

***GEOFF BROWN & ASSOCIATES LTD***

**PERFORMANCE BASED RATE SETTING  
REVIEW OF FORECAST CAPITAL EXPENDITURE FOR THE SECOND  
REGULATORY PERIOD**

**TARLAC ELECTRIC INCORPORATED (TEI)**

Prepared for  
**ENERGY REGULATORY COMMISSION**

**FINAL**  
**24 November 2009**

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**EXECUTIVE SUMMARY****TOTAL CAPEX**

A comparison of our recommended total CAPEXC with TEI's forecast for the period January 2009 to June 2014 is shown in the table below. Following submission of its revenue application, TEI submitted a lower, revised forecast that corrected a number of errors in the revenue application forecast. We have used this corrected revised forecast as the basis for our review.

**Comparison of TEI Forecast and Recommended CAPEX (PhP Million, real)**

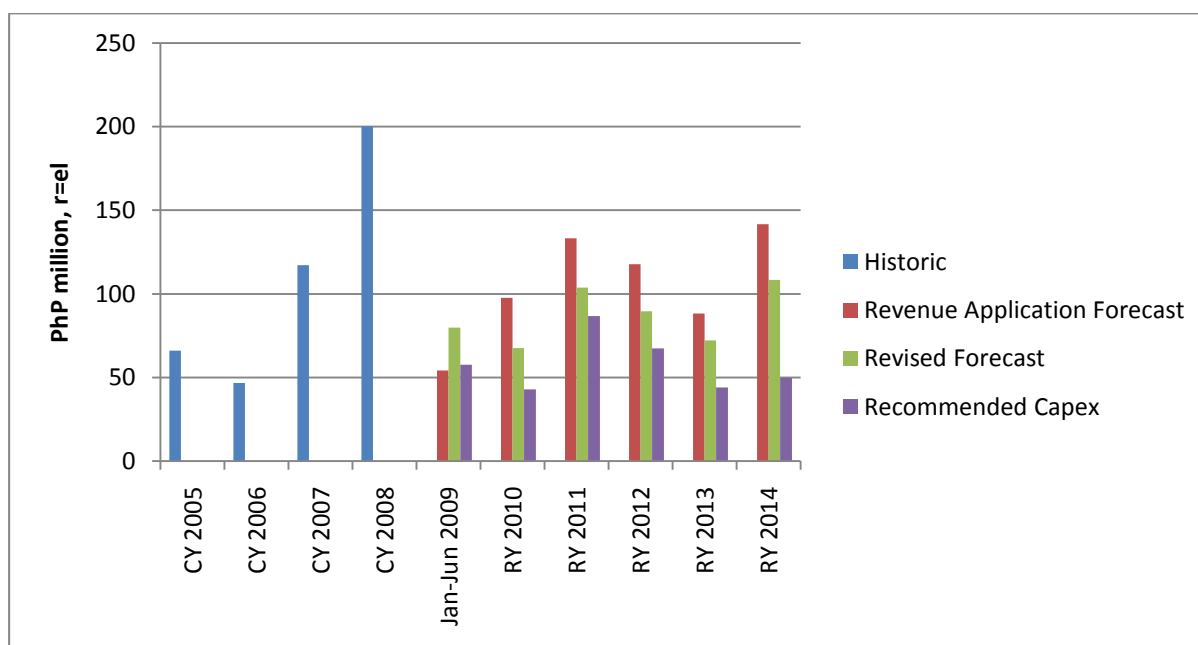
	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014	Total (RY 2011-14)
TEI Revenue Application Forecast	54.28	97.59	133.17	117.80	88.19	141.72	480.88
TEI Revised Forecast	79.92	67.67	103.70	89.70	72.28	108.33	374.01
Recommended CAPEX	57.60	43.02	86.69	67.50	44.01	49.87	248.07
Reconciliation Adjustments <sup>1</sup>	25.65	(29.92)	(29.47)	(28.10)	(15.91)	(33.39)	(106.87)
Recommended Adjustments <sup>2</sup>	(22.32)	(24.65)	(17.01)	(22.20)	(28.27)	(58.46)	(125.94)
Total Adjustments	3.33	(54.57)	(46.48)	(50.30)	(44.18)	(91.85)	(232.81)
Impact of Total Adjustments <sup>3</sup>	6%	(56%)	(35%)	(43%)	(50%)	(65%)	(48%)

Note 1: Difference between revenue application and revised forecast

Note 2: Adjustments to revised forecasts recommended as a result of this review

Note 3: Impact of both reconciliation and recommended adjustments on revenue application forecast.

A comparison of the recommended and forecast CAPEX with actual expenditure over the historical period CY 2005-08 is shown in the figure below.

**Comparison of Forecast, Recommended and Historical Total CAPEX****MAJOR PROJECTS**

A comparison of our recommended total major project CAPEX with TEI's revised major project CAPEX forecast for the period January 2009 to June 2014 is shown in the table below. We have not shown the major project CAPEX submitted in the initial revenue application template since it did not reconcile with the major project information summaries and was clearly in error. We think that TEI initially

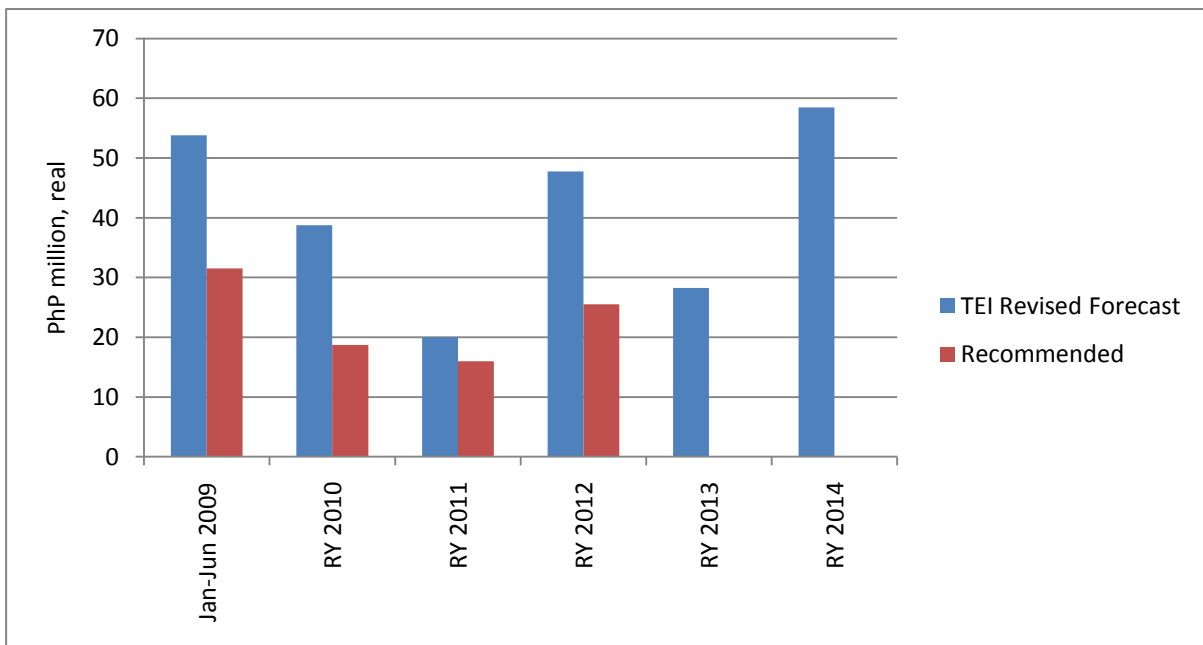
included much of the expenditure shown in the major project information summaries as residual CAPEX.

**Comparison of TEI Revised Forecast with our Recommended Major Project CAPEX (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014	Total (RY 2011-14)
TEI Revised Forecast	53.82	38.73	20.00	47.74	28.27	58.46	154.47
Recommended	31.50	18.73	16.00	25.54	-	-	41.54
Adjustment	(22.32)	(20.00)	(4.00)	(22.20)	(28.27)	(58.46)	(112.93)
Impact of Adjustment	(41%)	(52%)	(20%)	(47%)	(100%)	(100%)	(73%)

A comparison of TEI's revised forecast major project CAPEX with our recommended major project CAPEX over the forecast period is shown in the figure below.

**Comparison of Recommended and Forecast Major Project CAPEX**



We recommend the following adjustments to TEI's revised major projects CAPEX forecast.

- We recommend a reduction of PhP2.00 Million in the forecast cost of the new San Rafael-Luisita-CAT 69 kV line to reflect the use of smaller 336.4 MCM conductor. Our analysis indicates that this conductor size will be sufficient to carry the expected load at the end of the optimization planning period in the event of a worst case 'n-1' contingency. The recommended adjustment has left some funding in this project to address the thermal constraint on the existing 69 kV line.
- We recommend a reduction of PhP20.32 Million to the forecast cost of replacing the existing transformer at the TPC substation. While we recognize the need for an earth reference on the 69 kV side, we believe that this does not require the transformer to be replaced as either the existing transformer could be modified or an earth reference could be obtained by installing a zigzag transformer on the high voltage side.
- We recommend a reduction of PhP20.00 Million to the forecast cost of the San Rafael substation. Our analysis indicates that the additional transformer capacity will not be needed before the end of the second regulatory period. However we recommended that sufficient funds be left in the project for the construction of the switching station associated with the new 69 kV line.

- We recommend that the cost of the new covered warehouse and associated depot facilities at the San Rafael site be reduced by PhP4.00 Million. This reflected Asian Appraisal's advice that TEI's forecast cost for this new complex was high.
- We recommend that the proposed new office complex not be constructed until after the end of the second regulatory period. However we recommended that PhP3.00 Million be left in this project for the temporary refurbishment of the existing facilities once linemen and stores staff move to the new depot complex.
- We recommend that the service vehicle replacement program proposed for 2014 be deferred until after the end of the second regulatory period.
- We recommend that the proposed San Isidro substation not proceed as our analysis indicates that the additional power transformer capacity is not required given the forecast loads at the end of the second regulatory period.
- We recommend that the proposed Balete substation not proceed as our analysis indicates that the additional power transformer capacity is not required given the forecast loads at the end of the second regulatory period.

**RESIDUAL RENEWAL CAPEX**

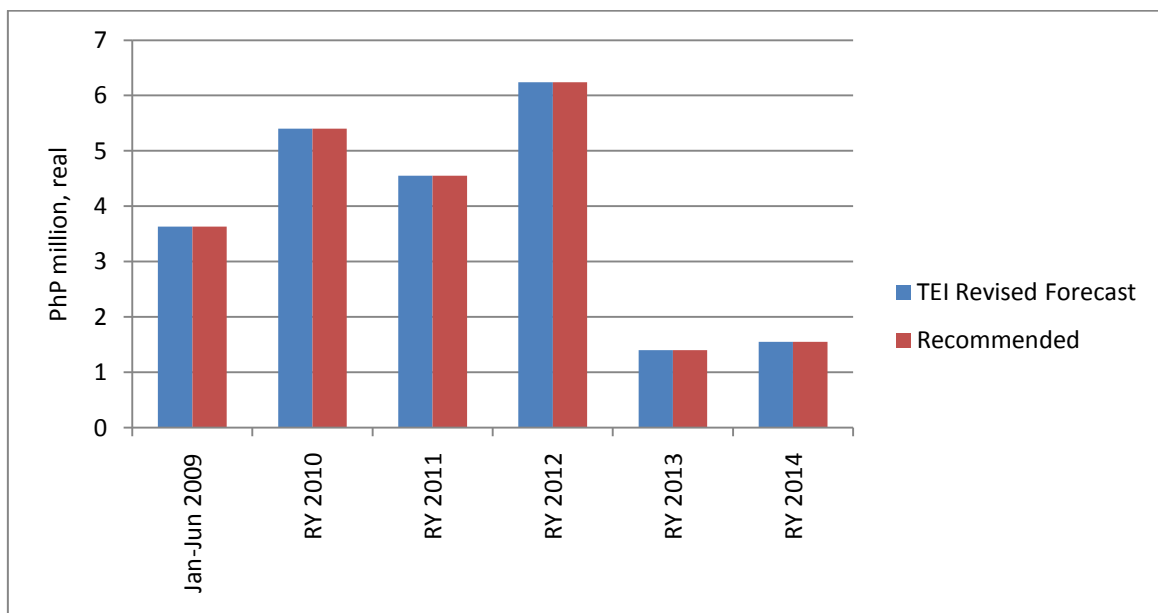
A comparison of our recommended residual renewal CAPEX with TEI's revised residual renewal CAPEX forecast for the period January 2009 to June 2014 is shown in the table below. We recommend no adjustments to TEI's revised forecast.

