

Republic of the Philippines
ENERGY REGULATORY COMMISSION
San Miguel Avenue, Pasig City

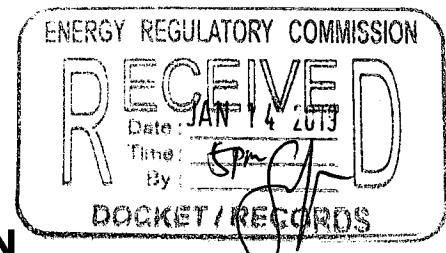
**IN THE MATTER OF THE
APPLICATION FOR
APPROVAL OF THE
EMERGENCY REPLACEMENT
OF ONE (1) 33-MVA POWER
TRANSFORMER AT
TAGAYTAY SUBSTATION,**

ERC Case No. 2019- 005 RC

**MANILA ELECTRIC COMPANY
(MERALCO),**

Applicant.

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APPLICATION

Applicant **MANILA ELECTRIC COMPANY (MERALCO)**,
through the undersigned counsel, most respectfully avers: that –

1. Applicant is a private corporation duly organized and existing under the laws of the Republic of the Philippines, with principal office located at Lopez Building, Ortigas Avenue, Barangay Ugong, Pasig City. It may be served with notices and other processes of this Honorable Commission through its undersigned counsel at the address indicated herein.

2. Applicant has a legislative franchise to construct, operate and maintain an electric power distribution system for the conveyance of electric power to the end-users in the cities and municipalities of Metro Manila, Bulacan, Cavite and Rizal, and certain cities/municipalities/barangays in Batangas, Laguna, Quezon and Pampanga, pursuant to Republic Act No. 9209.

3. Applicant seeks the Honorable Commission's approval of its emergency replacement of one (1) 33 MVA, 110 kV–13.8 kV, three (3)-phase power transformer with On-Load Tap Changer (OLTC) at the Tagaytay Substation for the replacement of the defective Power Transformer Bank No. 1.

4. The Application is filed pursuant to the Honorable Commission's Resolution No. 26, Series of 2009, entitled: "*Resolution Amending the Rules for Approval of Regulated Entities' Capital*

Expenditure Projects". Emergency Capital Expenditure projects are those that require immediate implementation during an event that is not a force majeure or fortuitous event in order to maintain safe, reliable, secure and efficient operation of the power system.

5. However, for purposes of recovering the capital cost of the said emergency project through Applicant's rates, the same will go through the process of evaluation by the Honorable Commission during the regulatory reset process in accordance with the Rules for the Setting of Distribution Wheeling Rates (RDWR) for Distribution Utilities (DUs).

BACKGROUND

6. The Tagaytay Substation is located at Nasugbu Highway, Brgy. Maharlika West, Tagaytay City, Cavite and serves the entire City of Tagaytay, including portions of the municipalities of Indang, Silang, Amadeo, and Trece Martires, Cavite. The Tagaytay Substation has one (1) 33 MVA, 110kV-13.8kV power transformer bank.

7. On 14 November 2018, the lone Tagaytay Power Transformer Bank No. 1 was tripped out by the transformer differential relay, with targets at phases A and B, due to the turn-to-turn short on the H1H2 windings. The power transformer was immediately subjected to a series of tests on the same day. Results of the tests revealed that the transformer had low percentage (%) turns ratio, measured on the H1H2-X0X2 windings, compared with the H2H3-X0X3 and H1H3-X0X1 windings. Similarly, it was found out that the excitation tests could not be conducted between the H1H2 and H2H3 windings.

8. Furthermore, the Transformer Fault Gas Analysis done on 15 November 2018 for both the gas and oil samples taken from the Buchholz relay showed high values of combustible gas such as Acetylene (C₂H₂), Hydrogen (H₂), Methane (CH₄), Carbon Monoxide (CO) and Ethane (C₂H₆).

9. Given these adverse test results, Applicant was constrained to replace the defective Tagaytay Power Transformer Bank No. 1 and to temporarily transfer its loads to the adjoining transformer banks with 110kV-13.8kV, namely, the Silang 33 MVA Bank No. 1 and Tagaytay West Bank No. 1

10. The set-up caused the Silang Bank No.1 and Tagaytay West Bank No. 1 to operate above critical level at 93.0% and 89.0%, respectively.

11. With the critical loading of said power transformers, any outage thereof would have resulted to prolonged and massive

))

interruption in the municipalities/towns of Indang, Amadeo, Silang, Cavite, Tagaytay City, and Trece Martires, Cavite. In particular, an outage would have critically affected the supply of electricity to vital customers in said areas, such as the Bangko Sentral ng Pilipinas Training Facility, Philippine Public Safety College, Filinvest Land, Inc., Ayala Land Inc., Alveo Land Corp., and Globe Telecom Inc.

12. Considering the imminent risks posed by shifting the loads to the adjoining power transformers, MERALCO was constrained to undertake an interim solution. Thus, on 19 November 2018, Applicant replaced the defective Tagaytay Power Transformer No. 1 with a 41 MVA, 110kV-13.8kV power transformer pulled out from the Los Baños Substation. This temporary solution was done to relieve the critical loading of the Silang and Tagaytay West power transformer banks.

13. Since this is only an interim solution, the 41 MVA Power Transformer shall be returned to Los Baños Substation as soon as the new 33 MVA, 110kV-13.8kV Power Transformer arrives.

14. Shown below are the projected loadings of the affected power transformers with and without the replacement of the defective 33 MVA Tagaytay Power Transformer.

Table 1: Without Project

Parameter Under Consideration	
Loading of Silang Bank No. 1	93.0%
Loading of Tagaytay West Bank No.1	89.0%
System Loss	18,377,060 kWh

Table 2: With Project

Parameter Under Consideration	
Loading of Tagaytay Bank No.1	77.0%
Loading of Silang Bank No.1	68.0%
Loading of Tagaytay West Bank No.1	80.0%
System Loss	13,080,423 kWh

15. In view of the foregoing, there was an urgent need to implement the emergency project to replace the 33 MVA Power Transformer in the Tagaytay Substation.

16. The total cost for the emergency replacement of the power transformer at the Tagaytay Substation is **FORTY FOUR MILLION SEVEN HUNDRED FIFTY SIX THOUSAND FOUR HUNDRED SEVENTEEN & 04/100 PESOS (Php 44,756,417.04).**

17. In further support of the Application, attached hereto are the following documents:

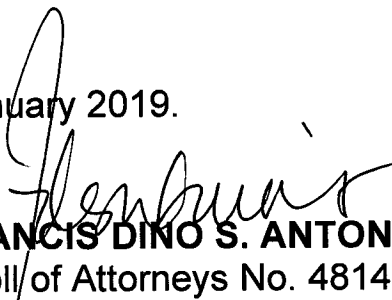
- **Annex "A"** – Emergency CAPEX Project Information Summary with supporting documents: (i) Technical and Economic Analysis, (ii) Cost Estimates; (c) Expenditure Summary; (iii) Cost Benefit Analysis Calculation; and (iv) Gantt Chart;
- **Annex "B"** – Documents showing the results of tests conducted on Tagaytay Power Transformer Bank No. 1; and
- **Annex "C"** – Judicial Affidavit of Engr. Mario Angelito A. delos Reyes, Manager and Head of Applicant's Substation Services Asset Management Office.

