

GEOFF BROWN & ASSOCIATES LTD

**REVIEW OF FORECAST CAPITAL EXPENDITURE:
SECOND REGULATORY PERIOD**

**La Union Electric Company Inc
(LUECO)**

ADDENDUM

Prepared for

ENERGY REGULATORY COMMISSION

February 2, 2010

TABLE OF CONTENTS

SECTIONS

1. INTRODUCTION.....	1
2. ANALYSIS	3
2.1 NEW 15/20 MVA TRANSFORMER AT BUANG	3
2.1.1 Background.....	3
2.1.2 Analysis	4
2.2 RECOMMENDATION	6
2.3 OTHER ISSUES	6

APPENDIX A: SUMMARY OF COMMENTS

EXECUTIVE SUMMARY

We recommend the following adjustments to the forecast capital expenditure (capex) allowed in the Draft Determination.

Recommended Capex Adjustments (PhP million, real 2009)

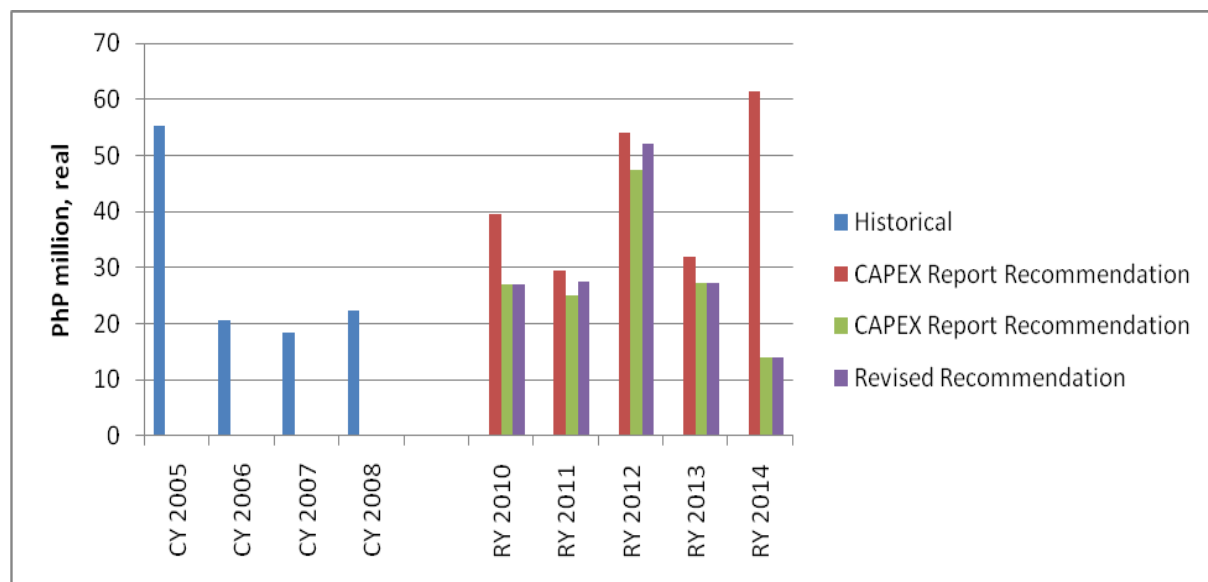
	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014	Total (RY 2011-14)
Revenue application	39.50	29.58	54.05	31.86	61.48	176.97
Recommended forecast ¹	26.97	25.11	47.48	27.28	13.96	113.83
Adjustments						
Additional capacity of Bauang substation transformer			7.00			7.00
Adjustment to timing of Central Bank line upgrade		2.40	(2.40)			-
Revised recommendation	26.97	27.51	52.08	27.28	13.96	120.83

Note 1: CAPEX Report, Table 6.1; Draft Determination, Table 4.2.

The recommended adjustments allow for an increase in the capacity of the new transformer at Bauang substation to provide a greater level of redundancy in an N-1 contingency situation and to defer the future requirement for additional power transformer capacity. It also provides for the advancement of the construction of the Central Bank line as an insurance against a complete failure of the existing transformer at Bauang.

