA, and Hydro Maya) is 0.6% of the total COP amount. Notably, BEL’s objection was only related to Hydro Maya, which constitutes 0.1% of the total COP amount. It is the Independent Expert’s opinion that this amount cannot be considered material especially given that forecast errors are adjusted during the ARP.

With respect to SSEL (1.2% higher of total COP), BEL indicated to the Independent Expert that the PUC’s projections are too optimistic. BEL indicated to be currently engaged in discussions with SSEL to increase their production. It is the Independent Expert’s view that it is

appropriate to await the outcome of these discussions and take this into account when deciding on SSEL's share in the COP.

For BELCOGEN (1.9% higher of total COP), BEL indicated that their lower forecast is based on conversations with the IPP who indicated that they intend to use more of their production for their own operational energy needs. In this light it is the Independent Expert's view that the lower BEL forecasts are used in the COP projections.

Table 1: Differences in COP forecasts between BEL and PUC. Total figures for the FTP.

	Difference in Supply (GWh)			Difference in COP (BZD)		
	PUC - BEL	%	% of total	PUC - BEL	%	% of total
Challilo-Mollejon	(2)	0%	0.0%	3	2%	0.3%
VACA	11	3%	0.3%	2	2%	0.2%
Hydro Maya	9	15%	0.2%	1	15%	0.1%
Belcogen	76	30%	2.1%	17	30%	1.9%
Santander (SSL)	54	41%	1.5%	11	52%	1.2%
BAPCOL	144	223%	3.9%	35	68%	3.9%
BEL Gas Turbine & Mobiles	5	94%	0.1%	(7)	-49%	-0.8%
Subtotal	297	20%	8.1%	61	16%	6.8%
CFE Supply	(446)	-32%	-12.1%	(167)	-48%	-18.3%
Solar incl JICA	(252)	-63%	-6.9%	(54)	-67%	-5.9%
Fossil 1 (LPG)	88	23%	2.4%	(14)	-12%	-1.5%
Fossil 2	325		8.8%	77		8.5%
Subtotal	(285)	-13%	-7.8%	(158)	-29%	-17.3%
Total	11	0%	0.3%	(96)	-11%	-10.6%

For

BEL's observation that CFE quantities have been increased do not seem to be correct. As can be seen in Figure 1, PUC's forecasts for CFE quantities are in fact lower than BEL's. This objection is therefore considered to be invalid.

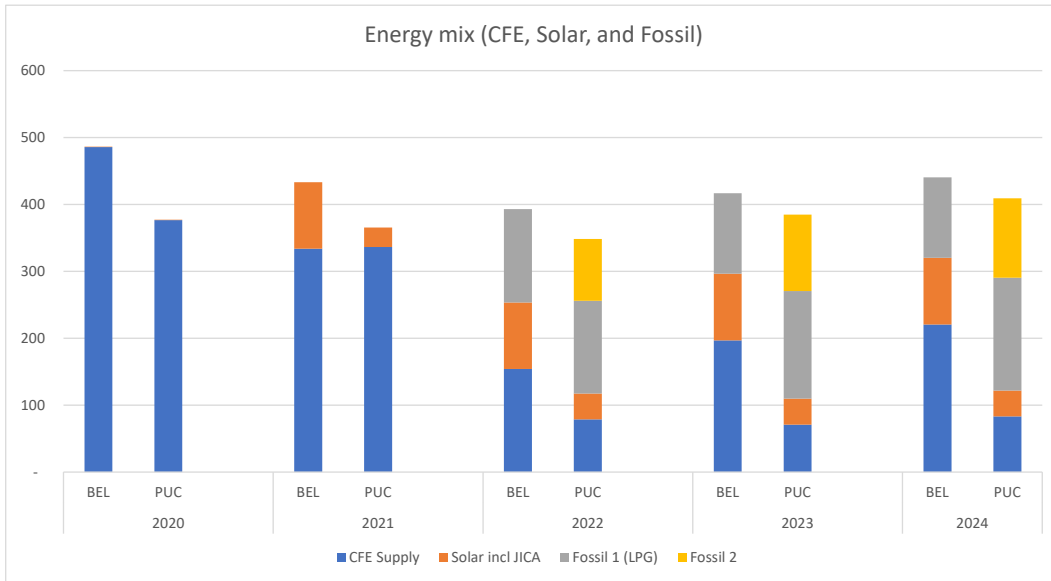


Figure 1: Comparison between projected energy mix for CFE, solar, and fossil resources between BEL and PUC.