PRAYER

WHEREFORE, it is respectfully prayed to this Honorable Commission that the Applicant's emergency replacement of the power transformer at the Tagaytay Substation be **APPROVED**.

Other relief just and equitable under the premises are likewise prayed for.

Pasig City, 11 January 2019.



FRANCIS DINO S. ANTONIO

Roll of Attorneys No. 48145

PTR No. 5229236; 1/9/19; Pasig City

IBP No. 66245; 1/9/19; RSM

MCLE Compliance No. VI-0003791; 3 November 2017



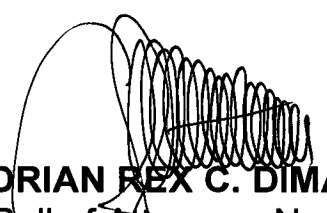
HAZEL ROSE B. SEE

Roll of Attorneys No. 48265

PTR No. 5229237; 1/9/19; Pasig City

IBP No. 06460(LIFETIME); 01/16/07; QC

MCLE Compliance No. VI-0000253; 11 July 2016


ADRIAN REX C. DIMALANTA

Roll of Attorneys No. 61149

PTR No. 5229240; 1/9/19; Pasig City

IBP No. 66248; 1/9/19; PPLM

MCLE Compliance No. VI-0000233; 11 July 2016


ISAGANI C. CORUÑA II

Roll of Attorneys No. 63123

PTR No. 5229243; 1/9/19; Pasig City

IBP No. 66250; 1/9/19; RSM

MCLE Compliance No. VI-0007787; 6 April 2018

7th Floor Lopez Building, Ortigas Avenue

Barangay Ugong, Pasig City

Telephone Number 1622-2260; Fax No. 1622-3550

Email address: regulatory.legal.admin@meralco.com.ph

Republic of the Philippines)
City of Pasig) S.S.

CITY OF MAKATI

VERIFICATION
AND CERTIFICATION ON NON-FORUM SHOPPING

I, **JOSE RONALD V. VALLES**, Filipino, of legal age, married, with office address at 7th Floor, Lopez Building, Ortigas Avenue, Barangay Ugong, Pasig City, after being sworn in accordance with law, hereby depose and say that—

1. I am the Vice President and Head, Regulatory Management Office, of Applicant **Manila Electric Company (MERALCO)**. In such capacity, I have caused the preparation and filing of the foregoing Application;

2. Moreover, I have been authorized by the Board of Directors of MERALCO to certify that Applicant has not heretofore filed any similar action, pleading or application involving the same issues before the Supreme Court, the Court of Appeals or any other lower courts or administrative bodies. A copy of the Secretary's Certificate authorizing me to cause the preparation of the instant Application and sign this Verification and Certification is attached hereto as Annex "D";

3. I have read and understood the allegations contained therein and the same are true and correct based on my personal knowledge and authentic records made available to me in the ordinary course of business of MERALCO;

4. To the best of my knowledge, no similar action or proceeding is pending before the Supreme Court, the Court of Appeals, the lower courts or administrative bodies;

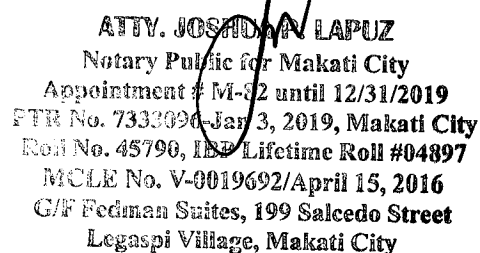
5. If I should hereafter learn that a similar action has been filed before the Supreme Court, the Court of Appeals, the lower courts or administrative bodies, I undertake to report such fact to this Honorable Commission within five (5) days from notice of such fact.

IN WITNESS WHEREOF, I have hereunto affixed my signature this ____ day of January 2019 at Pasig City, Philippines.


JOSE RONALD V. VALLES
Affiant

SUBSCRIBED and SWORN to before me this JAN 11, 2019 day of January 2019, affiant having exhibited to me his Social Security System ID bearing the number 33-10900088.

Doc. No. 109;
Page No. 29;
Book No. 12;
Series of 2019.


ATTY. JOSHUA LAPUZ
Notary Public for Makati City
Appointment # M-82 until 12/31/2019
PTR No. 7333096-Jan 3, 2019, Makati City
Roll No. 45790, LRD Lifetime Roll #04897
MCLE No. V-0019692/April 15, 2016
G/F Fedman Suites, 199 Salcedo Street
Legaspi Village, Makati City



ORTIGAS AVENUE, PASIG CITY
0300 PHILIPPINES

ANNEX " 0 "

REPUBLIC OF THE PHILIPPINES)
PASIG CITY) S.S.
CITY OF MAKATI

SECRETARY'S CERTIFICATE

I, WILLIAM S. PAMINTUAN, a duly elected, qualified and incumbent Assistant Corporate Secretary of the Manila Electric Company (MERALCO), a corporation duly organized and existing under and by virtue of the laws of the Philippines, do hereby certify that:

At the regular meeting of the Board of Directors of the Company duly convened and held on February 26, 2018, at which meeting a quorum was present, acted throughout and voted, the following resolution amending the resolution of the Board on February 23, 2015 on the same subject, was approved and that said amendatory resolution is in full force and effect on the date hereof:

"RESOLVED, that the Board of Directors of the Manila Electric Company (MERALCO) authorize, as it hereby authorizes, Messrs. MANUEL V. PANGILINAN, Chairman, OSCAR S. REYES, President & Chief Executive Officer, SIMEON KEN R. FERRER, Corporate Secretary, ALFREDO S. PANLILIO, Senior Vice President, Head, Customer Retail Services and Head, Corporate Communication, RAMON B. SEGISMUNDO, Senior Vice President & Head, Human Resources & Corporate Services, ROBERTO R. ALMAZORA, Senior Vice President, RONNIE L. APEROCHO, Senior Vice President & Head, Networks, RUBEN B. BENOSA, First Vice President & Head, Corporate Logistics, Ms. IVANNA G. DELA PEÑA, First Vice President & Head, Regulatory Management Office, WILLIAM S. PAMINTUAN, First Vice President, Assistant Corporate Secretary, Compliance Officer and Head, Legal and Corporate Governance, JOSE RONALD V. VALLES, Vice President and Head, Regulatory Affairs, MARIA ZARAH R. VILLANUEVA-CASTRO, Senior Assistant Vice President & Head, Corporate Legal Services, RAUL G. CORALDE, Assistant Vice President & Head, Litigation Services, MICHELLE O. DELOS SANTOS-BONA, Assistant Vice President & Head, Legal Operations Support, CRISTOPHER B. ARPON, Legal Counsel & Head, Litigation Team 1, CORNELIO MANUEL III C. DICCION, Manager & Head, Litigation Team 2, EUGENE JUDE DENIS GERARD E. ALABANZA, Senior Manager & Head, Tax & Labor Litigation, and any lawyer or employee of MERALCO that any of them may designate, name or appoint:

- (1) to represent the Company, in the institution, prosecution, and defense of any claim, complaint, action, proceeding, petition, application, protest, suit, or case, for or against the Company, before any court, prosecutor's office, regulatory, quasi-judicial, or administrative body, agency, or office of the national or any local government;
- (2) to sign, execute, and deliver in connection therewith the necessary or appropriate complaint, petition, application, position paper, memorandum, all types of pleadings and motions, verifications, affidavit-complaint, counter-affidavit, affidavit of merit, affidavit of desistance, affidavit of witness, and all other affidavits of whatever nature, certificate of non-forum shopping, powers of

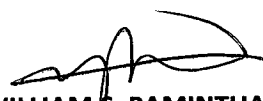
attorney, certifications, and all other instruments as may be necessary or proper;

- (3) to represent the Company or to designate, name, and appoint a representative or an attorney-in-fact in behalf of the company during the investigation, inquest, preliminary investigation, preliminary conference, pre-trial, mediation, conciliation, arbitration, trial, execution, and all other stages of or incidents related to the case, proceeding or action; to negotiate, enter into, and agree to an amicable settlement, compromise agreement, plea bargaining, admissions or stipulations of fact or documents, simplification of issues, limitation on the number of witnesses, alternative modes of dispute resolution, withdrawal, dismissal or waiver of claim or action; and to perform and execute any and all actions or deeds as may aid in the prompt disposition of such cases, proceedings, or actions filed in behalf of or against the Company;

"RESOLVED, FURTHER, that any previous resolution of the Board of Directors on the same subject matter that is inconsistent herewith shall be deemed terminated, superseded and revoked."

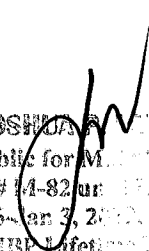
Pursuant to the above resolutions, it is hereby certified that MERALCO is authorized to file the Application with the Energy Regulatory Commission (ERC) entitled: "IN THE MATTER OF THE APPLICATION FOR APPROVAL OF THE EMERGENCY REPLACEMENT OF ONE (1) 33-MVA POWER TRANSFORMER AT TAGAYTAY SUBSTATION" and that Atty. JOSE RONALD V. VALLES, Vice President and Head, Regulatory Management Office, is an authorized representative and signatory of the company with respect to the aforesaid petition.

WITNESS THE SIGNATURE of the undersigned as such officer of the Company and its corporate seal hereunto affixed on this ____ day of _____ 2019.


WILLIAM S. PAMINTUAN
Assistant Corporate Secretary

SUBSCRIBED AND SWORN to before me this ____ day of JAN 11 2019, affiant exhibited to me his Taxpayer Identification Number (TIN) 146-473-562, issued by the Bureau of Internal Revenue (BIR) as his competent evidence of identity.

Doc. No. 106;
Page No. 29;
Book No. 12;
Series of 2019.


ATTY. JOSHUA A. M. M. M.
Notary Public for Makati City
Appointment # 14-82 un 17200/2012
BIR No. 7333096- Jan 3, 2012, Makati City
Lah No. 45790, IBI Lifetime Roll #04897
MCLB No. V-0019692/April 15, 2016
G/F Pedman Suites, 199 Saicedo Street
Legaspi Village, Makati City

MANILA ELECTRIC COMPANY				 MERALCO
Emergency Project Information Summary				
Project Code	N/A	Priority Ranking	Emergency	
Project Title	EMERGENCY REPLACEMENT OF POWER TRANSFORMER BANK NO. 1 AT TAGAYTAY SUBSTATION			
Project Type	Renewal			
Project Driver	Network: Asset Condition			
Project Cost (in millions)	Forex: USD 0.78 M	Local: PHP 3.29 M	Total: PHP 44.76 M	
Regulatory Year	RY2019	Commissioning Date	Jan-June 2020	
Project Description	<p>This emergency Capital Expenditure (CAPEX) project is for the replacement of the defective 33 MVA, 110 kV – 13.8 kV, three-phase Power Transformer, with On Load Tap Changer (OLTC) at the Tagaytay Substation with a new 33 MVA, 110 kV – 13.8 kV, three-phase Power Transformer, with OLTC.</p> <p>The scope of the project includes, among other things:</p> <ul style="list-style-type: none"> • Unspotting of Power Transformer • Hauling of Power Transformer and accessories • Spotting of Power Transformer • Pre-Assembly Test (Dew Point / Core to ground) • Power Transformer Assembly and Harness/Acc. • Vacuum Drying / Leak Test • Mobilization of Oil Machine • Mobilization of ISO Tank with oil • Oil Reconditioning • Oil Filling • Hot Oil Circulation • Stabilizing / Bleeding • Electrical / Calibration Testing • Chemical testing • Final Re-touch and Clearing • De-mobilization of Heavy equipment • Protection Works and Other Substation Works • Pre-Com Checklist and Final Inspection • Commissioning • Site Clearing and Material Return • Activities for final testing of faulted power transformer 			
Project Justification	<p>On 14 November 2018, the 33 MVA 110kV – 13.8 kV Tagaytay Power Transformer Bank was tripped out by the transformer differential relay, with targets at phases A and B, due to the turn-to-turn short on the H1H2 windings. The power transformer was immediately subjected to a series of tests. Results of the tests revealed that the transformer had low percentage (%) turns ratio, measured on the H1H2-X0X2 windings, compared with the H2H3-X0X3 and H1H3-X0X1 windings. Similarly, it was found out that the excitation tests could not be conducted between the H1H2 and H2H3 windings.</p>			

ANNEX A: TECHNICAL AND ECONOMIC ANALYSIS

1. BACKGROUND

1.1. Existing System

The Tagaytay Substation is located at Nasugbu Highway, Brgy. Maharlika West, Tagaytay City, Cavite and serves the entire City of Tagaytay, including portions of the municipalities of Indang, Silang, Amadeo, and Trece Martires, Cavite. The Tagaytay Substation has one (1) 33 MVA, 110kV-13.8kV power transformer bank.

On 14 November 2018, the 33 MVA 110kV – 13.8 kV Tagaytay Power Transformer Bank was tripped out by the transformer differential relay, with targets at phases A and B, due to the turn-to-turn short on the H1H2 windings. The power transformer was immediately subjected to a series of tests. Results of the tests revealed that the transformer had low percentage (%) turns ratio, measured on the H1H2-X0X2 windings, compared with the H2H3-X0X3 and H1H3-X0X1 windings. Similarly, it was found out that the excitation tests could not be conducted between the H1H2 and H2H3 windings.

Furthermore, the Transformer Fault Gas Analysis done for both gas and oil samples taken from the Buchholz relay showed high values of combustible gas such as Acetylene (C₂H₂), Hydrogen (H₂), Methane (CH₄), Carbon Monoxide (CO) and Ethane (C₂H₆).

Given these adverse test results, Applicant had to replace the defective Tagaytay Power Transformer Bank No. 1. Pending the replacement, Applicant was constrained to temporarily transfer its loads to the adjoining transformer banks with 110kV-13.8kV, namely, the Silang 33 MVA Bank No. 1 and Tagaytay West Bank No. 1

The set-up caused the Silang Bank No.1 and Tagaytay West Bank No. 1 to operate above critical level at 93.0% and 89.0%, respectively.