The impact of this adjustment on the allowed capex is shown in the figure below.

Impact of Recommended Capex Adjustments (PhP million, real 2009)



1. INTRODUCTION

The Energy Regulatory Commission (ERC) has promulgated a performance-based form of regulation (PBR) for regulated investor owned electricity distribution utilities in the Philippines. Under the PBR framework, a regulated entity will be subject to a price cap for the delivery of distribution wheeling services. The reset process for the setting of the price cap for the six (6) regulated entities entering PBR at the third entry point is currently underway. This process will result in the setting of a maximum price path that will determine the maximum average price a regulated entity can charge for each year of the Second Regulatory Period (which commences on 1 July 2010 and ends on 30 June 2014).

The mechanism for the calculation of the price cap and the procedure and timelines for the introduction of this cap, are described in the Rules for Setting the Distribution Wheeling Rate (RDWR), which was released by the ERC on December 8 2008¹. The ERC has also formulated its position on the reset process – as set out in a Position Paper, also dated December 8 2008².

An important requirement of the reset process going forward is the review of the CAPEX forecasts submitted by the regulated entities as part of the rate-setting process under PBR. The required CAPEX is critical to the determination of the revenue to which regulated entities are entitled and on which the price caps will be based.

The RDWR require that the CAPEX forecast provided by a regulated entity be reviewed by a Regulatory Reset Expert as part of the PBR regulatory reset process. Geoff Brown & Associates Ltd (GBA) has been engaged by the ERC to review the capital expenditure (CAPEX) forecasts of the six (6) regulated entities (including LUECO) that will be entering PBR at the third entry point.

LUECO submitted a PBR revenue application to ERC on June 19 2009³ (Revenue Application). GBA submitted its final report on its review of the CAPEX forecast included in LUECO's Revenue Application on November 26 2009⁴ (CAPEX Report). ERC publicly released its draft determination on the Revenue Application on November 25 2009⁵ (Draft Determination). Following the release of the Draft Determination, ERC held a Public Consultation in San Juan, La Union on January 27 2010. At the public consultation LUECO raised a number of issues in respect of the Draft Determination and was required by the ERC to subsequently provide additional information to support its position. GBA was present at the public consultation and has now reviewed the additional information supplied by LUECO insofar as this information relates to the CAPEX forecast. In this Addendum to the CAPEX Report we document our review of the issues raised and, where appropriate, modify the recommendations in the CAPEX Report on LUECO's reasonable CAPEX requirements for the second regulatory period.

In undertaking this review we have relied on the accuracy of the information provided to the ERC by LUECO. We cannot be held responsible for any conclusions based on misleading or inaccurate information provided to us.

¹ *Rules for Setting Distribution Wheeling Rates (RDWR) for Privately Owned Distribution Utilities Entering Performance Based Regulation (Third Entry Point)*, Energy Regulatory Commission, December 8 2008.

² *Regulatory Reset for the July 2010 to June 2014 Regulatory Period Privately Owned Distribution Utilities subject to Performance Based Regulation, Position Paper*, Energy Regulatory Commission, December 8 2008.

³ ERC Case No 2009-044RC

⁴ *Review of Forecast Capital Expenditure for the Second Regulatory Period, La Union Electric Company Inc (LUECO)*, Geoff Brown & Associates Ltd, November 26 2009.

⁵ *Regulatory Reset for La Union Electric Company Inc. (LUECO) July 2010 to June 2014 (Second Regulatory Period) Draft Determination*, Energy Regulatory Commission, November 9 2009.

The issues that were discussed at the Public Consultation are summarized in Appendix A. Only those issues that could have a material impact on the forecast CAPEX approved in the Draft Determination are discussed in detail in the body of this Addendum.

All expenditures in this Addendum are expressed as PhP million, real 2009.