BEL’s objection that the PUC has reduced quantities from solar production and increased those from gaseous fuel generation on the other hand is correct. The PUC overall strategy seems to have been to reduce supply from CFE and solar and replace this by hydro and fossil. Also refer to Table 1 where it can be seen that CFE and solar have been reduced by a total of $(-12.1 - 6.9 = -19\%)$ while this has been offset by hydro/IPPs $(+ 8.1\%)$ and fossil $(2.4 + 8.8 = 11.2\%)$. No arguments have been presented by the PUC on the specific choice for this different energy mix, but it seems to be driven by the view of the PUC that (1) there will be no further PV introduced due to the 20 MW limitation, and (2) additional fossil generation capacity will be installed.

The issue of PV generation was discussed in Section 4 (Objection 1D). Given that in the Independent Expert’s view there are no reasons to not allow the introduction of PV energy up to 45 MW, reducing BEL’s forecast would not seem to be justified.

Table 2: Differences in assumed prices between BEL and PUC.

	2020		2021		2022		2023		2024	
	BEL	PUC	BEL	PUC	BEL	PUC	BEL	PUC	BEL	PUC
Challilo-Mollejon	0.26	0.26	0.23	0.23	0.20	0.20	0.20	0.20	0.20	0.21
VACA	0.34	0.30	0.26	0.26	0.23	0.23	0.23	0.23	0.23	0.23
Hydro Maya	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Belcogen	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23
Santander	0.16	0.17	0.16	0.17	0.16	0.17	0.16	0.17	0.16	0.17
BAPCOL	0.80	0.34	0.80	0.38	0.80	0.50	0.80	0.73	0.80	0.72
BEL Gas Turbine & Mobiles	2.19	0.57	2.19	1.43	2.98	1.43	2.98		2.98	
CFE Supply	0.26	0.24	0.24	0.16	0.24	0.15	0.24	0.14	0.24	0.15
Solar incl JICA	0.29	0.29	0.20	0.18	0.20	0.18	0.20	0.18	0.20	0.18
Fossil 1 (LPG)					0.29	0.20	0.29	0.21	0.29	0.21
Fossil 2						0.23		0.24		0.24

With regards to the introduction of fossil capacity, it is observed that the average price assumed by the PUC is 21 ct/kWh and 24 ct/kWh for Fossil 1 (LPG) and Fossil 2 respectively. On the other hand, the PUC has assumed on average 18 ct/kWh for Solar. Given that solar is assumed to be less expensive, it is unclear why fossil generation should then be considered preferable over solar.

At the same time, it should be noted that at the time of the development of these forecasts (before the COVID-19 situation), fuel prices were at higher levels. These prices have dropped significantly due to the reduction in demand. In this regard, it is very unlikely that the assumed prices for fossil generation as shown in Table 2 will still be valid.