With the critical loading of said power transformers, any outage thereof would have resulted to prolonged and massive interruption in the municipalities/towns of Indang, Amadeo, Silang, Cavite, Tagaytay City, and Trece Martires, Cavite. In particular, an outage would have critically affected the supply of electricity to vital customers in said areas, such as the Bangko Sentral ng Pilipinas Training Facility, Philippine Public Safety College, Filinvest Land, Inc., Ayala Land Inc., Alveo Land Corp., and Globe Telecom Inc.

Considering the imminent risks posed by shifting the loads to the adjoining power transformers, MERALCO was constrained to undertake an interim solution. Thus, on 19 November 2018, Applicant replaced the defective Tagaytay Power Transformer No. 1 with a 41 MVA, 110kV-13.8kV power transformer pulled out from the Los Baños Substation. This temporary solution was done to relieve the critical loading of the Silang and Tagaytay West power transformer banks.

Since this is only an interim solution, the 41 MVA Power Transformer shall be returned to Los Baños Substation as soon as the new 33 MVA, 110kV-13.8kV Power Transformer arrives.

1.2. Planning Criteria and Standards

2.1. Analysis

2.1.1. Qualitative Performance Measures

Parameter Under Consideration	Result without Project	Result with Project
Loading of existing Silang 33-MVA Bank No. 1 (Condition: Tagaytay Transformer Bank No. 1 is out)	Critical level	Within normal loading condition
Loading of existing Tagaytay West 33-MVA Bank No. 1 (Condition: Tagaytay Transformer Bank No. 1 is out)	Critical level	Critical level during peak hours
System Loss	Higher system loss	Lower system loss

2.1.2. Quantitative Performance Measures

Table 1: Without Project

Parameter Under Consideration	
Loading of Silang Bank 1	93.0%
Loading of Tagaytay West Bank 1	89.0%
System Loss	18,377,060 kWh

Table 2: With Project

Parameter Under Consideration	
Loading of Tagaytay Bank 1	77.0%
Loading of Silang Bank 1	68.0%
Loading of Tagaytay West Bank 1	80.0%
System Loss	13,080,423 kWh

2.2. Specific Planning Criteria breached

During the tests conducted, the Tagaytay Power Transformer failed the ratio and excitation tests, and was recommended for immediate replacement.

3. PROJECT FORMULATION AND EVALUATION

3.1 Project Alternative

3.2 Technical Analysis

The following table summarizes the comparison of the advantages and disadvantages of the alternatives:

Alternative	Advantages	Disadvantages
Alternative 1 Replace the defective 33 MVA power transformer with new 33 MVA power transformer	<ul style="list-style-type: none">• Normal distribution line flexibility will be restored, ensuring the reliability of the distribution system in the area.• Reliability and quality of electric service to affected customers as well as the safety of the people in the affected areas will be ensured and preserved.• Lower system loss in the affected area.	<ul style="list-style-type: none">• There is no significant disadvantage compared to Alternative 2.
Alternative 2 Replace the defective 33 MVA power transformer with new 50 MVA power transformer.	<ul style="list-style-type: none">• This alternative provides additional capacity to accommodate new loads.• Normal distribution line flexibility will be restored, ensuring the reliability of the distribution system in the area.• Reliability and quality of electric service to affected customers as well as the safety of the people in the affected areas will be ensured and preserved.• Lower system loss in the affected area.	<ul style="list-style-type: none">• To fully utilize the additional capacity, this alternative will require significant additional cost in the future (e.g. construction of new feeders, switchgear replacement).
Alternative 3 Partial Conversion of Tagaytay 32XS to 20 kV/34.5 kV without Replacement of	<ul style="list-style-type: none">• Critical loading of Silang Power Transformer Bank 1 will be partially relieved.	<ul style="list-style-type: none">• The critical loading of Silang Power Transformer Bank 1 will only be partially relieved, while the

Without the emergency CAPEX project, there will be increased exposure of the affected 13.8kV distribution lines due to emergency load shifting. Similarly, there will be constraints in accommodating additional loads due to inadequate capacity.

A 33 MVA Power Transformer proves to be sufficient for meeting the load requirements of the area. While a 50 MVA Power Transformer may provide additional capacity, additional equipment is needed to be installed before this can be fully utilized. Moreover, there are already ongoing projects such as the expansion of Tagaytay West Substation to accommodate the future load requirements in the area.

Thus, it is recommended that a new 33 MVA Power Transformer Bank No. 1 be immediately installed at Tagaytay substation to fully address all technical problems/concerns and to continuously provide quality and reliable electric service to its customers in the affected areas.

Scope of work

- Replacement of 33MVA power transformer with OLTC.
 - Unspotting of Power Transformer
 - Hauling of Power Transformer and accessories
 - Spotting of Power Transformer
 - Spotting of RCC
 - Pre-Assembly Test (Dew Point / Core to ground)
 - Mobilization of Heavy Eqpt.
 - Uncrating of Accessories (at temporary storage)
 - Hauling of Accessories to Site
 - Power Transformer Assembly and Harness/Accessories
 - Vacuum Drying / Leak Test
 - Mobilization of Oil Machine
 - Mobilization of ISO Tank with oil
 - Oil Reconditioning
 - Oil Filling
 - Hot Oil Circulation
 - Stabilizing / Bleeding
 - Electrical / Calibration Testing
 - Chemical testing
 - Final Re-touch and Clearing
 - De-mobilization of Heavy equipment
 - Protection Works and Other Substation Works
 - Pre-Com Checklist and Final Inspection
 - Commissioning
 - Site Clearing and Material Return
 - Activities for final testing of faulted power transformer

4.1. Impact

ANNEX B: PROJECT COST

The project cost includes labor and material costs. The material costs are based on the moving average price of the equipment that will be used in relation to this project. The cost includes the power cables, sealing end terminations, transformer oil, taxes, duties, brokerage, trucking services and installation.

Table 1: Detailed Cost Estimate

	Labor Cost	Material Cost	Other Cost	Sub-Total
Power transformer	2,358,796.47	41,482,498.30	915,122.27	44,756,417.04
Total (PhP)	2,358,796.47	41,482,498.30	915,122.27	44,756,417.04

Table 2: Summary of Cost Estimates

Description	Quantity	Major Equipment	Total
Tagaytay Power Transformer	1	33 MVA, 110kVD-13.8kVY three-phase power transformer with On-Load Tap Changer (OLTC)	44,756,417.04
Total (PhP Real 2018)			44,756,417.04

Table 3. Cost Component Breakdown

Cost Component	RY2019
Local	3,286,875.44
FOREX (US \$)	779,502.66
Total (PhP, Real 2018)	44,756,417.04