2. ANALYSIS

2.1 NEW 15/20 MVA TRANSFORMER AT BUANG

2.1.1 Background

In our CAPEX Report we noted that LUECO was supplied from a single 69 kV line from NGCP's Bauang point of supply and that it was therefore unable to achieve the n-1 subtransmission reliability that Table 5.1 of the Position Paper indicates is acceptable⁶. We recommended that CAPEX be allowed to enable LUECO to replace the existing 7.5 MVA transformer at Bauang with a new 10 MVA transformer, noting that the output of the existing transformer was limited to 4.5 MVA due to an internal insulation fault⁷. In making this recommendation we stated that:

A problem for LUECO is that there is currently insufficient transformer capacity to cover for the loss of the largest 20 MVA transformer at Poro. As shown in Table 2.3 [of the CAPEX report], in the event of a loss of the 20 MVA transformer, there would be no more than 21.5 MVA of power transformer capacity to serve a potential load of 26.3 MVA⁸.

We further stated that⁹:

Buang substation was loaded to 4.5 MVA at 0.95 power factor in CY 2008 and based on our demand forecast the load will reach about 5 MVA at the end of second regulatory period.

and

We note that a 10 MVA transformer is larger than necessary to supply the potential load in the area supplied by Bauang. However we have not recommended reducing the transformer size as, with a strong distribution network, the larger transformer could, if necessary, be used to supply some of the load currently supplied by Poro. If a 10 MVA transformer is installed the total usable power transformer capacity on the network would increase from 41.5 MVA to 47.5 MVA. This would give sufficient transformer capacity to provide n-1 redundancy for the expected load in 2014, provided the full capacity of the new transformer could be utilized, and could therefore defer the need for the new 20 MVA substation or additional transformer capacity at Poro.

LUECO has proposed that capacity of the recommended new transformer at Bauang be increased to 20 MVA and that it be supplied from a separate 69 kV feeder from the NGCP substation. It noted that that its Bauang substation is only 80 meters from the NGCP substation and, if the additional transformer capacity was allowed, indicated that it would connect its Bauang substation to a separate NGCP feeder supplied from a different NGCP substation. This arrangement would provide an N-1 level of redundancy up to the capacity of the Bauang transformer.

LUECO confirmed at the Public Consultation there would be sufficient funding to install the larger transformer if the full Php 28.6 million it requested in the revenue application to upgrade and rehabilitate the Bauang substation was reinstated¹⁰.

⁶ Section 2.1.

⁷ Section 4.2.

⁸ Section 4.1

⁹ Section 4.2

¹⁰ In our CAPEX report we recommended that the requested CAPEX of Php 28.6 million for Bauang substation improvements be reduced to Php 21.6 million by deferring some rehabilitation works to the third regulatory period.

2.1.2 Analysis

As noted in the CAPEX report, in addition to the LUECO owned 69 kV line supplying its Poro substation, there is also a 115 kV line which is owned partly by NGCP and partly by LUECO and which supplies Voice of America (VOA). LUECO advises that, for contractual reasons, it cannot get access to this line and for this analysis we have assumed that it will not be available to LUECO. This is discussed further in Section 2.2.

While, as indicated above the load normally serviced by the Bauang substation is limited to a maximum of approximately 5 MVA, LUECO's proposal will provide a significant level of redundancy by:

1. providing for LUECO's Poro and Bauang substations to be supplied by separate 69 kV lines connected to different circuit breakers at the NGCP substation. Hence the failure of a line or a circuit breaker at the NGCP substation will not de-energize both substations simultaneously.
2. allowing the two substations to back one another up in the event of a power transformer failure through load transfers in the 13.2 kV network.

We note further that, provided there is sufficient power transfer capacity in the 13.2 kV network, increasing the capacity of the new transformer in Bauang will defer the need to construct a new 69/13.2 kV substation within San Fernando city or, alternatively, to increase the power transformer capacity installed at Poro substation.