**Comparison of TEI's Revised Residual Renewal CAPEX Forecast and our Recommended Residual Renewal CAPEX (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014	Total (RY 2011-14)
TEI Revised Forecast	3.63	5.4	4.55	6.24	1.4	1.55	13.74
Recommended	3.63	5.4	4.55	6.24	1.4	1.55	13.74
Adjustment	-	-	-	-	-	-	-

A comparison of TEI's revised forecast residual renewal CAPEX with our recommended residual renewal CAPEX over the forecast period Jan 2009 to June 2014 is shown in the figure below.

**Comparison of TEI Revised Residual Renewal Forecast and our Recommended CAPEX**



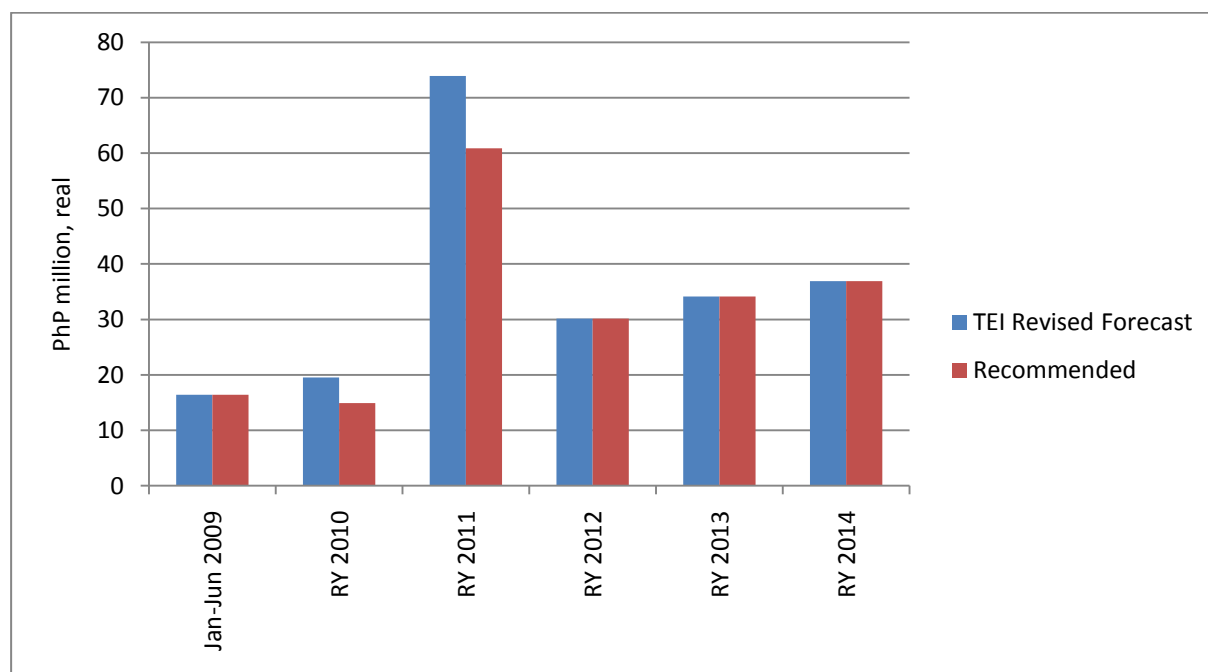
**RESIDUAL GROWTH CAPEX**

A comparison of our recommended residual growth CAPEX with TEI's revised forecast for the period January 2009 to June 2014 is shown in the table below.

**Comparison of TEI's Revised Forecast and Recommended Residual Growth CAPEX (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014	Total (RY 2011-14)
TEI Revised Forecast	16.39	19.54	73.90	30.14	34.16	36.88	175.08
Recommended	16.39	14.89	60.89	30.14	34.16	36.88	162.07
Adjustment	-	(4.65)	(13.01)	-	-	-	(13.01)
Impact of Adjustment	-	(24%)	(18%)	-	-	-	(7%)

A comparison of TEI's revised forecast residual growth CAPEX with our recommended CAPEX is shown in the figure below.

**Comparison of Revised Residual Growth CAPEX Forecast with our Recommended CAPEX**

We recommend that CAPEX for station equipment and overhead conductors and devices for the connection of distribution feeders into San Rafael substation be removed from the revised forecast. This is consistent with our recommendation that the San Rafael substation project should not proceed.

**RESIDUAL REFURBISHMENT CAPEX**

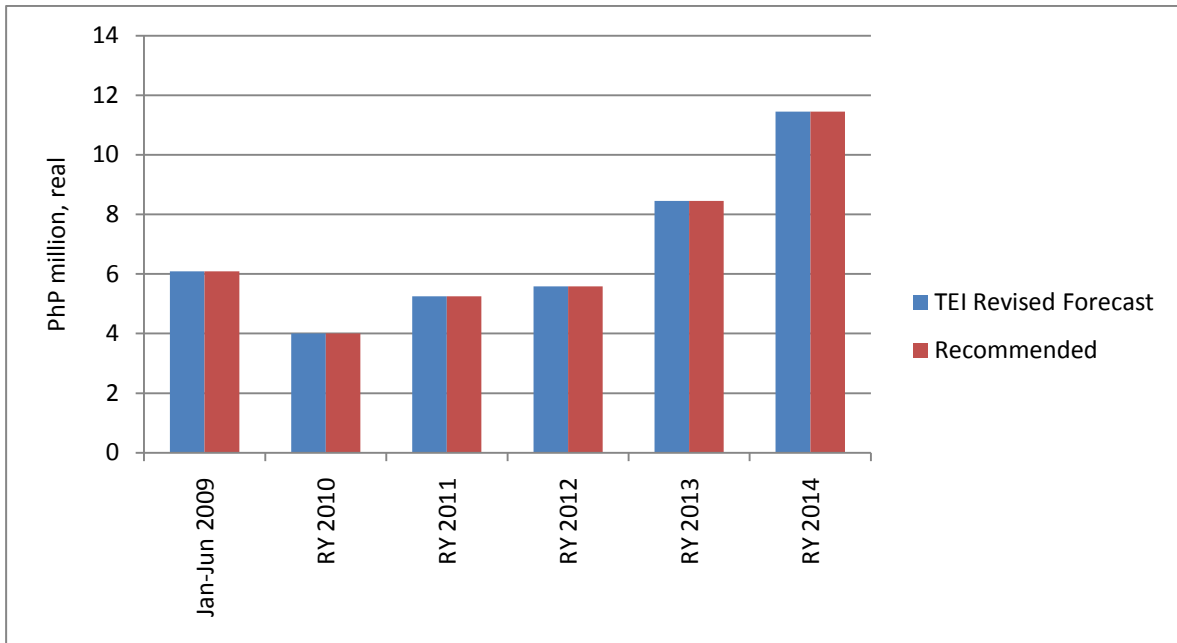
We recommend no adjustments to TEI's revised residual refurbishment CAPEX forecast. A comparison of our recommended total residual refurbishment CAPEX with TEI's revised forecast for the period January 2009 to June 2014 is shown in the table below.

**Comparison of TEI Revised Forecast and Recommended Residual Refurbishment CAPEX (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014	Total (RY 2011-14)
TEI Revised Forecast	6.09	4.00	5.25	5.58	8.45	11.45	30.73
Recommended	6.09	4.00	5.25	5.58	8.45	11.45	30.73
Adjustment	-	-	-	-	-	-	-

A comparison of TEI’s revised residual refurbishment CAPEX forecast with our recommended CAPEX is shown in the figure below.

**Comparison of Recommended and Forecast Residual Refurbishment CAPEX**



**OTHER ISSUES**

At the clarificatory meeting TEI advised that one reason why it wanted to build a new 69 kV line was that there was a thermal constraint on a section of the existing line that prevents it being operated at its full rating. While the nature of this constraint is not clear, we think the issue should be addressed, and we have left funding in the major project for the construction of the San Rafael – Luisita line to provide for this.

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## 1. INTRODUCTION

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The Energy Regulatory Commission (ERC) is currently implementing a performance-based form of regulation (PBR) for investor owned electricity distribution utilities in the Philippines. Under the PBR framework a distribution utility will be subject to a cap on the average price that it may charge for the delivery of distribution wheeling services. This price cap is reset in advance of each four year regulatory period using the building block approach described in the Rules for Setting the Distribution Wheeling Rate (RDWR), which was released by the ERC on December 8, 2008<sup>1</sup>. It takes the form of a price path that specifies the maximum average price (MAP) that a regulated utility may charge in each year of the regulatory period.

The entry of distribution utilities into the PBR process has been staggered into four (4) entry points and the reset process for the setting of the price cap for the six (6) utilities entering PBR at the third entry point is currently underway. This process will result in the setting of the price path for each utility for a regulatory period that commences on July 1, 2010 and terminates on June 30, 2014. This regulatory period is specified in the RDWR as the second regulatory period<sup>2</sup>.

The ERC has published a Position Paper, also dated December 8, 2008, which sets out in some detail how the price reset process for the six (6) third entry point utilities will be undertaken<sup>3</sup>.

An important requirement of this reset process is the review of the capital expenditure (CAPEX) forecasts submitted by the investor owned utilities in the revenue applications that have been submitted in accordance with the requirements of the RDWR and the Position Paper. CAPEX over the second regulatory period will impact the size of the regulated asset base (RAB), which will in turn impact both the return on capital (profit) and return of capital (depreciation). Profit and depreciation form two of the building blocks in the price setting process specified in the RDWR.

Geoff Brown & Associates Ltd (GBA) has been engaged by the ERC to review the capital expenditure forecasts of the utilities that will enter PBR at the third entry point. These are:

- Cabanatuan Electric Corporation (CELCOR);
- Davao Light and Power Company (DLPC);
- Ibaan Electric and Engineering Corporation (IEEC);
- La Union Electric Company (LUECO);
- Tarlac Electric Incorporated (TEI); and
- Visayan Electric Company (VECO).

In accordance with clause 4.12.4 of the RDWR the objective of the review is to determine whether each CAPEX forecast is:

- based upon the best available prices obtainable from international markets;
- reasonably efficient from a design and implementation point of view;

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

<sup>2</sup> No first regulatory period applied to the six utilities entering PBR at the third entry point.

<sup>3</sup> Regulatory Reset for the July 2010 to June 2014 Regulatory Period for Privately Owned Distribution Utilities subject to Performance Based Regulation, Position Paper, Energy Regulatory Commission, December 8, 2008.

- likely to support the forecast growth in connections, co-incident peak demand and energy delivered; and
- is sufficient to allow the relevant utility to achieve or exceed the applicable target levels of performance.