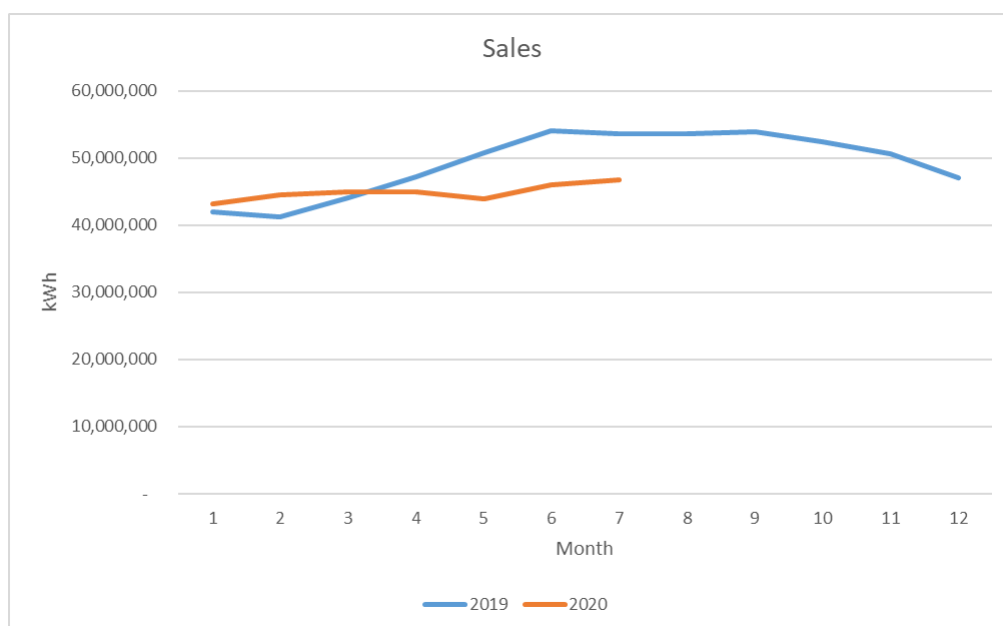


Figure 2: Trend in sales by BEL 2020 versus 2019.

Furthermore, it is also to be questioned whether the COP forecasts by either BEL or the PUC will still be valid, given that the demand in the BEL system has dropped significantly. Sales data from BEL show that there has been a significant drop since March due to the COVID-19 pandemic (see Figure 2). In the period April till July 2020, the level of sales has been 11.5% less than in the corresponding period in 2019. This will certainly also have a major impact on the energy mix and hence the COP.

6.4. Conclusion

It is the Independent Expert's view that there are presently a number of issues that prevent one from making an accurate forecast for the COP. This is particularly driven by the lower level of demand due to the COVID-19 situation and corresponding uncertainty in the optimal energy mix and prices.

At the other side, the regulatory mechanism allows for a periodic adjustment of the COP based on outturn figures. Forecast errors will therefore – in principle – be netted within the system. Given the uncertainties, it is not logical to assume that any new COP forecast will necessarily be better than either of the two forecasts by BEL or the PUC. In that respect, it seems more appropriate not to recommend a completely new COP forecast, but rather recommend which of the two forecasts is more suitable in the current environment.

In developing his recommendation, the Independent Expert is mindful of the fact that the present Regulatory Account Balance has a significant balance amount. In the spirit of the regulatory system which aims at achieving a zero balance, it would therefore be appropriate to adopt the more pessimistic (higher) forecast for the COP.

The following recommendation is made:

- Adopt BEL's forecast for the COP.

7. OBJECTION 3: PERFORMANCE BASED REGULATION

7.1. Description of the objection

PUC's has stated the intention to introduce Performance Based Regulation (PBR) for Economic Dispatching commencing the 2020-24 FTP. It is understood that such a scheme would consist of rewards/losses to be applied to BEL based on the performance relative to certain targets.

In its objections to the PUC's Initial Decision, BEL indicated that there is no principle objection against the mechanism. However, BEL insists that it should be intimately involved in the development of this system. This request of BEL can be characterized as a request for consultation.

Further BEL, in its objection letter, raised its concern that the present purchase agreement with Mexico is based on a price that is predetermined two days in advance. If BEL foregoes the purchase, it still is liable for the cost if CFE is unable to resell the energy and incurs a loss. This according to BEL puts the company always at a disadvantage with respect to optimizing and operationalizing its economic dispatch plan. BEL states that the methodology must avoid penalizing BEL for this intractability.

7.2. Evaluation - Consultation

It is generally desirable for regulators to provide incentives to achieve an optimal level of performance. Better performance implies that the utility is offering its customers best value for their money. This is particularly important given that the utility provider is a monopolist who in principle does not have such an incentive naturally. Regulatory mechanisms such as a PBR scheme can help to fill this void.