ANNEX C: EXPENDITURE SUMMARY

MANILA ELECTRIC COMPANY					
Capital Expenditure - Major Projects					
Local Expenditure					
PROJECT NAME:		CAPITAL EXPENDITURE - MAJOR PROJECTS (LOCAL COMPONENT)			
EMERGENCY REPLACEMENT OF POWER TRANSFORMER BANK NO. 1 AT TAGAYTAY SUBSTATION					
		Forecast (Php, real) (Regulatory Year)			
Category		2017	2018	2019	2020
Regulated Distribution Services Assets					
Network	Land and Land Rights (Distribution Purposes)				
	Structures and Improvements (Distribution Purposes)				
	Station Equipment				
	Power transformers		3,286,875		
	Switchgear				
	Protective equipment				
	Metering & control equipment				
	Communications equipment				
	Other station equipment				
	Poles, Towers and Fixtures - Distribution				
	Overhead Conductors and Devices - Distribution				
	Underground Conduits - Distribution				
	Underground Conductors and Devices - Distribution				
	Distribution Transformers				
	Power Conditioning Equipment				
	Meters, Metering Instruments & Metering Transformers - Distribution				
	Information technology equipment (distribution)				
	Regulated Entity Property on Consumer's Premises				
	Street Lights and Signal Systems				
	Submarine Cables				
Non-network	Land and Land Rights (non-network)				
	Structures and Improvements (non-network)				
	Office Furniture and Equipment				
	Transportation Equipment				
	Stores Equipment				
	Tools, Shop and Garage Equipment				
	Laboratory Equipment				
	Information Systems Equipment (non-network)				
	Power-operated Equipment				
	Communication Plant and Equipment				
	Miscellaneous Equipment				
	Materials				
	Subtrans				
Sub-total Regulated Distribution Services		0	3,286,875	0	0
Distribution Connection Services Assets					
Network	Poles, Towers and Fixtures (Customer)				
	Overhead Conductors and Devices (Customer)				
	Underground Conduits (Customer)				
	Underground Conductors and Devices (Customer)				
	Line Transformers (Customer)				
Non-network	Information Systems Equipment (Connection)				
	Land and Land Rights (non-network)				
	Structures and Improvements (non-network)				
	Office Furniture and Equipment				
	Transportation Equipment				
	Stores Equipment				
	Tools, Shop and Garage Equipment				
	Laboratory Equipment				
	Information Systems Equipment (non-network)				
	Power-operated Equipment				
Materials	Communication Plant and Equipment				
	Miscellaneous Equipment				
	Materials and supplies (including spares)				
Sub-total Distribution Connection Assets		0	0	0	0
Regulated Retail Services Assets					
	Meters, Instruments & Metering Transformers (Consumer Consumption Metering)				
	Land and land rights				
	Structures and improvements				
	Office Furniture and Equipment				
	Transportation Equipment				
	Stores Equipment				
	Tools, Shop and Garage Equipment				
	Laboratory Equipment				
	Information Systems Equipment				
	Communication Plant and Equipment				
Materials	Miscellaneous Equipment				
	Sub-total Regulated Retail Services Assets	0	0	0	0
TOTAL CAPEX		0	3,286,875	0	0

Notes : References to Regulatory Years are for the 12-month period ending on June 30 of the year noted.

ANNEX C: EXPENDITURE SUMMARY

MANILA ELECTRIC COMPANY					
Capital Expenditure - Major Projects					
US\$ Expenditure (including all international expenditure)					
PROJECT NAME:		CAPITAL EXPENDITURE - MAJOR PROJECTS (US\$ COMPONENT)			
EMERGENCY REPLACEMENT OF POWER TRANSFORMER BANK NO. 1 AT TAGAYTAY SUBSTATION					
		Forecast (US\$, real) (Regulatory Year)			
Category		2017	2018	2019	2020
Regulated Distribution Services Assets					
Network	Land and Land Rights (Distribution Purposes)				
	Structures and Improvements (Distribution Purposes)				
	Station Equipment				
	Power transformers		779,503		
	Switchgear				
	Protective equipment				
	Metering & control equipment				
	Communications equipment				
	Other station equipment				
	Poles, Towers and Fixtures - Distribution				
	Overhead Conductors and Devices - Distribution				
	Underground Conduits - Distribution				
	Underground Conductors and Devices - Distribution				
	Distribution Transformers				
	Power Conditioning Equipment				
	Meters, Metering Instruments & Metering Transformers - Distribution				
	Information technology equipment (distribution)				
	Regulated Entity Property on Consumer's Premises				
	Street Lights and Signal Systems				
Non-network	Submarine Cables				
	Land and Land Rights (non-network)				
	Structures and Improvements (non-network)				
	Office Furniture and Equipment				
	Transportation Equipment				
	Stores Equipment				
	Tools, Shop and Garage Equipment				
	Laboratory Equipment				
	Information Systems Equipment (non-network)				
	Power-operated Equipment				
	Communication Plant and Equipment				
	Miscellaneous Equipment				
	Materials				
	Materials and supplies (including spares)				
	Subtrans				
	Transferred subtransmission assets				
	Sub-total Regulated Distribution Services	0	779,503	0	0
Distribution Connection Services Assets					
Network	Poles, Towers and Fixtures (Customer)				
	Overhead Conductors and Devices (Customer)				
	Underground Conduits (Customer)				
	Underground Conductors and Devices (Customer)				
	Line Transformers (Customer)				
	Information Systems Equipment (Connection)				
Non-network	Land and Land Rights (non-network)				
	Structures and Improvements (non-network)				
	Office Furniture and Equipment				
	Transportation Equipment				
	Stores Equipment				
	Tools, Shop and Garage Equipment				
	Laboratory Equipment				
	Information Systems Equipment (non-network)				
	Power-operated Equipment				
	Communication Plant and Equipment				
	Miscellaneous Equipment				
	Materials				
	Materials and supplies (including spares)				
	Sub-total Distribution Connection Assets	0	0	0	0
Regulated Retail Services Assets					
	Meters, Instruments & Metering Transformers (Consumer Consumption Metering)				
	Land and land rights				
	Structures and improvements				
	Office Furniture and Equipment				
	Transportation Equipment				
	Stores Equipment				
	Tools, Shop and Garage Equipment				
	Laboratory Equipment				
	Information Systems Equipment				
	Communication Plant and Equipment				
	Miscellaneous Equipment				
	Sub-total Regulated Retail Services Assets	0	0	0	0
TOTAL CAPEX		0	779,503	0	0

Notes : References to Regulatory Years are for the 12-month period ending on Jun 30 of the year noted.