This report presents GBA's review of the CAPEX forecast of TEI. The forecast was submitted to the ERC as part of TEI's revenue and performance incentive scheme application (revenue application), on June 15, 2009.

In undertaking this review we have relied on the accuracy of the information provided to the ERC by TEI. During the clarificatory meeting process, we queried information that appeared to be incomplete, inconsistent or inaccurate. However, we did not undertake an audit or attempt to verify the information on which we relied. We therefore cannot be held responsible for any conclusions or recommendations based on misleading or inaccurate information provided to us.

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## 2. NETWORK OVERVIEW

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### 2.1 NETWORK DESCRIPTION

TEI takes its supply at 69 kV from the National Grid Corporation of the Philippines (NGCP) substation at Concepcion. This substation supplies a TEI-owned 69 kV sub-transmission line that in turn supplies four (4) TEI-owned zone substations with a total power transformer capacity of 87 MVA. In addition the line supplies a fifth substation with a capacity of 5 MVA owned by the Central Azucarera de Tarlac (CAT) sugar mill. Although the sugar mill is now connected to the TEI network, it remains an NGCP customer. The TEI zone substations supply a distribution network that is used to distribute electricity to approximately 1,850 distribution transformers located throughout its franchise area. The distribution transformers are used to convert the electricity from 13.8 kV to a low voltage level that is used to supply the majority of TEI's 58,400 customers.

While the above accurately describes the essence of the TEI network the following features are of note.

- The 69 kV sub-transmission line was purchased from NGCP in 2008.
- Tarlac Power Corporation (TPC) operates an embedded diesel power plant that is capable of injecting 18 MW into TEI's 69 kV sub-transmission network at the TPC zone substation. The power plant is connected to the 13.8 kV bus at the TPC zone substation and, when operating, supplies the TPC substation's two (2) 13.8 kV feeders directly rather than via the 69 kV network. When the power plant is not operating these feeders are supplied from the NGCP substation via the sub-transmission network.

A problem for TEI is that, because of the winding arrangement of the 69/13.8 kV transformer at TPC substation, it is unable to energize the sub-transmission network from the TPC power plant when the NGCP supply is not available. This means that only that portion of the TPC power station output that can be directly injected into the 13.8 kV network can be used as backup in these circumstances.

TEI has a power purchase contract with TPC and, as per information provided during the clarificatory meeting, both parties are currently negotiating to extend this contract for up to 25 years.

- TEI has one customer, Phelps Dodge (a cable manufacturing company), that is directly connected to its 69 kV sub-transmission network. The customer owns the 69/13.8kV supply transformer.
- Although TEI has purchased the 69 kV sub transmission feeder from NGCP in 2008, the CAT sugar mill is still an NGCP customer. We understand that NGCP pays TEI the connection charges paid by the sugar mill through a discount on its bills for transmission connection and delivery charges.
- TEI's single 69 kV feeder does not have 'n-1' capability. In the event of a loss of the feeder, limited backup is currently available from the TPC power plant injection at 13.8 kV, as noted above.
- The 13.8 kV distribution feeders are interconnected by normally open switches and, in the event of the loss of a zone substation, there is some spare capacity within the distribution network to transfer load to other zone substations.

**2.2 CURRENT AND FORECAST ENERGY SALES AND DEMAND**

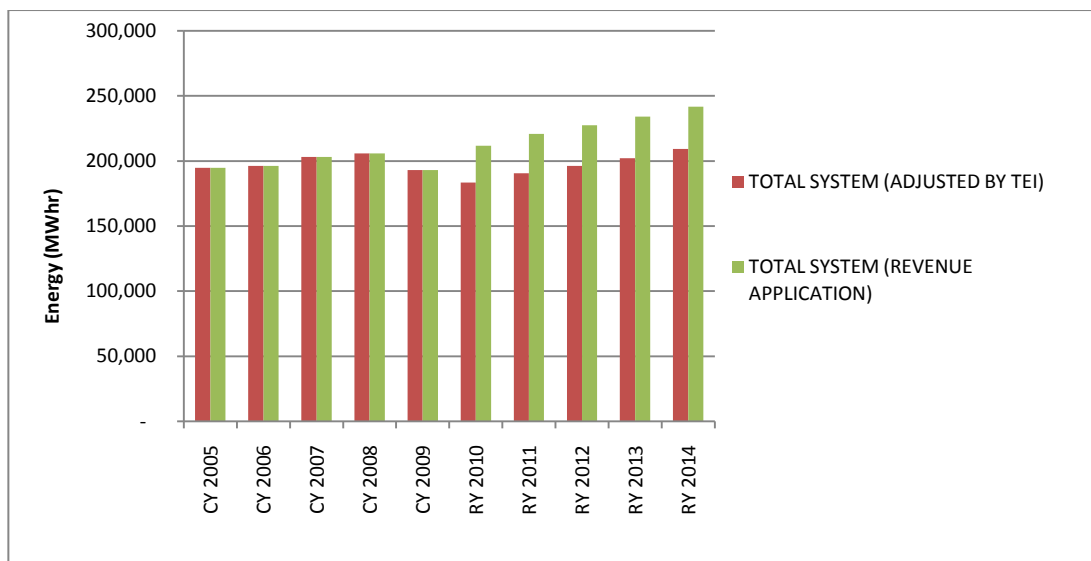
Growth in peak demand is a key driver of capital expenditure and the forecast growth in demand therefore underpins this review. If, for example, the ERC considers that the peak demand forecast in the revenue application is high, then some of the projects forecast for commissioning towards the end of the second regulatory period may not be required until after the start of the third regulatory period.

TEI’s revenue application forecast the network after diversity peak demand to grow from a peak demand of 42.98 MW in CY 2008 to 48.61 MW in CY 2014, as shown in Table 2.2. This is an overall increase of 5.63 MW, corresponding to an average growth rate of around 2.1%<sup>4</sup>. At the same time, energy sales were forecasted to grow from 205.7 GWh in CY 2008<sup>5</sup> to 241.6 GWh in RY 2014, an annual growth rate of 2.5%.

Following the clarificatory meeting, TEI submitted a revised energy sales forecast, as shown in Figure 2.1 and Table 2.1. The adjusted energy sales forecast for RY 2014 is 209.2 GWh, an increase of only 0.24% per year as compared to actual energy sales in CY 2008.

Our view is that, the maximum peak demand forecast for RY 2010 to RY 2014 will reduce by around 6 MW for RY 2014 based on the adjusted energy sales forecast. Over the period 2005-09, TEI’s energy sales have increased at an average rate of 2.1%<sup>6</sup> and energy purchase at the rate of 1.8%. Based on the historical values we have assumed an average growth rate for the demand to be around 1.9%. From the information provided by TEI<sup>5</sup>, the load factor varies from 0.58 to 0.63 and therefore even if the maximum peak demand reduces the outcomes of this review will remain unchanged. Hence for this review we have assumed a peak demand in 2014 of 42.92 MW.

**Figure 2.1: TEI’s Actual and Forecast Energy Sales**



<sup>4</sup> This forecast is derived by aggregating the estimated demand of different customer classes. The metered after diversity maximum demand in CY 2008 was 39.43 MW and TEI forecasts this to increase to 46.44 MW in 2014, a growth rate of about 2.8%

<sup>5</sup> As per NGCP’s monthly metering bills for CY 2008 provided by TEI

<sup>6</sup> Revised Load Forecast 2009-2025 submitted by TEI

**Table 2.1: Energy Sales-Actual and Forecast**

	CY 2005	CY 2006	CY 2007	CY 2008	CY 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
<b>Energy Consumption (GWh)</b>										
TEI Forecast – Revenue Application	194.74	196.10	202.97	205.77	193.11	211.63	220.85	227.35	234.04	241.63
Forecast as subsequently adjusted by TEI	194.74	196.10	202.97	205.77	193.11	183.33	190.43	196.10	202.19	209.21

**Table 2.2: Forecast Grid Point Maximum Demand (MW)**

CY 2008	CY 2009	CY 2010	CY 2011	CY 2012	CY 2013	CY 2014
42.98	49.64	43.51	45.42	46.60	47.51	48.61

## 2.3 NETWORK UTILIZATION

The extent to which the existing network is utilized is also relevant to the required capital expenditure since if the network is lightly utilized then proposed capital expenditure can be deferred until demand growth has used up existing spare capacity.

A network that is over-utilized is normally unable to provide reasonable reliability of supply. On the other hand networks that are under-utilized are economically inefficient because they include excess assets that must be paid for by customers. Hence determining the appropriate level of network utilization requires reliability to be balanced against economic efficiency. Table 5.1 of the Position Paper specifies the level of security that may be allowed for in network design and permits the 69 kV sub-transmission network and the zone substations to have a level of security of n-1. We interpret this to mean that, following the loss of any one sub-transmission line or zone substation transformer at peak load, sufficient redundant capacity may be built into the network to allow supply to be restored following network reconfiguration and utilizing any embedded generation that may reasonably be expected to be available.

### 2.3.1 Utilization of Transformers

The 69/13.8 kV power transformers currently on the TEI network are shown in Table 2.3.

**Table 2.3: Existing Transformer Capacity**

Substation	Transformers	Total Capacity (MVA)
LIP (Luisita Industrial Park)	1 x 25/30 MVA	30
Maliwalo	1 x 10/12 MVA	12
Maliwalo (Spare)	1 x 5 MVA	-
Panganiban	1 x 20/25 MVA	25
TPC (Tarlac Power Corporation)	1 x 15/20 MVA	20
<b>Total</b>		<b>87</b>

Source: SKM's Regulatory Asset Valuation Report for TEI, Dated 24 April 2009.

The directly connected 69 kV loads are shown in Table 2.4.

**Table 2.4: 69 kV Connected Loads**

Customer	Total Capacity (MVA)	Comments
CAT Sugar Mill	5	3.83 MW of maximum load for CY 2008. The CAT sugar mill is a NGCP customer connected to TEI's 69kV sub-transmission network at 6.9 km from NGCP substation.
Phelps Dodge	5	TEI's 69kV Customer. Connected at LIP substation located at 9.3 km from NGCP substation on 69 kV line. The maximum load for CY 2008 was 2.45 MW <sup>7</sup>

Source: SKM's Regulatory Asset Valuation Report for TEI, Dated 24 April 2009.

TEI has not included the CAT sugar mill load in its demand and energy forecast for the second regulatory period. For the purposes of this analysis we have assumed the maximum network demand in RY 2014 (excluding the CAT sugar mill) will be 42.9 MW or 47.1 MVA assuming a power factor of 0.91. We have further assumed that the total 13.8 kV load will not include the Phelps Dodge load (5.5 MVA).

Hence this analysis indicates that in RY 2014 in a worst case contingency situation, the maximum total load on all TEI's power transformers would be 41.6 MVA. The largest power transformer on the network is the 30 MVA LIP substation transformer, and if this transformer was not available the total power transformer capacity would be reduced from 87 MVA to 57 MVA. As this is 37% greater than the required capacity we conclude there is no requirement to install additional power transformers before the end of the second regulatory period.

We note that if the higher RY 2014 forecast of 48.6 MW in TEI's revenue application was assumed the situation would not change. Using this forecast we assume the contingency power transformer requirement would be approximately 48 MVA (after removing the Phelps Dodge load), which is still 16% less than the minimum available capacity following an 'n-1' contingency.

### 2.3.2 Utilization of Distribution Network

The analysis of transformer utilization in Section 2.3.1 presupposes that there is sufficient capacity in the distribution network to allow the network to be reconfigured and load to be transferred from one power transformer to another. To confirm this, we have measured the total capacity of the distribution network (at the connection point of each feeder) and compared this with the required level of load transfer.