2.1.2.1 Transformer Size

We considered the appropriate transformer size if the new transformer at Bauang on the basis of the criteria that it had to provide sufficient power transformer capacity to supply the forecast load at the end of the allowed planning period in the event of a loss of the existing 20 MVA transformer at Poro. For this analysis we made the following assumptions.

- Available transformer sizes are 10 MVA, 12.5 MVA, 15 MVA and 20 MVA.
- The demand on the 69 kV network is forecast to continue to grow at the same rate as assumed in Table 2.2 of the CAPEX report. For power transformers the allowed planning period is 10 years if optimization is to be avoided¹¹. Assuming the transformer is installed in 2012, as proposed by LUECO in its expenditure forecast, the total forecast demand on the 69 kV network in 2022 is therefore of interest. We estimate this to be 27.0 MW or 28.5 MVA, assuming a 0.95 power factor.

Table 2.3 of the CAPEX report indicates a total of 37.5 MVA 69/13.2 MVA of power transformer capacity at Poro. However, we have discounted the 5 MVA unit, as this appears to be old and unlikely to be serviceable in 2022. Hence, assuming a 20 MVA transformer is installed at Bauang and there is no additional transformer capacity installed, there would be a total of 52.5 MVA of serviceable transformer capacity available to supply an expected 2022 peak demand 28.5 MVA. If a 20 MVA transformer was out of service in an N-1 contingency this would reduce to 32.5 MVA.

If the new transformer size at Bauang was limited to 15 MVA, the available transformer capacity in 2022 under a worst case n-1 contingency would be reduced to 27.5 MVA, which would be insufficient to supply the forecast peak 2022 demand. Hence we concur with LUECO that, given its planning assumptions, a 20 MVA transformer at Bauang is justified.

¹¹ Position Paper, Section A5.

2.1.2.2 Distribution Network Capacity

The other issue to be considered is whether there is sufficient capacity in the 13.2 kV network to transfer the load of the 20 MVA Bauang transformer to San Fernando city proper in the event of a worst case contingency.

Currently there are two 13.2 kV lines connecting LUECO’s Bauang substation to the distribution network within San Fernando city. In our CAPEX report we recommended that expenditure be allowed to upgrade the Central Bank line to 336.4 MCM ACSR conductor, which would give it a power transfer capacity of around 11.8 MVA at 13.2 kV. The second line is the Pagdalagan line, which is constructed of 4/0 all aluminium conductor with a rating of 7.8 MVA.

For the purposes of this review, only the 2014 loads need to be considered when considering the transfer capacity of the 13.2 kV network under contingency conditions. This is because any 13.8 kV upgrades that are required only to meet loads that will arise after 2014 can be deferred until the third regulatory period. The 13.8 kV load transfer analysis also needs to take into account the load on the Payocpoc line, which takes its supply from the Bauang substation and feeds loads to the south, away from San Fernando city. LUECO’s forecast indicates that the combined peak demand on the Payocpoc and Pagdalagan lines in 2014 will be about 5.1 MVA, of which approximately 1 MVA will be on the Pagalagnan line.

On this basis our analysis of the required 13.2 kV transfer capacity between San Fernando city and Bauang is presented in Table 1 below.

Table 1: Analysis of 13.8 kV Power Transfer Capacity

Forecast peak demand on 69 kV network in 2014 ¹	26.3 MVA
Peak demand on Payocpoc line (south of Bauang)	4 MVA
Peak demand north of Bauang in 2014	22.3 MVA
Load supplied from Poro assuming loss of 20 MVA transformer ²	12.5 MVA
13.8 kV transfer capacity required ³	9.8 MVA
13.8 kV transfer capacity available ⁴	19.6 MVA

- Note 1: From Section 2.3.1 of CAPEX report
- Note 2: If the 5 MVA transformer was still available this would increase to 17.5 MVA. However we have assumed that this transformer, which is currently used as a spare, would not be available.
- Note 3: This is the portion of the 22.3 MVA load north of Bauang that cannot be supplied from the 12.5 MVA transformer at Poro.
- Note 4: This comprises the 11.8 MVA capacity of the upgraded Central Bank line and the 7.8 MVA capacity of the existing Pagalagnan line

We conclude that, as the total available 13.8 kV transfer capacity in 2014 will exceed the maximum required capacity by almost 10 MVA no additional upgrades to the 13.8 kV network (over and above that recommended in the report) would be necessary during the second regulatory period as a consequence of the increased capacity of the Bauang transformer.