In fact, many regulators have set in place PBR schemes dealing with all sort of performance areas. In this regard, there are no reasons to question the PUC's intention to introduce a PBR scheme for dispatch efficiency. The PUC also has the legal authority to do so: The Electricity Act in Section 4 gives the PUC the authority to issue Byelaws on quality of service standards. It is therefore unequivocally clear that the PUC has the authority to implement a PBR scheme for dispatch efficiency.

When introducing new regulations, effective and early consultation between regulators, customers and utilities is an essential component for ensuring appropriate regulatory systems are established.⁸ Consultation assists regulators to understand the implications of their regulations on industry participants, and enables stakeholders to discuss the impact of regulation and suggest alternatives and improvements. The canvassing of all the possible alternatives is not the only outcome of consultation — consultation provides the basis to ensure that the quality of regulation is maximized.

Consultation helps regulators to be realistic in terms of the timing of the introduction of new regulations. For example, where stakeholders will not be able to change their practices immediately to comply with the new regulation, consultation should take place well in advance of the making of regulatory changes. A spirit of openness between the regulator and industry stakeholders can go some way to addressing the issues of information imbalances between the stakeholder and the regulator.

7.3. Evaluation - Specification of the PBR scheme

Section 4 of the Electricity Act requires that service standards shall be in a manner that provides BEL “a reasonable opportunity to recover the reasonable costs of providing service and secure a reasonable rate of return on investment when operating in a manner compatible with international standards of an efficiently operated power system of similar characteristics to that of Belize”.

From this it is clear that although the PUC has the authority to apply a PBR scheme, this will need to adhere to certain principles. Building on the specification in the Electricity Act and the international best-practices in this regard, these principles can practically be defined as follows:

1. Clear measure

There can be no incentive scheme without a clearly defined measure of performance. Terms as well as the formula for the performance indicator need to be defined clearly. It is therefore

⁸ Best practice utility regulation, Utility Regulators Forum, 1999.

advisable to use already existing standard measures of performance in the industry. The underlying data to be collected for measuring and reporting the performance should also be well-defined and be available in the case of regulatory audits and checks.

2. Realistic targets

A proper incentive scheme is characterized by an effective choice for the target level. The target needs to be both realistic and challenging. A good starting point is the historical performance, as this can be considered a level of performance that the utility in principle can also achieve in the future. Later on, the target can be increased also taking into account performance relative to international peers operating in similar circumstances.

3. Symmetry of Incentives

Incentive schemes need to recognize the fact that incentive should be symmetric i.e. should offer both penalties and rewards. The utility should be penalized in case of underperformance but also have the prospect of a reward in case of better performance than the target. This has to do with fairness and effectiveness. A regulated utility will be more committed to a scheme where it can earn rewards rather than only end up paying penalties. This is perceived as fair and also increases the acceptance and therefore success of the scheme.

4. Limitations to financial risks

Variations in performance can potentially cause large financial fluctuations both in the sense of very high penalties or very high rewards. The first reason is the fact that the regulator will by definition not be able to set a perfect quality target (as well as incentive level). The second reason has to do with the stochastic quality variations. Even though quality performance may be stable over a longer period of time, there can be (sometimes significant) variations from year to year. To limit such financial risks, it is good practice to include a cap on the penalty or reward level. That is, the penalty and reward should not be higher than a certain amount in absolute terms (e.g. defined in terms of basis points rate of return or a percentage of revenue). Another way to reduce financial risks is to cumulate the penalties and rewards over a period of time. Years with very high rewards and years of very high penalties would thus tend to net off each other out over the longer period.

7.4. Conclusion

It is the Independent Expert's view that PUC has clear authority to develop and implement a PBR scheme for efficient dispatch. It also does not appear that BEL's objections were against this, but rather requests regarding the process through which this is to happen (consultation) and the need to incorporate the specific circumstances under which BEL carried out the dispatch (PBR specification).

The following recommendations are made:

1. The PUC develops the PBR scheme in close consultation with BEL as well as other relevant stakeholders;
2. The PUC assures that the requirements of the Electricity Act and international best-practice principles (clear measure, realistic target, symmetric incentive, risk limitation) are incorporated in the PBR scheme.