Tables 4.16 – 4.18 of the SKM Asset Valuation Report shows that there are a total of 16 distribution feeders. All feeders, except for one at Maliwalo, have a 336.4 MCM aluminum core steel reinforced (ACSR) backbone conductor with a power transfer capacity of 12.3 MVA. The remaining feeder uses AWG # 4/0 conductor with a power transfer capacity of 8.1 MVA. Hence the total 13.8 kV feeder capacity is more than 192 MVA.

In the event of the loss of a power transformer, as discussed in Section 2.3.1, the required capacity is 48 MVA assuming TEI's revenue application forecast and 42 MVA assuming the revised forecast. The utilization of the distribution network would be 25% and 19% respectively. This is low by international standards and indicates that there is significant spare capacity in the distribution network to allow load to be transferred to other substations in the event of a worst case contingency.

### 2.3.3 Utilization of 69 kV Sub-transmission Network

TEI's 69 kV primary feeder lines use a 336.4 MCM ACSR conductor having a thermal capacity of 61.55 MVA. The length of 69 kV line from NGCP's substation to the farthest TPC substation is 24.09 km. During the clarificatory meeting on 17 August 2009, TEI indicated that, due to thermal constraints on a section of 69 kV line, the sub-transmission capacity is limited to 44 MW i.e. 48.3 MVA at 0.912 power factor. We consider that TEI

<sup>7</sup> TEI's Revenue Application Annexure H: Forecast Energy.

should rectify this issue so that the full thermal capacity of the existing 69 kV line can be used – it would be much more cost effective to gain additional capacity by repairing the existing asset than to leave the asset as is and rely on the construction of new assets to provide the required capacity. We understand from the discussion at the clarificatory meeting that the constraint is caused by overheating problems on a small section of the line and, if this is the case, the rectification cost would be relatively low. This is discussed further in Section 4.1.

Notwithstanding this, the existing sub-transmission network is radial and does not have 'n-1' capability and therefore a fault on any of the 69 kV lines will cause major supply interruption. TEI is proposing to augment the existing 69 kV radial line to form a ring network and provide 'n-1' capability at the sub-transmission level. Our view is that TEI should proceed with this augmentation, as it will improve security of supply without exceeding the maximum security levels specified in the Position Paper.

### 3. OVERVIEW OF HISTORICAL AND FORECAST EXPENDITURE

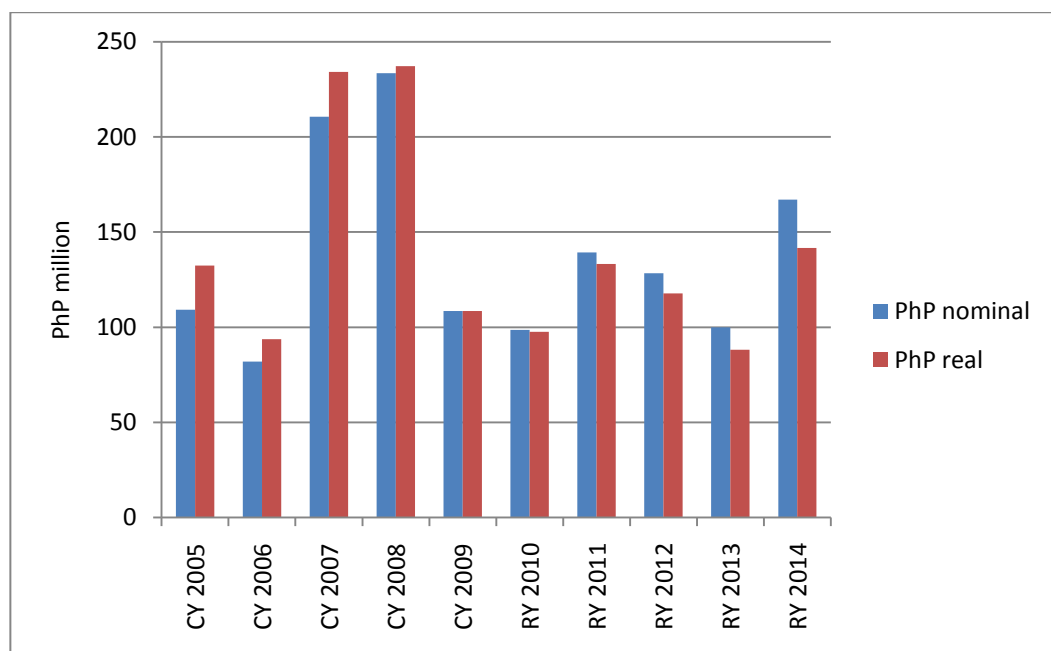
TEI's historical and forecast total CAPEX, as presented in its revenue application, is shown in Table 3.1 below.

**Table 3.1: Total Historical and Forecast CAPEX (PhP Million)**

	CY 2005	CY 2006	CY 2007	CY 2008	CY 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
PhP nominal	109.21	81.99	210.64	233.41	108.55	98.51	139.26	128.37	99.94	167.04
PhP real	132.35	93.67	234.15	237.16	108.55	97.59	133.17	117.80	88.19	141.72

This historical and forecast CAPEX is also shown graphically in Figure 3.1 below.

**Figure 3.1: Total Historical and Forecast CAPEX (PhP Million)**



An examination of the information above indicates that the base year is CY 2009 when real and nominal values are the same. For prior years, nominal CAPEX is less than the same expenditure expressed in real terms while in subsequent years it is vice versa. This is to be expected in situations where the real value of the PhP depreciates over time. In this report all expenditures are expressed as PhP real, unless otherwise stated in order to remove the impact of this depreciation from the analysis.

For TEI and all third entry point utilities the regulatory year starts on 1 July and finishes on 30 June. RY 2010 denotes the regulatory year ending 30 June 2010. Hence there is a six month overlap between CY 2009 and RY 2010 and expenditure budgeted to occur during this overlap period (1 July 2009 – 31 December 2009) should be shown twice in the above forecast. This is a consequence of the ERC's transition from calendar years to regulatory years for expenditure forecasting and rate setting purposes.

It can also be seen that, in real terms, budgeted and forecast CAPEX is highest in CY 2007, CY 2008, RY 2011 and RY 2014. This high capital expenditure is due to the impact of major projects either commissioned or being proposed for commissioning in these years. In RY 2011 TEI is proposing to complete a new warehouse and a number of growth and refurbishment projects, including expenditure towards implementation of a full SCADA system, service vehicle replacements, purchase of 69 kV disconnects for San Rafael substation and 13.8 kV lines for interconnecting 69 kV sub-transmission

substations. In RY 2014 it is proposing to commission the 69 kV Balete substation and purchase additional service vehicles.

The CAPEX forecast shown in Tables 3.1 and, Figure 3.1, was revised and resubmitted by TEI during the clarificatory meeting. The reason for this was to remove duplication of historical expenditure and also to show major project expenditure that was consistent with the major project information summaries. The revised CAPEX forecast is shown below in Table 3.2 and Figure 3.2.

**Table 3.2: Revised Total Historical and Forecast CAPEX resubmitted by TEI (PhP Million)**

	CY 2005	CY 2006	CY 2007	CY 2008	RY 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
PhP nominal	54.60	40.99	105.33	196.98	106.02	68.31	108.45	97.75	81.91	127.68
PhP real	66.18	46.84	117.09	200.15	106.02	67.67	103.70	89.70	72.28	108.33

**Figure 3.2: Revised Total Historical and Forecast CAPEX resubmitted by TEI (PhP Million)**

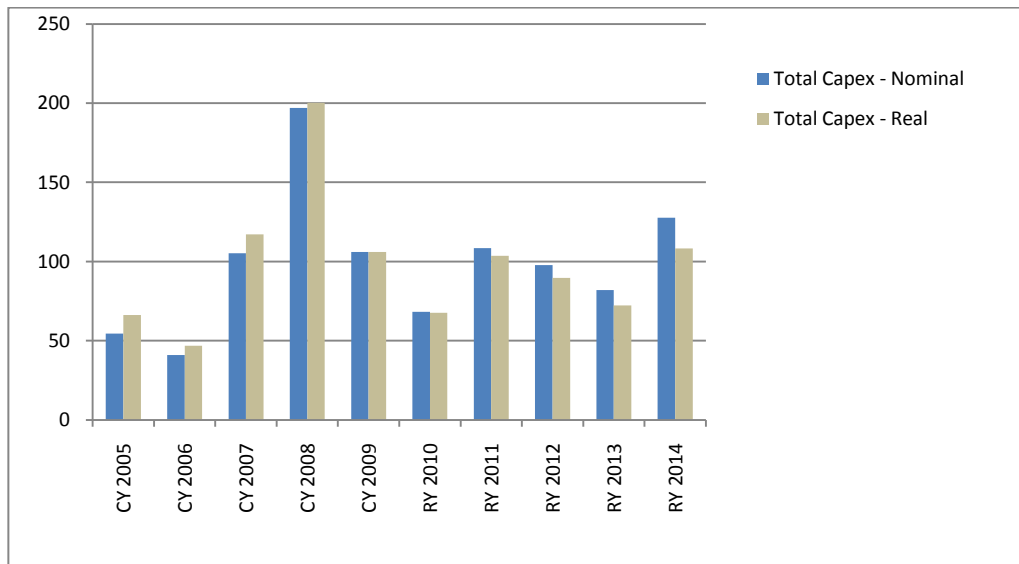


Table 3.3 shows the difference between the original and revised forecasts. It shows that the revised CAPEX is lower for every year of both the historical and forecast period. Over the period RY 2010-14, the total forecast CAPEX in the revenue application was PhP578.47 Million whereas in the revised forecast it was only PhP441.68 Million, a reduction of over 23%.

**Table 3.3: Difference between Revenue Application CAPEX (Table 3.1) and Revised Forecast by TEI (Table 3.2) (PhP Million real)**

	CY 2005	CY 2006	CY 2007	CY 2008	CY 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revenue application	132.35	93.67	234.15	237.16	108.55	97.59	133.17	117.80	88.19	141.72
Revised forecast	66.18	46.84	117.09	200.15	106.02	67.67	103.70	89.70	72.28	108.33
Adjustment	(66.17)	(46.83)	(117.06)	(37.01)	(2.53)	(29.92)	(29.47)	(28.10)	(15.91)	(32.39)

For this review it is necessary to remove the double counting of the expenditure over the overlap period July-December 2009, which we assume has been shown in both the CY 2009 and RY 2010 CAPEX. To make this adjustment for the revenue application forecast we have assumed that all expenditure in CY 2009 is incurred evenly throughout

the year. This implies that half the CY 2009 expenditure is incurred in the period January-June 2009 and the balance is included in the RY 2010 forecast.