2.1.2.3 Timing

LUECO has suggested that, due to the condition of its existing transformer at Bauang, the transformer replacement be advance from 2012 to 2011. We have looked at this but consider that a more cost effective way of securing supply to the network in the event of a complete failure of the Bauang transformer would be to advance the upgrade of the Central Bank line. Should the Bauang transformer fail, the Central Bank line could be used to supply the Payocpoc load. The load on the Pagdalagan line could be supplied by closing the Pagdalagan Bridge isolator and opening the Lussoc Bridge isolator.

We therefore recommend that the timing of the Central Bank line upgrade be advanced from 2012 to 2011.

2.2 RECOMMENDATION

We recommend that the CAPEX forecast approved in the Draft Determination be increased by Php 7.00 million in RY 2012 to allow for an increase in the capacity of the proposed new transformer at Bauang substation.

We further recommend that Php 2.40 million in the Draft Determination CAPEX forecast be advanced from RY 2012 to RY 2011 to allow for the advancement of the Central Bank line upgrade project.

The impact of these adjustments is shown in Table 2 below.

Table 2: Recommended Adjustments to CAPEX Forecast in Draft Determination

	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014	Total (RY 2011-14)
Recommended forecast ¹	26.97	25.11	47.48	27.28	13.96	113.83
Adjustments						
Additional capacity of Bauang substation transformer			7.00			7.00
Adjustment to timing of Central Bank line upgrade		2.40	(2.40)			-
Revised recommendation	26.97	27.51	52.08	27.28	13.96	120.83

Note 1: CAPEX Report, Table 6.1; Draft Decision, Table 4.2.

2.3 OTHER ISSUES

As noted in Section 2.1.1, recommendations in Section 2.2 above are predicated on the assumption that LUECO cannot get access to the 115 kV subtransmission line that supplies the VOA owned substation. This line, which is rated at over 100 MVA (when energized at 115 kV), carries a peak demand of only about 2 MVA and passes along the perimeter of LUECO's Poro substation. It is owned by NGCP between NGCP's point of supply at Bauang and the Poro substation and by LUECO between the Poro substation and VOA.

Our view is that this line is under-utilized and should be operated at 69 kV in parallel with the existing 69 kV line between Bauang and Poro. This would not only provide an N-1 subtransmission supply to Poro substation but would also reduce LUECO's subtransmission losses, potentially by more than 50%. We suspect that this loss reduction could be sufficient to reduce LUECO's total system losses to below the 8.5% loss cap specified by the ERC.

We understand from LUECO that it is unable to utilize this line because VOA has a contract with NGCP that requires a direct connection to the NGCP grid at 115 kV¹². LUECO has indicated that this is because:

- VOA considers that a 115 kV line is inherently more reliable than a 69 kV line due to the increased phase spacing. We acknowledge this but point out that the existing line would be more even more reliable if it was operated at 69 kV because, while the phase spacing would not change, the flashover distance would reduce on account of the lower voltage.

¹² This is notwithstanding the fact that LUECO is the energy supplier to VOA.

- If load rationing is required, NGCP has a policy of shedding load at 69 kV before it sheds load at higher voltages. We understand that VOA pays NGCP additional connection charges to achieve this higher level of reliability. We have not investigated this issue in detail but we suspect this is less of an issue now than when the line was first constructed, given the current generation surplus on Luzon.