8. CONCLUSION AND RECOMMENDATIONS

The purpose of this Independent Review was to review the objections brought forward by BEL on the PUC's Initial Decision on the next FTP. The main recommendations are as follows:

Table 3: Summary of outcome of the Independent Review.

Objection	Recommendation
1A: Routine Investments in Standards and Safety	Provisionally approve while BEL presents appropriate documentation
1B: Investment in Smart grid	Provisionally approve while BEL presents appropriate documentation
1C: Investment in Democracia-Dangriga line	Provisionally approve while BEL presents appropriate documentation
1D: Investment in BECOL interconnection	Approve interconnection cost, but in general terms and not for a specific location, pending further study and competitive-bidding process by potential suppliers
1E: Investment in Mexico line	Include in capital plan
2: Cost of Power	Adopt BEL forecast
3: Performance Based Regulation	Implement but in close consultation with BEL (and other stakeholders) and taking into account regulatory best-practices

The general recommendation in the area of investment is that BEL provides the necessary analysis and justification for these investments. Pending such information, it is recommended to provisionally accept the investment. In the case that the provided information is considered insufficient, these costs can be netted from the Regulatory Account Balance.

This particular approach has been recommended as this provides certainty to PUC that unjustified investments will not be allowed, while this provides an incentive to BEL to assemble the analysis and facts in order for the PUC to evaluate the investment.

In the case that prior allowed investments are not allowed after all, then the Regulatory Account Balance can be used to make the necessary adjustments. This at the same time provides an opportunity to reduce the balance of this account more progressively towards zero.

For COP, any forecast errors are to be corrected anyhow and any new forecast for COP is not likely to be more accurate than the current ones. In this light and taking into account the need to reduce the Regulatory Account Balance, it is recommended to adopt BEL's forecast.

For the PBR scheme, it is recommended to follow the best-practices in regulation related to consultation and the design of the scheme.

Based on the above, the Regulated Values and the MER are recommended as follows:

Belize Electricity Limited (BEL)					
INDEPENDENT EXPERT RECOMMENDED Tariff Basket Revenue (TBR) and Components and Mean Electricity Rate (MER) for Full Tariff Period (FTP) July 1, 2020, to June 30, 2024					
Tariff Basket Revenue (TBR) and Revenue Components for each ATP of the FTP and Mean Electricity Rate for the FTP - \$:					
Year	2020 2021	2021 2022	2022 2023	2023 2024	Total FTP
Revenue Components of TBR:					
Value Added of Delivery (VAD)					
OPEX	32,524,967	33,012,258	33,506,842	34,008,830	133,052,897
Return	37,994,901	40,299,172	46,474,064	52,840,591	177,608,728
Depreciation	17,729,677	18,047,578	19,142,107	22,075,180	76,994,542
Taxes/Licence Fees	6,270,161	5,906,594	6,117,557	6,340,039	24,634,352
Sub-Total (VAD)	94,519,706	97,265,602	105,240,571	115,264,641	412,290,520
Reference Cost of Power					
Corrections - FTRP	8,842,163	8,842,163	8,842,163	8,842,163	35,368,653
- ARP 21	0	0	0	0	0
- ARP 22	0	0	0	0	0
- ARP 23	0	0	0	0	0
Less: Other Income	-3,673,592	-3,700,384	-3,728,696	-3,755,890	-14,858,563
Tariff Basket Revenue	280,637,277	282,003,939	292,228,018	308,025,677	1,162,894,911
Demand [MWhs]	613,966	634,866	655,765	676,665	2,581,262
Mean Electricity Rate (MER) - July 1, 2020 - June 30, 2024 - \$:	0.4571	0.4442	0.4456	0.4552	0.4505

Finally, it is observed that the differences in views between BEL and the PUC may to a large extent be attributed to the absence of an up-to-date Generation/Transmission Expansion Plan. It is good practice for system expansion plans to be updated on a regular basis, typically at least every five years. Such a plan creates common ground for all parties. In this light it is highly recommended that the initiative is taken to develop such a plan in the near future.