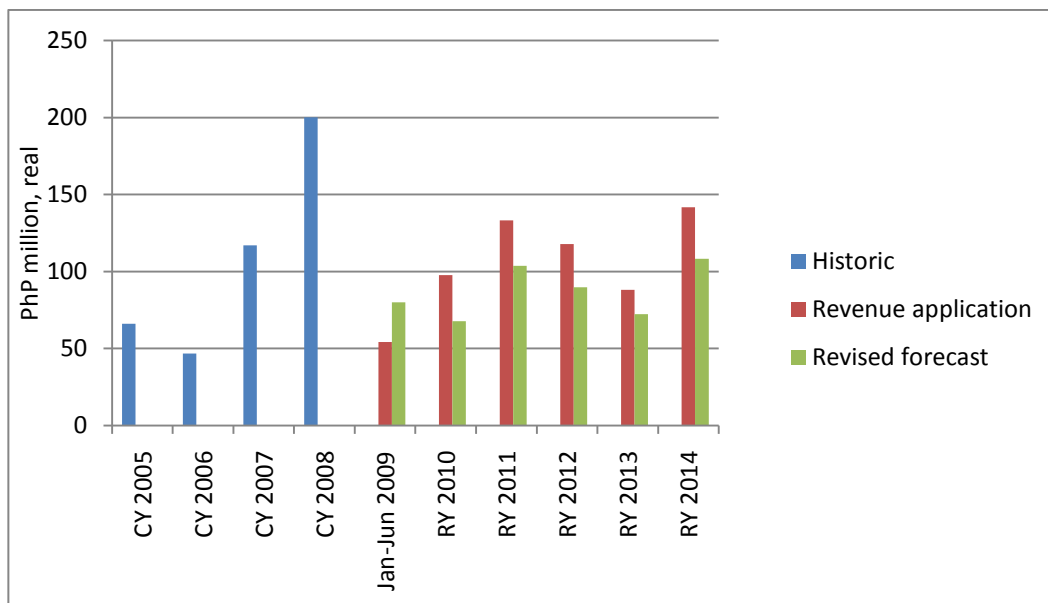
For the revised forecast, the major project expenditure is consistent with the major project information summaries and this expenditure has been allocated in accordance with the completion dates shown in these summaries. We have then assumed that the residual expenditure in CY 2009 has been incurred evenly throughout the year.

On this basis, Table 3.4 presents the revenue application and revised CAPEX forecasts for the period January 2009 to July 2014 with the double counting in the overlap period removed. The adjustment shown is the initial adjustment required to reconcile the initial and revised forecast. A comparison of the initial and revised forecasts with the historical expenditure in the revised submission is shown in Figure 3.3. In this figure, we have not shown the historical expenditure submitted in the revenue application as this included double counted CAPEX and was clearly in error.

**Table 3.4: Comparison of Revenue Application and Revised CAPEX Forecasts (January 2009 to June 2014 (PhP Million, Real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revenue Application	54.28	97.59	133.17	117.80	88.19	141.72
Revised	79.92	67.67	103.70	89.70	72.28	108.33
Reconciliation Adjustment	25.65	(29.92)	(29.47)	(28.10)	(15.91)	(33.39)

**Figure 3.3: Comparison of Revenue Application and Revised Forecast with Historical Expenditure (PhP Million, real)**



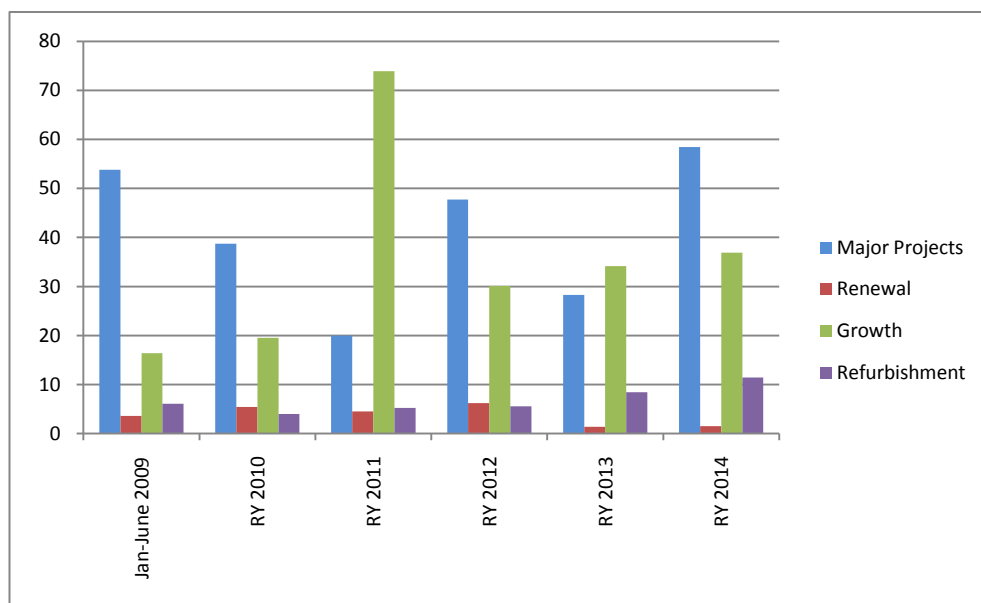
It can be seen that in the revised CAPEX forecast, expenditure over the period Jan-Jun 2009 is relatively high. This is due to the major project expenditure. The major project sheets indicate that the new San Rafael-Luisita 69 kV line should be commissioned in February 2009 and the new transformer at the TDC substation (also called the Sto. Nino upgrade) should be commissioned in June 2009. No major projects were scheduled for commissioning in the period July-December 2009.

The breakdown of the revised forecast into the ERC's standard expenditure categories is shown below in Table 3.5 and Figure 3.3.

**Table 3.5: Breakdown of Adjusted Historical and Forecast Expenditure resubmitted by TEI (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Major Projects	53.82	38.73	20.00	47.74	28.27	58.46
Renewal	3.63	5.40	4.55	6.24	1.40	1.55
Growth	16.39	19.54	73.90	30.14	34.16	36.88
Refurbishment	6.09	4.00	5.25	5.58	8.45	11.45

**Figure 3.3: Breakdown of Adjusted Historical and Forecast Expenditure resubmitted by TEI (PhP Million, real)**



In the revised forecast major projects form a much higher proportion of the total CAPEX, but the residual growth expenditure is still very significant.

## 4. MAJOR PROJECT EXPENDITURE

### 4.1 SAN RAFAEL-LUISITA 69 KV LINE (FEB 2009)

This project involves the construction of a new 5.8 km, 69 kV line using 795 MCM ACSR conductor from San Rafael substation and connecting to an existing line that was used to supply a cotton mill that has now disconnected from the network. In the revenue application TEI estimated a project cost of PhP26.38 Million and provided a commissioning date of February 2009. In the resubmitted information, TEI estimated a project cost of PhP26.50 Million<sup>8</sup>.

The purpose of the new 69 kV line is to provide 'n-1' security at the sub-transmission level. As per Table 5.1 of the Position Paper, a network security at sub-transmission level of 'n-1' is permitted. Our view is that TEI should be permitted to construct this new line as it will improve the reliability of supply and will not exceed the security criterion set out in the Position Paper.

The worst case 'n-1' contingency for this line under the reconfigured network arrangement will be the loss of the existing 69 kV line between LIP and Maliwalo substations. In this event the new line could potentially have to supply the TPC, Panganihan and Maliwalo substation loads, which at present total approximately 31 MVA.

However, instead of 795 MCM conductor for the 69 kV line, we consider that only 336.4 MCM conductor is required. Our view is that, assuming the worst case contingency situation, the load is unlikely to exceed the 61 MVA rating of 336.4 MCM conductor within the optimization planning horizon of 15 years. In any case, injection from the TPC power station could be used to reduce the line loading in such a contingency.

Our recommended adjustment to the cost of the 69 kV line is shown in Table 4.1. The adjustment provides for a reduction in conductor size from 795 MCM to 336.4 MCM. However, we have reduced the amount of the adjustment we would normally recommend to provide funding for the rectification of the thermal constraint on the existing sub-transmission line, as discussed in Section 2.3.3.

**Table 4.1: Adjustments to Cost of San Rafael- Luisita- CAT 69 kV (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
TEI Revenue Application Expenditure Forecast	26.38					
TEI Adjusted Expenditure Forecast	26.50					
Recommended adjustment for Santo Nino Transformer Upgrade	(2.00)					

### 4.2 SANTO NINO (TPC) SUBSTATION TRANSFORMER REPLACEMENT (JUN 2009)

The purpose of this project is to replace the existing 69/13.8 kV transformer which has a delta-star connection (with the delta on the 69 kV winding) with a new transformer of the same rating but with a star-star connection. This project is shown in the CAPEX forecast as being commissioned in June 2009, even though at the clarificatory meeting in August 2009, TEI indicated that the new transformer had still to be ordered.

When the 69 kV network is disconnected from the NGCP substation, TEI is currently unable to use the TPC power plant to energize its sub-transmission network, as all TEI's power transformers have high voltage delta windings and the only earth reference point available for the 69 kV sub-transmission network is the 69 kV star winding on the NGCP transformer. Hence, when the NGCP transformer is unavailable, there is no 69 kV earth

<sup>8</sup> We have assumed this project cost to be accurate as it is consistent with the revised major project template.

reference point on the sub-transmission network. Protection systems require an earth reference to ensure unsafe operation conditions can be detected and operation of a network at any voltage without a proper earth reference is not recommended for safety reasons. Therefore, with the NGCP supply out of service, the backup capacity available from the TPC power station is limited to the capacity of the TPC 13.8 kV feeders. We agree that this is a constraint on the operation of the existing network and that it is therefore an issue that should be addressed.

TEI argues that, with the replacement of the existing delta-star transformer with a star-star transformer, the protection system will have the necessary earth reference at 69 kV and this will allow the full capacity of the power station to be utilized. The new transformer has a forecast installed cost of PhP26.75 Million in the revenue application and in the revised submission it is PhP27.32 Million. We have used the revised cost for this review as it is consistent with the revised major project template.

Our view is that replacement of the existing transformer with a star-star transformer is an unnecessarily expensive option and is also not an optimal solution from a technical perspective. In particular it will not block harmonics to the generator from the 69 kV network. Such harmonic currents can damage the generator. For this reason it is a common practice to use star-delta transformers for connecting generators to the network. An alternative and lower cost earthing method such as a 69 kV zigzag transformer could be used to provide an earth reference for protection system<sup>9</sup>.

In its Asset Valuation Report, SKM optimized the capacity of the 15/20 MVA power transformer to the capacity required to supply the 13.8 kV TPC loads from the sub-transmission network. In making this optimization SKM appears to take the view that the connection point of the power station to the TEI network was at 69 kV and that it is therefore the responsibility of the power station to provide the step-up generator transformer. If this view is accepted then we would be obliged to recommend that no funding for this project be included in the approved CAPEX forecast as it would be used to replace an asset that had been optimized out of the network.

However we have reservations about this optimization and its consistency with other decisions of the ERC. For example, in the DLPC Valuation Report, which has also been accepted by the ERC, SKM determined that the connection point of some generators to the distribution system was the 13.8 kV circuit breaker and allowed this circuit breaker to be included in the regulated asset base as a regulated distribution system asset<sup>10</sup>. Further, ERC allowed Cotabato Light and Power Company (CLPC) to include generating plant and associated connection assets in the regulated distribution asset base due to the fact the power station was needed for reliability

We think the TPC power plant point of connection should logically be at 13.8 kV on the basis that it supplies the TEI's two distribution feeders directly at that voltage. This would mean that the 69/13.8 kV transformer, which is used to inject electricity from the TPC power station into the 69 kV sub-transmission network and also by TEI to supply its distribution feeders when the power station is not operating, should be considered part of the regulated distribution network and not subject to optimization. If this approach is accepted then any costs associated with replacing or refurbishing this transformer may legitimately be included in the TEI CAPEX forecast.

However we do not recommend that the provision in the CAPEX forecast should be sufficient to replace this transformer with a new one, given that cheaper alternatives are available to achieve the required objective. Instead, we propose that the funding be reduced to PhP7.00 Million which is our estimated cost for the procurement and installation of a zigzag earthing transformer and associated protection. Alternatively TEI may choose to use this funding have the existing transformer modified to a star-star configuration, although this is not an ideal technical solution given that star-star transformers will allow the passage of harmonics. However in this application this should

<sup>9</sup> See [http://en.wikipedia.org/wiki/zigzag\\_transformer](http://en.wikipedia.org/wiki/zigzag_transformer) for brief information on the construction and application of zigzag transformers.