ANNEX C: EXPENDITURE SUMMARY

MANILA ELECTRIC COMPANY		 MERALCO			
Capital Expenditure - Major Projects					
Total Expenditure, local and foreign (PhP, real)					
PROJECT NAME:		CAPITAL EXPENDITURE - MAJOR PROJECTS (TOTAL, REAL)			
EMERGENCY REPLACEMENT OF POWER TRANSFORMER BANK NO. 1 AT TAGAYTAY SUBSTATION					
		Forecast (PhP, real) (Regulatory Year)			
Category		2017	2018	2019	2020
Regulated Distribution Services Assets					
Network	Land and Land Rights (Distribution Purposes)	0	0	0	0
	Structures and Improvements (Distribution Purposes)	0	0	0	0
	Station Equipment				
	Power transformers	0	44,756,417	0	0
	Switchgear	0	0	0	0
	Protective equipment	0	0	0	0
	Metering & control equipment	0	0	0	0
	Communications equipment	0	0	0	0
	Other station equipment	0	0	0	0
	Poles, Towers and Fixtures - Distribution	0	0	0	0
	Overhead Conductors and Devices - Distribution	0	0	0	0
	Underground Conduits - Distribution	0	0	0	0
	Underground Conductors and Devices - Distribution	0	0	0	0
	Distribution Transformers	0	0	0	0
	Power Conditioning Equipment	0	0	0	0
	Meters, Metering Instruments & Metering Transformers - Distribution	0	0	0	0
	Information technology equipment (distribution)	0	0	0	0
	Regulated Entity Property on Consumer's Premises	0	0	0	0
	Street Lights and Signal Systems	0	0	0	0
	Non-network	Submarine Cables	0	0	0
Land and Land Rights (non-network)		0	0	0	0
Structures and Improvements (non-network)		0	0	0	0
Office Furniture and Equipment		0	0	0	0
Transportation Equipment		0	0	0	0
Stores Equipment		0	0	0	0
Tools, Shop and Garage Equipment		0	0	0	0
Laboratory Equipment		0	0	0	0
Information Systems Equipment (non-network)		0	0	0	0
Power-operated Equipment		0	0	0	0
Communication Plant and Equipment		0	0	0	0
Miscellaneous Equipment		0	0	0	0
Materials	Materials and supplies (including spares)	0	0	0	0
Subtrans	Transferred subtransmission assets	0	0	0	0
Sub-total Regulated Distribution Services		0	44,756,417	0	0
Distribution Connection Services Assets					
Network	Poles, Towers and Fixtures (Customer)	0	0	0	0
	Overhead Conductors and Devices (Customer)	0	0	0	0
	Underground Conduits (Customer)	0	0	0	0
	Underground Conductors and Devices (Customer)	0	0	0	0
	Line Transformers (Customer)	0	0	0	0
Non-network	Information Systems Equipment (Connection)	0	0	0	0
	Land and Land Rights (non-network)	0	0	0	0
	Structures and Improvements (non-network)	0	0	0	0
	Office Furniture and Equipment	0	0	0	0
	Transportation Equipment	0	0	0	0
	Stores Equipment	0	0	0	0
	Tools, Shop and Garage Equipment	0	0	0	0
	Laboratory Equipment	0	0	0	0
	Information Systems Equipment (non-network)	0	0	0	0
	Power-operated Equipment	0	0	0	0
	Communication Plant and Equipment	0	0	0	0
	Miscellaneous Equipment	0	0	0	0
Materials	Materials and supplies (including spares)	0	0	0	0
Sub-total Distribution Connection Assets		0	0	0	0
Regulated Retail Services Assets					
	Meters, Instruments & Metering Transformers (Consumer Consumption Metering)	0	0	0	0
	Land and land rights	0	0	0	0
	Structures and improvements	0	0	0	0
	Office Furniture and Equipment	0	0	0	0
	Transportation Equipment	0	0	0	0
	Stores Equipment	0	0	0	0
	Tools, Shop and Garage Equipment	0	0	0	0
	Laboratory Equipment	0	0	0	0
	Information Systems Equipment	0	0	0	0
	Communication Plant and Equipment	0	0	0	0
	Miscellaneous Equipment	0	0	0	0
	Sub-total Regulated Retail Services Assets		0	0	0
TOTAL CAPEX		0	44,756,417	0	0

Notes : References to Regulatory Years are for the 12-month period ending on June 30 of the year noted.

Manila Electric Company
COST-BENEFIT-ANALYSIS TEMPLATE



Project Name : Replacement of Tagaytay Bank 1
Brief Description : Purchase a new 33MVA Power Transformer and replace the defective Tagaytay Bank 1

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	
	3,574	3,613	3,653	3,694	3,735	3,776	3,818	3,861	3,903	3,947	3,990	4,035	4,079	4,125	4,170	4,217	4,263	4,311	4,358	4,407	4,456	4,505	4,555	4,605	4,656	4,708	4,760	4,813	4,866	4,920	
	4,487	4,537	4,587	4,638	4,690	4,742	4,794	4,847	4,901	4,956	5,011	5,066	5,122	5,179	5,237	5,295	5,354	5,413	5,473	5,534	5,595	5,658	5,720	5,784	5,848	5,913	5,979	6,045	6,112	6,180	
	2,073																														
0	10,134	8,150	8,240	8,332	8,424	8,518	8,612	8,708	8,805	8,902	9,001	9,101	9,202	9,304	9,407	9,512	9,617	9,724	9,832	9,941	10,051	10,162	10,275	10,389	10,504	10,621	10,739	10,858	10,978	11,100	

(Peso amounts in thousands)
CASH INFLOWS
Operational Savings
Avoided cost
Additional Revenue

44,756	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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NET CASH FLOWS

30 years
14.97%

WACC

IRR	19%
NPV	9,466.87
B / C	1.23

Manila Electric Company
COST-BENEFIT-ANALYSIS TEMPLATE



Project Name : Replacement of Tagaytay Bank 1
Brief Description : Purchase a new 50MVA Power Transformer and replace the defective Tagaytay Bank 1

Year 0	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
	3,574	3,613	3,653	3,694	3,735	3,776	3,818	3,861	3,903	3,947	3,990	4,035	4,079	4,125	4,170	4,217	4,263	4,311	4,359	4,407	4,455	4,505	4,555	4,605	4,656	4,708	4,760	4,813	4,866	4,920
	4,487	4,537	4,587	4,638	4,690	4,742	4,794	4,847	4,901	4,956	5,011	5,066	5,122	5,179	5,237	5,295	5,354	5,413	5,473	5,534	5,595	5,658	5,720	5,784	5,848	5,913	5,979	6,045	6,112	6,180
	2,073																													
0	10,134	8,150	8,240	8,332	8,424	8,518	8,612	8,708	8,805	8,902	9,001	9,101	9,202	9,304	9,407	9,512	9,617	9,724	9,832	9,941	10,051	10,162	10,275	10,389	10,504	10,621	10,739	10,858	10,978	11,100

48,536	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	279	246	287	250	293	255	298	260	304	265	310	270	315	274	320	279	326	284	332	347	291	340	353	299	349	361	306	357	370	313
48,536	750	246	287	250	293	255	298	260	304	265	310	270	315	274	320	279	326	284	332	347	291	340	353	299	349	361	306	357	370	313

(48,536)	9,384	7,904	7,953	8,082	8,131	8,263	8,314	8,448	8,500	8,637	8,691	8,831	8,887	9,029	9,104	9,232	9,291	9,440	9,500	9,694	9,760	9,822	9,743	10,091	10,156	7,502	10,433	10,501	7,273	10,787
----------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	-------	--------	--------	-------	--------

WACC
30 years
14.97%

IRR	17%
NPV	6,179.30
B/C	1.14

Manila Electric Company
COST-BENEFIT-ANALYSIS TEMPLATE

Project Name : Replacement of Taguig Bay 1
Brief Description : Partial Conversion of Taguig Bay 32XS to 20 MV/34.5 kV