We also note that there is only one transformer with a 115 kV winding at NGCP's Bauang substation. If a fault was to develop in this transformer NGCP could be unable to supply VOA until the fault was repaired. This could be an extended period, during which both NGCP and LUECO would lose revenue. We also note there is no network backup for the 5 MVA 115/4.16 kV transformer at the VOA substation and a similar situation could arise if this transformer failed.

In our view a preferable situation for both LUECO and VOA would be for:

- LUECO to operate this line at 69 kV and to divert it into the Poro substation;
- the existing VOA substation to be converted from 115/4.16 kV to 69/13.2 kV. This would allow VOA to be provided with a standby supply from LUECO's 13.2 kV distribution network, which already exists in the area, which would mean that supply to VOA could be maintained in the event of a failure of the VOA substation transformer. Under normal operating conditions this arrangement would also provide a third point of injection into the LUECO 13.2 kV distribution network, which would further reduce losses.

Arguably this issue is outside our scope of work, although we are required to review LUECO's CAPEX forecast in the context of what we consider to be the least cost long term development plan for the network. We raise the because we are concerned that the unavailability of the existing 115 kV line is resulting in the sub-optimal long development of the LUECO network and is imposing avoidable additional costs on LUECO and its customers.

We also note that, under the development approach proposed in this section VOA could avoid paying the premium connection charges to NGCP and at the same time significantly reduce the risk of being left without a grid supply for an extended period of time as a consequence of a transformer failure.

As a consequence we would encourage LUECO to try and resolve this issue with VOA before it prepares its CAPEX forecast for the third regulatory period.

APPENDIX A
SUMMARY OF COMMENTS

Page/ Number	Section	Discussion of Comment/s and/or Questions for Clarification	Suggestions / Proposed Change(s) to the Draft Determination	GBA Comment
CAPEX Page 8	Review	“ The sub-transmission network does not have any ‘n-1’ capability. In the event of loss of either of the 69KV or 115KV lines, the connected customers will lose supply. There is no alternative means of providing supply to the disconnected customers.”	Install 15/20 MVA 69/13.2KV transformer at Bauang instead of a 10 MVA.	We agree with LUECO and have recommended that the transformer size be increased.
Page 11		“Assuming that the existing spare 69/13.2KV transformer is utilized in place of 69/4.16KV and no additional transformer capacity was added, in the event of a failure of the largest 20 MVA transformer, there would only be 21.% MVA of 69/13.2KV transformer capacity available to carry the forecast of 26.3 MVA of peak demand. Hence additional power transformer capacity is necessary if ‘n-1’ redundancy was to be achieved.”	Connect the 15/20 MVA transformer to the 2 nd 50 MVA transformer of NGCP which is just 80 meters away. This would provide the ‘n-1’ reliability since the 69KV line supply will be coming from another transformer and the 15/20 MVA transformer can supply the customers of the 20 MVA transformer at Poro.	Noted
Page 14		“A problem for LUECO is that there is currently insufficient transformer capacity to cover for the loss of the largest 20 MVA transformer at Poro.”	Upgrade the Monumento to Pagdalagan bridge 13.2KV line and the Pagdalagan to Lussoc bridge 13.2KV line to augment the upgraded capacity of the Central Bank line (11.8 MVA) since the two segments make-up a portion of the main backbone and the tie-line between Bauang and Poro.	Our analysis indicates that this is not required during the second regulatory period. See Section 2.1.2.
Page 15		“An alternative approach would be for LUECO to relocate the 12,5 MVA transformer currently at Poro to Bauang and to install a second 20 MVA transformer at Poro.”	Schedule the Bauang 15/20 MVA transformer installation earlier at RY 2011 instead of RY 2012 due to its urgency. 7.5 MVA has consistently failed its annual dissolved gas analysis test for the past four years even after annual degasification. Said transformer has already been rewinded.	We have recommended that the Central Bank line upgrade be advanced to 2011 because of the risk of the failure of the Bauang transformer.
			Retain estimated CAPEX cost of P28.6M to cover the cost of increased capacity of transformer.	Agreed.