<sup>10</sup> Sinclair Knight Merz: *Davao Light and Power Company – Regulatory Asset Valuation, Valuation Date 31 December 2008*; 24 April 2009, p38.

not be a problem since, assuming the NGCP transformer has a delta high voltage winding, there is no harmonic source on the 69 kV network.

This adjustment to TEI's expenditure forecast is shown in Table 4.2:

**Table 4.2: Adjustments to Cost of Santo Nino/TPC Transformer Replacement (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
TEI Revenue Application Expenditure Forecast	26.75					
TEI Adjusted Expenditure Forecast	27.32					
Recommended adjustment for Santo Nino Transformer Upgrade	(20.32)					

#### 4.3 SAN RAFAEL SUBSTATION (RY 2010)

TEI purposes to construct this new substation with a 15/20 MVA transformer as a part of its 69 kV sub-transmission restructuring activity. The 15/20 MVA transformer will be relocated from the TPC substation after this transformer has been replaced under the project described in Section 4.2. The new substation has a forecast installed cost of PhP38.73 Million in the revenue application as well as the resubmission and is scheduled to be commissioned in February 2010. As per information provided by TEI during the clarificatory meetings, the San Rafael substation will be located at 11.7 km on the new 69 kV line with 795 MCM conductor. As discussed in Section 4.1, the purpose of the new 69 kV line to provide 'n-1' security at sub-transmission level.

Our view is that, although a 69 kV switching station at the San Rafael site is desirable, the installation of additional power transformer capacity will not be required before the end of the second regulatory period. As discussed in Section 2.3.1, TEI's network already has sufficient power transformer capacity to supply the forecast load at the end of the second regulatory period, even if the 25/30 MVA LIP transformer is out of service.

**Table 4.3: Adjustments to Cost of San Rafael Substation (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
TEI Revenue Application Expenditure Forecast		38.73				
TEI Adjusted Forecast		38.73				
Recommended Adjustment for San Rafael Substation		(20.00)				

We recommend that the CAPEX forecast be adjusted to remove the provisions for the installation of the relocated transformer, new 13.8 kV switchgear and the connection of the distribution lines and have estimated this change to reduce the cost of the work by PhP20.00 Million.

#### 4.4 COVERED WAREHOUSE, OPEN STOCKYARD, MOTOR POOLING AND PARKING (RY 2011)

This project involves the construction of new covered warehouse near the vicinity of San Rafael substation. TEI purposes to acquire a new 5000 m<sup>2</sup> lot to relieve space restrictions at its existing head office and depot location. TEI has also stated that stocks such as poles and distribution transformer are located in various locations and there are difficulties in managing the inventory. The forecast CAPEX also provides for the construction of a perimeter fence, covered warehouse, motor pool, concrete road and concrete pavement for distribution transformers and parking. The estimated expenditure for this project as per the revenue application is PhP20.00 Million distributed in RY 2010 and RY 2011 but in the revised forecast all expenditure has been shifted to RY 2011. TEI plans to commission the covered warehouse in 2011.

Our view is that this project will facilitate materials inventory management for TEI. The existing warehouse is located at the TEI office in Tarlac, which is a small, very congested site. We recommend that CAPEX for the construction of the covered warehouse, open stockyard, motor pool and parking be approved.

For this review we engaged Asian Appraisals to review major project expenditure forecasts for efficiency and reasonableness. In this case we were advised that TEI's estimated project cost was approximately 33% higher than what Asian Appraisals considered reasonable.

We therefore recommend that the project cost be adjusted to better reflect the current market rates. This adjustment is shown below in Table 4.4.

**Table 4.4: Adjustments to Cost of Covered Warehouse, Open Stockyard, Motor Pool and Parking (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
TEI Revenue Application Expenditure Forecast		13.05	6.95			
TEI Adjusted Forecast			20.00			
Recommended adjustment for Covered Warehouse, Open Stockyard, Motor Pool and Parking			(4.00)			

#### 4.5 MAIN OFFICE BUILDING (RY 2012)

This project involves the construction of a new main office building from concrete and steel reinforcement. The two (2) storey building will have a floor area of 1400 m<sup>2</sup> to house 100 office staff and provide upgraded customer service facilities. The linemen currently operating from the existing location will be shifted to the San Rafael warehouse complex. TEI at its existing location has limited space for both customers and staff. TEI purposes to commission the main building in RY 2012. The capital expenditure for this project in the revenue application was PhP25.20 Million spread over RY 2011 and RY 2012 but in the revised forecast all expenditure is shown in RY 2012. This is shown in Table 4.5.

We accept TEI's submission that its existing office facilities are inadequate for both staff and customers and we do not consider the new building proposed to be extravagant. However we are cognizant of the impact of capital expenditure on the distribution wheeling rate charges to customers and the need to be cautious in the approval of discretionary CAPEX. We see the new office building, together with the new warehouse as being discretionary and consider that this development program could be spread over two regulatory periods. Hence, while we have recommended approval of the new warehouse (See Section 4.4), we recommend that the forecast CAPEX for the new main office building not be approved in full. We have however left PhP3.00 Million in the project, which we consider TEI should to refurbish the facilities vacated by the linemen so they can be used by office staff. We see this as a temporary solution, until the new office building is constructed after 2014.

**Table 4.5: Adjustments to Cost of Main Office Building (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
TEI Revenue Application Expenditure Forecast			10.00	15.20		
TEI Adjusted Forecast				25.20		
Recommended adjustment for Main Office Building				(22.20)		

**4.6 SERVICE VEHICLE REPLACEMENT PROGRAM (RY 2012 & RY 2014)**

TEI purposes to replace its ageing fleet of service vehicles in RY 2012 and RY 2014. TEI has made significant adjustments to the expenditure initially shown in its revenue application major projects sheet and reduced the cost for replacement of vehicles to PhP22.54 Million in RY 2012 and PhP25.69 Million in RY 2014. We recommend that the forecast expenditure in RY 2012 be approved but the expenditure forecast for RY 2014 be deferred until the third regulatory period, in order to minimize the impact of the new CAPEX on the distribution wheeling rates charged to customers.

Our recommended reduction is shown in Table 4.6

**Table 4.6: Adjustments to Service Vehicle Replacement Program (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
TEI Revenue Application Expenditure Forecast				42.61		49.27
TEI Adjusted Forecast				22.54		25.69
Recommended adjustment to Service Vehicle Replacement Program						(25.69)

**4.7 SAN ISIDRO SUBSTATION (RY 2013)**

TEI purposes to install this new substation with a 10 MVA transformer, to offload Panganiban substation. The project would use the existing 10 MVA spare transformer presently located at LIP substation. The project would be commissioned in RY 2013 at a forecast cost (in its revised submission) of PhP28.27 Million. TEI purposes this substation because it would provide 'n-1' security to its zone substations.

As discussed in Section 2.3.1, TEI's network already has sufficient power transformer capacity for an 'n-1' event. Our view is that TEI will be able to transfer load, at 13.8 kV level from the Panganiban substation to adjacent substations. The distance between substations at Panganiban and Maliwalo is only 2.2 km. We consider that 13.8 kV interconnection can be used to transfer the 6 MW of load that was shown by TEI in its revenue application. From our analysis the forecast maximum load in RY 2014 for Panganiban substation will be 16.8 MW and therefore the 20/25 MVA transformer will have adequate capacity. For Maliwalo substation, the 10/12 MVA transformer is sufficient to meet the forecast load of 8.5 MW in RY 2014.

Based on the analysis, we recommend that the forecast CAPEX for this project not be approved as the capacities of existing power transformer and distribution circuits are sufficient to meet the load requirements until the end of the second regulatory period.

This adjustment to TEI's expenditure forecast is shown in Table 4.7:

**Table 4.7: Adjustments to Cost of San Isidro Substation (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
TEI Revenue Application Expenditure Forecast					26.81	
TEI Adjusted Forecast					28.27	
Recommended adjustment for San Isidro Substation					(28.27)	

**4.8 BALETE SUBSTATION (RY 2014)**

TEI purposes to construct a new substation at Balete with a 69/13.8 kV transformer rated at 5 MVA. TEI plans to relocate a spare transformer at Maliwalo to Balete. The purpose

of the project is to supply new loads near the proposed Luisita Industrial Park II, Central Azucarera de Tarlac and Luisita SCTEX exit. The substation would offload the LIP substation that TEI considers might get overloaded due to new load.

As discussed in Section 2.3.1, we consider that TEI's network already has sufficient power transformer capacity to supply the forecast load in RY 2014 even for an 'n-1' contingency event. Therefore the Balete substation project will not be required before the end of the second regulatory period.

Our recommended adjustment to TEI's CAPEX forecast is shown in Table 4.8:

**Table 4.8: Adjustments to Cost of Balete Substation (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
TEI Revenue Application Expenditure Forecast						30.12
TEI adjusted forecast						32.77
Recommended adjustment for Balete substation						(32.77)

#### 4.9 SUMMARY OF MAJOR PROJECT EXPENDITURE

A breakdown of TEI's revised forecast major project expenditure into individual projects is shown in Table 4.9.

**Table 4.9: Breakdown of Revised Forecast Major Project Expenditure**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
San Rafael - Luisita 69 kV line	26.50					
Sto. Nino Upgrade	27.32					
San Rafael Substation		38.73				
Warehouse			20.00			
Main Office Building				25.20		
Service Vehicles - 2012				22.54		
San Isidro Substation					28.27	
Balete Substation						32.77
Service Vehicles - 2014						25.69
<b>Total</b>	<b>53.82</b>	<b>38.73</b>	<b>20.00</b>	<b>47.74</b>	<b>28.27</b>	<b>58.46</b>

Our recommended individual project adjustments are summarized in Table 4.10.

**Table 4.10: Summary of Individual Adjustments (PhP Million, real)**

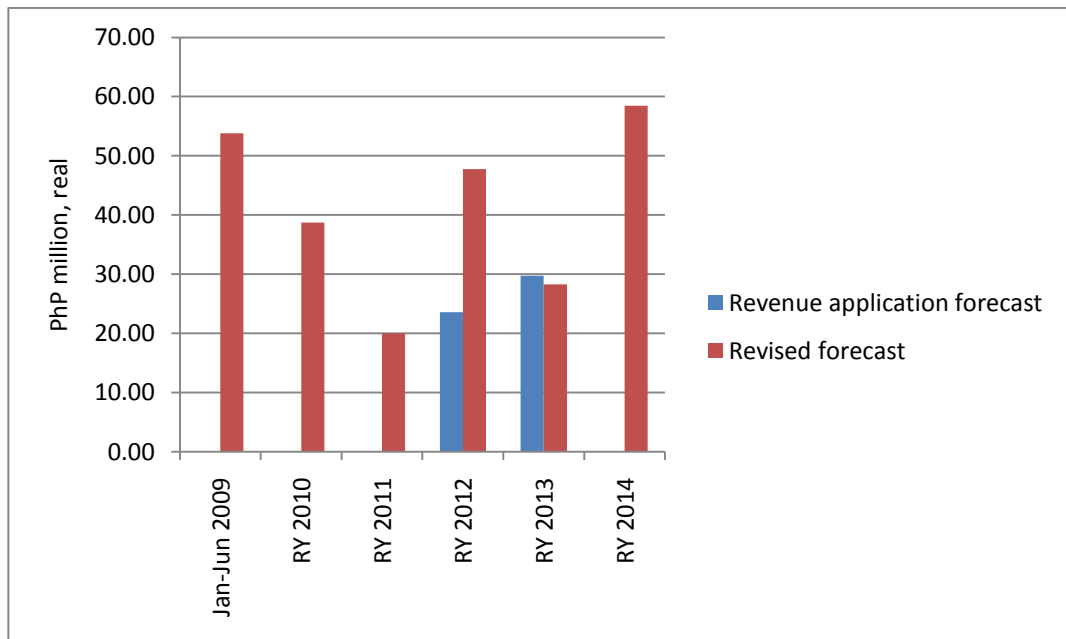
	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Adjustment to San Rafael-Luisita-CAT 69 kV line	(2.00)					
Adjustment to Sto. Nino (TPC) transformer replacement	(20.32)					
Adjustment to San Rafael substation		(20.00)				
Adjustment to covered warehouse etc			(4.00)			
Adjustment to main office building				(22.20)		
Adjustment to service vehicle replacement program						(25.69)
Deletion of San Isidro substation					(28.27)	
Deletion of Balete substation						(32.77)
<b>Recommended adjustments</b>	<b>(22.32)</b>	<b>(20.00)</b>	<b>(4.00)</b>	<b>(22.20)</b>	<b>(28.27)</b>	<b>(58.46)</b>

Our recommended major project CAPEX for the second regulatory period is shown in Table 4.11 and a comparison between the TEI forecast and our recommendation is shown in Figure 4.1.