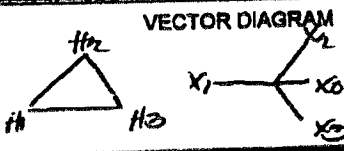


	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31		
(Peso amounts in thousands)																																	
CASH INFLOWS																																	
Operational Savings	3,488	3,518	3,549	3,579	3,611	3,642	3,674	3,706	3,739	3,772	3,805	3,838	3,873	3,907	3,942	3,977	4,012	4,048	4,085	4,121	4,158	4,196	4,234	4,272	4,311	4,350	4,380	4,420	4,471	4,512	4,552	4,594	
Avoided cost	4,379	4,417	4,455	4,494	4,533	4,572	4,612	4,653	4,693	4,735	4,777	4,819	4,861	4,905	4,948	4,992	5,037	5,082	5,128	5,174	5,221	5,269	5,315	5,364	5,412	5,462	5,511	5,562	5,613	5,664	5,716	5,768	
Additional Revenue	2,073																																
	0	9,940	7,935	8,004	8,073	8,143	8,214	8,286	8,359	8,432	8,506	8,581	8,657	8,734	8,812	8,890	8,969	9,049	9,130	9,212	9,295	9,379	9,464	9,549	9,636	9,723	9,812	9,902	10,083	10,176	10,263	10,352	
CASH OUTFLOWS																																	
Investment	52,860	13	13	13	14	14	14	14	14	14	14	14	14	15	15	15	15	15	15	15	16	16	16	16	16	16	16	16	16	17	17	17	
Maintenance cost																																	
Dislocation cost																																	
	52,860	484	13	13	14	14	14	14	14	14	14	14	14	15	15	15	15	15	15	15	16	16	16	16	16	16	16	16	16	17	17	17	
NET CASH FLOWS																																	
	(52,860)	9,457	7,922	7,990	8,050	8,130	8,201	8,272	8,345	8,418	8,492	8,567	8,643	8,719	8,797	8,875	8,954	9,034	9,115	9,197	9,280	9,363	9,448	9,534	9,620	9,707	9,796	9,885	9,976	10,067	10,159	10,252	

WACC	14.97%
IRR	16%
NPV	2,727.06
B / C	1.06

	SUBSTATION PREVENTIVE MAINTENANCE PROCEDURE	PM-DSSB-251.02	Page 1 of 1
	POWER TRANSFORMER TEST REPORT	Rev. Code: 01	
	Effectivity Date: February 25, 2011		

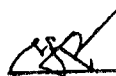
Location: ITAGAITAN PXF Unit No.: 1 Date Tested: NOV. 11, 2012
 Make: EFACEC Serial No.: C-13214 Class: 00/FA/1M2 Type: _____
 KVA (/ /) 33.33 Voltage Rating: 110/13.8 Oil Temp.: 51°C Wdg. Temp.: 53°C
 Tested by: KUDO Weather: NI GHTMILL Ambient Temp.: 26°C % Rel. Humidity: 74%
 Witnessed by: A. SANDORINO () PMT () Serviced () Reconditioned () New (☒) Faulted () Others _____

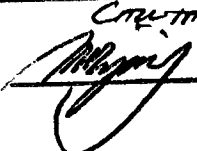
INSULATION POWER FACTOR TEST						INSULATION RESISTANCE (meg-ohms)					TESTS ON THE INSULATING OIL																																																					
Winding	Cap.	mA	watts	% IPF		Aft. 1 min.		Aft. 10 min.		P.I.	DBV	IFT	NN	COLOR	% IPF @ 20°C	WATER CONTENT																																																
				@ _____ °C	@ 20°C	500 V	2500 V	500 V	2500 V																																																							
H-G		14.2	1.24	0.873			1.870		2.029	1.09																																																						
X-G		22.9	1.32	0.577			1.350		1.425	1.10																																																						
Y-G																																																																
H-X		17.9	0.62	0.349			1.970		2.20	1.17																																																						
X-Y																																																																
Y-H IN		32.1	1.80																																																													
EXCITING CURRENT MEASUREMENT (mA)						TTR TEST: As Fnd Tap: <u>7/11276</u>																																																										
Wndg.	2.5KV	5.0KV	7.5KV	10kv			Winding	As Fnd.	Comp.	% Ratio																																																						
H H							H12-X02	12.170		86.000																																																						
H H							H12-X03	14.123	14.151	79.873																																																						
H H							H12-X01	14.110		99.710																																																						
LIGHTNING ARRESTERS				WINDING RESISTANCE		FULL VOLTAGE EXCITATION						LOADING																																																				
Phase	mA	watts		Wdg. at	at 75°C	Winding	Core Loss (Watts)				Year																																																					
PRIM. A											Max. Load																																																					
PRIM. B											Max. Temp.																																																					
PRIM. C											VISUAL INSPECTION																																																					
SEC. A						Winding	I ex (amperes)				Oil Level	<u>OK</u>																																																				
SEC. B											Oil Leaks	<u>None to Ormado</u>																																																				
SEC. C											Dehydrator																																																					
TERT. A											Cooling Fans																																																					
TERT. B											N ₂ Pressure																																																					
TERT. C																																																																
						CORE-TO-GRD. INS. RES. (meg-ohms)																																																										
						at 500V <u>175</u> at 2500V						OIL-CONSERVATION METHOD																																																				
												() Gas-Blanketed / Sealed																																																				
												(☒) Conservator () Other																																																				
NO.	Oil Level		BUSHINGS		Hot Collar		BUSHING DATA		<table border="1"> <thead> <tr> <th colspan="4">GENERAL CONDITIONS</th> </tr> <tr> <th>g</th> <th>o</th> <th>p</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>o</td> <td>a</td> <td>o</td> <td>r</td> </tr> <tr> <td>o</td> <td>t</td> <td>o</td> <td>i</td> </tr> <tr> <td>d</td> <td>i</td> <td>r</td> <td>t</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="4">Insulating Oil</td> </tr> <tr> <td colspan="4">Winding Tap-Charger</td> </tr> <tr> <td colspan="4">Winding Insulation</td> </tr> <tr> <td colspan="4">Bushings</td> </tr> <tr> <td colspan="4">Lightning Arresters</td> </tr> <tr> <td colspan="4">Cooling Fans</td> </tr> </tbody> </table>								GENERAL CONDITIONS				g	o	p	c	o	a	o	r	o	t	o	i	d	i	r	t					Insulating Oil				Winding Tap-Charger				Winding Insulation				Bushings				Lightning Arresters				Cooling Fans			
GENERAL CONDITIONS																																																																
g	o	p	c																																																													
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Lightning Arresters																																																																
Cooling Fans																																																																
H1	HI	LO	mA	watts	% IPF	% IPF	Make	Serial Number	Factory % IPF																																																							
H2			1.03	42.1	0.411																																																											
H3			1.02	46.2	0.454																																																											
H0																																																																
X1																																																																
X2																																																																
X3																																																																
X0																																																																
Y1																																																																
Y2																																																																
Y3																																																																

Instruments Used: TIR 35, MS-600

REMARKS: 1. LRD P.I. H-X, H-G, X-G @ HIGH TIR ICE ON H12-X02 ON ALL TAPS @ 6000TURNS
RATIO READING ON H12-X02. RECOMMENDED FOR REPLACEMENT.
NOTE: SEE ATTACHED TEST REPORT ON TURNS RATIO TEST (ALL TAPS) & WINDING RESISTANCE TEST
(CIRCUITS)

Received by: _____

Checked by: 

Approved by: 