**Table 4.11: Summary of Recommended Major CAPEX Expenditure (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revenue application forecast	-	-	-	23.60	29.75	-
Revised forecast	53.82	38.73	20.00	47.74	28.27	58.46
Recommended adjustments	(22.32)	(20.00)	(4.00)	(22.20)	(28.27)	(58.46)
<b>Recommended major project CAPEX</b>	<b>31.50</b>	<b>18.73</b>	<b>16.00</b>	<b>25.54</b>	<b>-</b>	<b>-</b>

**Figure 4.1: Comparison of TEI Revised Forecast and Recommended Major Project CAPEX**



All TEI's major project CAPEX should be categorized as growth for operational expenditure (OPEX) forecasting purposes.

## 5. REVIEW OF RESIDUAL CAPITAL EXPENDITURE

An analysis of TEI's residual CAPEX as submitted in its revenue application showed an average annual increase of 64% for historical years CY 2005-08 and an average annual increase of 13% for the second regulatory period with RY 2010 as the base. As noted in Section 3, TEI subsequently submitted a revised template, which reduced the forecast residual CAPEX through transferring some expenditure to the major projects template. We consider the revised CAPEX resubmitted by TEI to be a more accurate forecast as the values for major projects reconcile with the individual major project information summaries and we have used this template as the basis for our analysis.

TEI was unable to separate historical major project CAPEX from other historical expenditure. Therefore it is not possible to validly compare the residual forecast CAPEX with the residual historical CAPEX. We have focused this review on those line items in the template where the forecast CAPEX is substantially higher than the historical expenditure. We think that this approach is reasonable and also fair to TEI, given that the historical expenditure is likely to include the costs of some significant one-off projects, which would have been recorded as major projects had they been planned over the forecast period.

### 5.1 STATION EQUIPMENT

TEI has forecast total expenditure of PhP27.3 Million on growth related residual capital expenditure on station equipment<sup>11</sup> over the period RY 2010 to RY 2014. TEI has also forecast PhP1.58 Million towards refurbishment related expenditure. Historical expenditure was not reported by TEI for these line items in either growth or refurbishment expenditure worksheets.

As per TEI's justification provided during the clarificatory meeting, this expenditure is required for rehabilitation of the 69kV line from LIP to Avantex and Luzcor. The purpose of this line, which is being recommissioned and will connect to the new San-Rafael-Luisita-CAT line discussed in Section 4.1, is to provide 'n-1' security at the sub-transmission level. This project has not been included as a major project list as the cost is below the major project cost threshold. TEI also proposes to implement a full SCADA system and replace overcurrent relays at LIP station.

TEI has also included expenditure associated with the connection of distribution feeders into San Rafael substation, which will not be required if the project does not proceed, as recommended in Section 4.3 above. We recommend that the residual expenditure shown for San Rafael substation be disallowed for the second regulatory period and our recommended adjustment is shown in Table 5.1.

**Table 5.1: Recommended Adjustments to Revised Forecast CAPEX for Station Equipment (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revised TEI renewal forecast						
Revised TEI growth forecast	-	9.59	14.73			3.33
Revised TEI refurbishment forecast	-			1.58		
Recommended adjustments to growth forecast expenditure		(2.21)	(7.55)			

<sup>11</sup> As per the RDWR asset breakdown the station equipment includes protective equipment, switchgear, communications and metering and control equipments.

**5.2 POLES, TOWERS AND FIXTURES**

TEI's revised forecast includes PhP45.50 Million for growth related CAPEX and PhP30.95 Million for refurbishment related CAPEX on poles, towers and fixtures for the period RY 2010-14. This expenditure is primarily for the replacement of rotten wooden poles for both the 69 kV and 13.8 kV lines. The forecast shown in Table 5.2 indicates that the growth related expenditure forecast is consistent throughout the second regulatory period. The refurbishment related expenditure has increased in RY 2013 and RY 2014 due to replacement of higher number of wooden poles. TEI was unable to provide a breakdown of historical expenditure for poles, towers and fixtures and therefore historical values were not used for comparison.

**Table 5.2: Revised Forecast CAPEX for Poles, Towers and Fixtures (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revised TEI renewal forecast						
Revised TEI growth forecast	6.17	4.10	10.13	10.72	9.47	11.08
Revised TEI refurbishment forecast	4.01	4.00	5.25	4.00	8.45	9.25

Our view is that TEI should be allowed the requested expenditure in full.

**5.3 OVERHEAD CONDUCTORS AND DEVICES**

TEI's revised forecast includes PhP28.25 Million for growth related expenditure on overhead conductors and devices over the period RY 2010-14. TEI was unable to provide a breakdown of historical expenditure for overhead conductors and devices. The forecast shown in Table 5.3 indicates that the growth related expenditure forecast is consistent throughout the forecast period. TEI's expenditure is higher in RY 2011 due to requirement of 13.8 kV lines for connecting new loads.

Our view is that TEI should not be allowed the growth related residual expenditure for San Rafael substation as we recommended in Section 4.3 that this substation should not proceed during the second regulatory period. The adjusted values for residual expenditure for overhead conductors and devices are shown in Table 5.3.

**Table 5.3: Recommended Adjustments to Revised Forecast CAPEX for Overhead Conductors and Devices (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revised TEI renewal forecast						
Revised TEI growth forecast	3.23	4.85	10.14	3.65	5.12	4.49
Revised TEI refurbishment forecast	2.08					
Recommended adjustments to growth forecast expenditure	-	(2.44)	(5.46)			

**5.4 DISTRIBUTION LINE TRANSFORMERS**

TEI's revised forecast includes PhP18.52 Million for growth related expenditure on distribution transformers. TEI was unable to provide a breakdown of historical expenditure for distribution line transformers and the forecast expenditure for RY 2010. The forecast shown in Table 5.4 indicates that the growth related expenditure forecast is consistent throughout the second regulatory period.

**Table 5.4: Revised Forecast CAPEX for Distribution Line Transformers (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revised TEI renewal forecast						
Revised TEI growth forecast	-	-	4.60	3.61	4.26	6.05
Revised TEI refurbishment forecast						

Our view is that TEI should be allowed the growth related residual expenditure for distribution line transformers.

## 5.5 METERS, INSTRUMENTS AND METERING TRANSFORMERS

TEI has forecast PhP43.94 Million for growth related expenditure on meters, instruments and metering transformers over the second regulatory period but was unable to provide a breakdown of historical expenditure for this line item. This expenditure is towards meters, instruments and transformers required to serve new customers both residential and commercial. The forecast shown in Table 5.5 indicates that the growth related expenditure forecast is consistent throughout the second regulatory period. In CY 2009, the growth related expenditure for this line item was PhP9.176 Million. In the table below we have assumed that half of this expenditure will be incurred in RY2010, consistent with our assumptions in Section 3, but not that this does not fully reconcile with TEI's revised template.

We recommend that TEI be allowed the full growth related expenditure for meters, instruments and metering transformers.

**Table 5.5: Revised Forecast CAPEX for Meters, Instruments and Metering Transformers (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revised TEI renewal forecast						
Revised TEI growth forecast	4.59	4.59	10.50	10.17	10.55	12.72
Revised TEI refurbishment forecast						

## 5.6 INFORMATION SYSTEM EQUIPMENT (NON-NETWORK)

TEI's revised CAPEX forecast includes PhP18.44 Million for residual expenditure on non-network related information system equipment and out of this PhP14.39 Million is for renewal. As per the revised CAPEX template, TEI's average historical expenditure for this line item was PhP3.49 Million is similar to the average forecast expenditure of PhP3.05 Million for second regulatory period. The expenditure is towards updates and annual subscription fees for engineering analysis software and billing system software. TEI's renewal related expenditure forecast shown in Table 5.6 indicates that the values are higher in RY 2010 and RY 2011 due to purchase of customized customer service software.

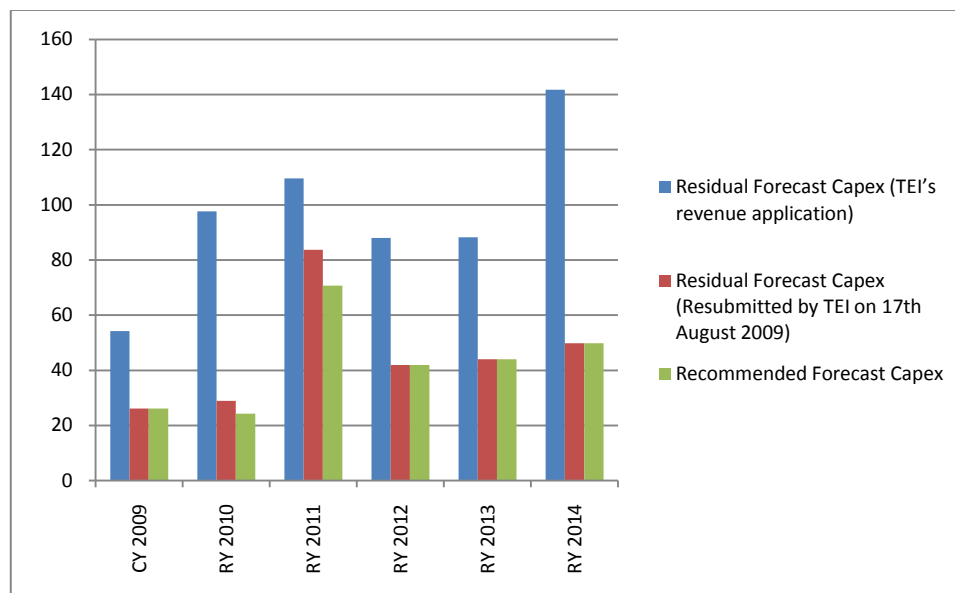
We recommend that TEI be allowed the full residual expenditure on non-network related information system equipment.

**Table 5.6: Revised Forecast CAPEX for Information System Equipment (Non-network) (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revised TEI renewal forecast	3.58	5.30	4.45	1.69	1.40	1.55
Revised TEI growth forecast					1.95	
Revised TEI refurbishment forecast						2.10

**5.7 SUMMARY OF RECOMMENDED ADJUSTMENTS TO RESIDUAL FORECAST CAPEX**

On the basis of the analysis above, we recommend the residual expenditure shown in Figure 5.1 and Table 5.7 be allowed for RY 2010 to RY 2014. The recommended residual expenditure over the five-year forecast period RY 2010-14 is PhP230.82 Million, a decrease of 56% on TEI's revenue application value of PhP525.12 Million for total residual expenditure over the same period. When compared to the TEI's resubmitted residual CAPEX of PhP248.48 Million for five-year forecast period, there is a decrease of 7% as against the recommended residual expenditure over the same period.

**Figure 5.1: Recommended Residual CAPEX (PhP Million real)****Table 5.7: Recommended Residual CAPEX (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revenue application forecast	54.28	97.59	109.57	88.05	88.19	141.72
Revised TEI Forecast	26.10	28.94	83.70	41.96	44.01	49.87
Recommended Adjustments		(4.65)	(13.01)			
Recommended forecast	26.10	24.29	70.69	41.96	44.01	49.87

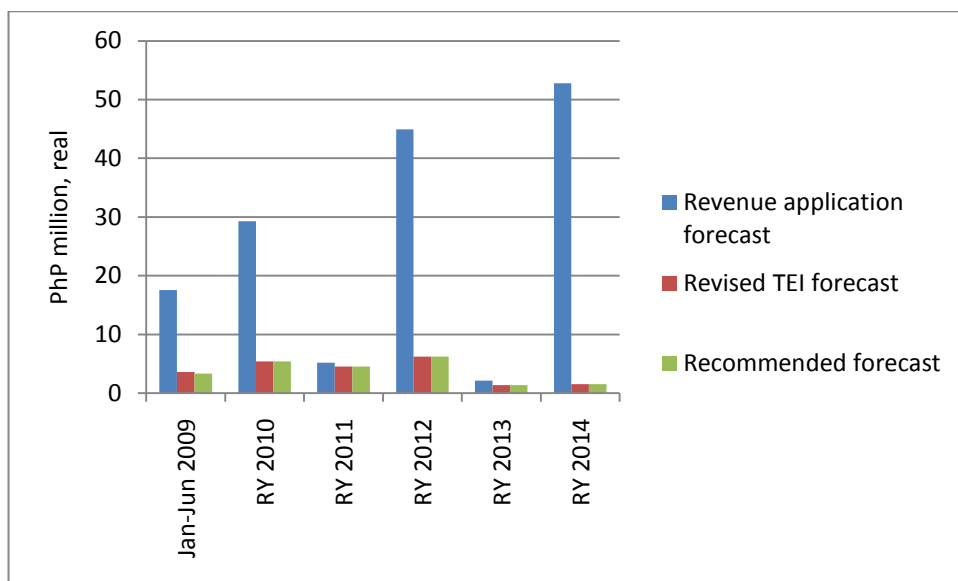
**5.7.1 Residual Renewal CAPEX**

TEI's forecast residual renewal CAPEX and our recommended adjustments are summarized in Table 5.8 and Figure 5.2

**Table 5.8: Comparison of Forecast and Recommended Residual Renewal CAPEX (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revenue application forecast	17.57	29.28	5.18	44.91	2.15	52.77
Revised TEI forecast	3.63	5.40	4.55	6.24	1.40	1.55
Recommended adjustments	-	-	-	-	-	-
Recommended forecast	3.63	5.40	4.55	6.24	1.40	1.55

**Figure 5.2: Comparison of Forecast and Recommended Residual Renewal CAPEX (PhP Million, real)**



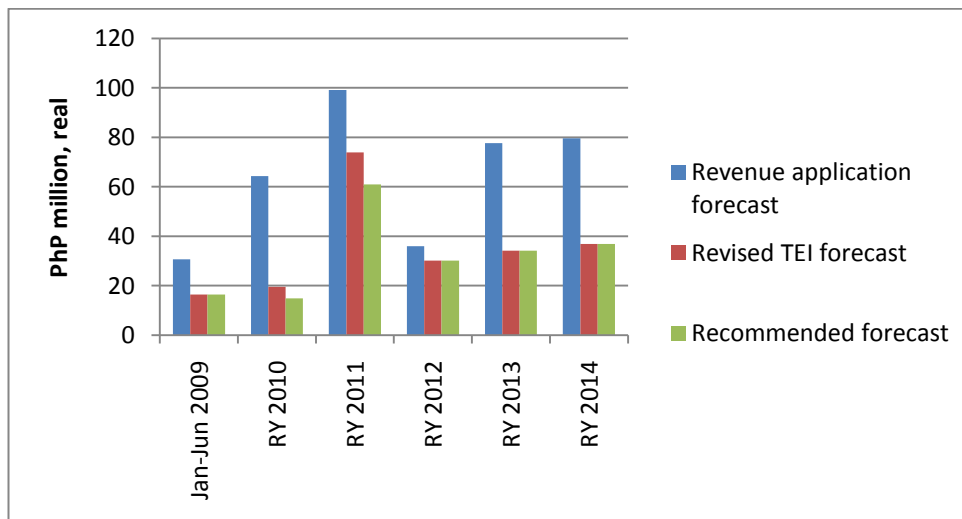
**5.7.2 Residual Growth CAPEX**

TEI’s forecast residual growth CAPEX and our recommended adjustments are summarized in Table 5.9 and Figure 5.3

**Table 5.9: Comparison of Forecast and Recommended Residual Growth CAPEX (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revenue application forecast	30.62	64.31	99.14	35.98	77.59	79.60
Revised TEI forecast	16.39	19.54	73.90	30.14	34.16	36.88
Recommended adjustments						
Adjustment to station equipment		(2.21)	(7.55)			
Adjustment to overhead conductors and devices		(2.44)	(5.46)			
Total recommended adjustments		(4.65)	(13.01)			
<b>Recommended forecast</b>	<b>16.39</b>	<b>14.89</b>	<b>60.89</b>	<b>30.14</b>	<b>34.16</b>	<b>36.88</b>

**Figure 5.3: Comparison of Forecast and Recommended Residual Growth CAPEX**



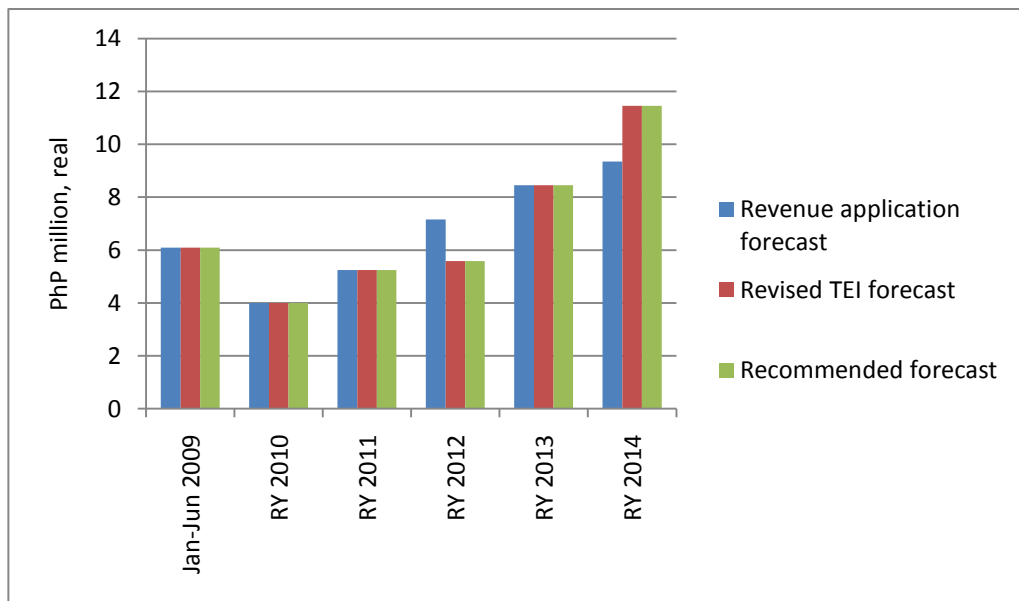
**5.7.3 Residual Refurbishment CAPEX**

TEI’s forecast residual refurbishment CAPEX and our recommended adjustments are summarized in Table 5.10 and Figure 5.4

**Table 5.10: Comparison of Forecast and Recommended Residual Refurbishment CAPEX (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Revenue application forecast	6.09	4.00	5.25	7.16	8.45	9.35
Revised TEI forecast	6.09	4.00	5.25	5.58	8.45	11.45
Recommended adjustments	-	-	-	-	-	-
Recommended forecast	6.09	4.00	5.25	5.58	8.45	11.45

**Figure 5.4: Comparison of Forecast and Recommended Residual Refurbishment CAPEX**



## 6. SUMMARY OF RECOMMENDED TOTAL CAPITAL EXPENDITURE

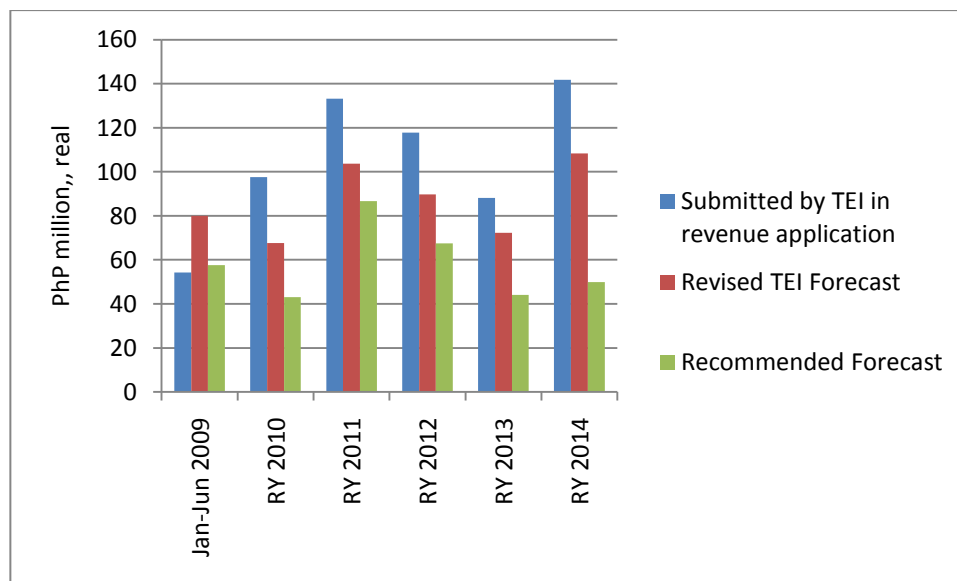
On the basis of the analysis for major projects and residual expenditure, we recommend the CAPEX shown in Table 6.1 be allowed for the forecast period January 2009 to June 2014. The total recommended CAPEX over the forecast period Jan 2009-Jun 2014 is PhP328.69 Million, a decrease of 45% on TEI's revenue application value of PhP632.74 Million forecast for total CAPEX over the same period. When compared to the TEI's resubmitted total CAPEX of PhP521.60 Million for the forecast period the recommended CAPEX represents a reduction of 33%.

**Table 6.1: Adjustments to Forecast Total CAPEX (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Submitted by TEI in revenue application	54.28	97.59	133.17	117.80	88.19	141.72
Revised TEI Forecast	79.92	67.67	103.70	89.70	72.28	108.33
Recommended Forecast	57.60	43.02	86.69	67.50	44.01	49.87

These recommended adjustments to forecast CAPEX is shown graphically in Figure 6.1 below.

**Figure 6.1: Recommended Adjustments to Forecast Total CAPEX**



The breakdown of the recommended forecast expenditure into the ERC's standard expenditure categories is shown in Table 6.2 and Figure 6.2.

**Table 6.2: Breakdown of Recommended Forecast Expenditure (PhP Million, real)**

	Jan-Jun 2009	RY 2010	RY 2011	RY 2012	RY 2013	RY 2014
Major Projects	31.50	18.73	16.00	25.54	-	-
Renewal	3.63	5.40	4.55	6.24	1.40	1.55
Growth	16.39	14.89	60.89	30.14	34.16	36.88
Refurbishment	6.09	4.00	5.25	5.58	8.45	11.45

**Figure 6.2: Breakdown of Recommended Forecast Expenditure (PhP Million, real)**