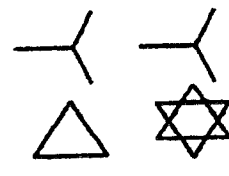
Retention: EQUIPMENT LIFE



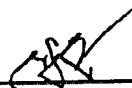
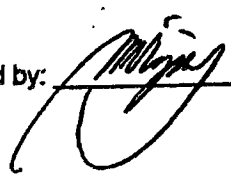
Retention: EQUIPMENT LIFE

	SUBSTATION PREVENTIVE MAINTENANCE PROCEDURE POWER TRANSFORMER TEST DATA	PM-DSSB-251.03 Rev. Code: 01	Page 1 of 1
		Effectivity Date: February 25, 2011	

Location: TALAYTAY SUBSTATION Condition: _____ Date: NOV. 14, 2018
 Make: EFACEC Ser. No.: C-132110 Weather: NIGHTWORK Amb. Temp.: 26 °C Rel. Hum.: 74 %
 Phase: _____ Capacity: 23.33 KVA Voltage Ratings: 110/13.2 kV %Z Volts: _____
 Co. No.: _____ Type: _____ Class: OA /FA1 /FA2 Temp. Rise: _____
 Tested by: KU, MM, EL, DO, JC Requested by: _____ Witnessed by: _____

WDG & TAPS	VOLTAGE RATING	WINDING RESISTANCE		RATIO TEST H31 - X01			INSULATION TEST					
		@ ____ °C	@ 75°C	AS FOUND RATIO	COMPUTED RATIO	% RATIO	A. MEGGER INSULATION RESISTANCE @ ____ °C				P. I.	
							TEST CONN	1 MIN RDG.		10 MIN RDG.		
1	121000	1.166		15.137	15.187	99.671	H-G	500V	2500 V	500 V	2500V	
2	119025	1.130		14.963	15.052	99.409	X-G					
3	118250	1.113		14.793	14.842	99.670	H-X					
4	116875	1.092		14.620	14.669	99.666	Y-G					
5	115500	1.064		14.448	14.497	99.662	X-Y					
6	114125	1.044		14.273	14.324	99.644	H-Y					
7	112750	1.013		14.110	14.151	99.710						
8	111375	0.992		13.933	13.979	99.671						
9	110000	0.942		13.762	13.806	99.681						
10	108625	0.965		13.588	13.634	99.663	B. INSULATION POWER FACTOR TEST:					
11	107250	0.982		13.416	13.461	99.666	TEST CONN	mA RDG	WATTS RDG	%IPF @ ____ °C	% IPF @20°C	
12	105875	1.013		13.246	13.288	99.684	H-G					
13	104500	1.044		13.073	13.116	99.672	X-G					
14	103125	1.067		12.900	12.943	99.668	H-X					
15	101750	1.084		12.729	12.771	99.671	Y-G					
16	100375	1.106		12.557	12.598	99.675	X-Y					
17	991000	1.131		12.385	12.426	99.670	H-Y					
							C. OIL TEST:					
							DBV	IFT	NN	SE	%IPF @ 20 °C	Color
Others							POLARITY TEST		VECTOR DIAGRAM			
							As Fd. Tap: _____					
							As Left Tap: _____					
							Polarity: _____					
							[] Subtractive					
							[] Additive					

Instrument Used : TTR 20 , DL20 23
 REMARKS : _____

Received by: _____ Checked by:  Approved by: 

Retention: EQUIPMENT LIFE

Transformer Fault Gas Analysis

Results

Sample

Equipment ID: TAGAYTAY BK1
Apparatus Type: TRN
Designation: BANK 1
Sampled By: RAM
Oil Temperature: 45 °C
Comment: Gas-in-Gas method; Oil type: ASTM D3812

Serial Number: C-13218
Sampling Point: BUCHOLZ
Syringe ID:
Date Sampled: 2018/11/14
Tank Pressure:

Analysis Files

Method: 20181114 Daily Method.prm
Calgas: 20181114232156 Calibration.prs
Air: 20181114232825 Air.prs
Oil: 20181114234107 Oil.prs
Calgas O2N2: 20181114232156 Calibration.prs
Air O2N2: 20181114232825 Air.prs
Oil O2N2: 20181114234360 Oil O2N2.prs

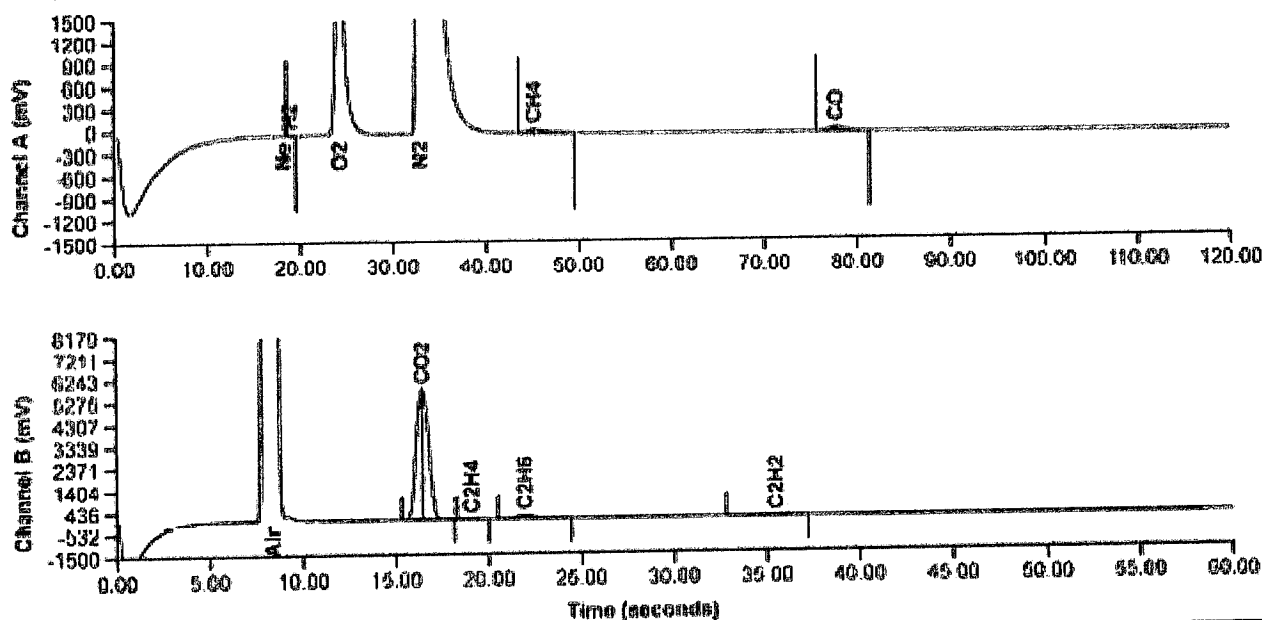
Analysis Identification

Analyzed By: ICF
Date Acquired: 2018/11/14
Instrument ID: 11745008
Version: PPMreport 3.0.0

Measurement Results

H2 (Hydrogen)	overload ppm
CH4 (Methane)	17642 ppm
CO (Carbon Monoxide)	overload ppm
CO2 (Carbon Dioxide)	11453 ppm
C2H4 (Ethylene)	267 ppm
C2H6 (Ethane)	274 ppm
C2H2 (Acetylene)	2201 ppm
O2 (Oxygen)	3596 ppm
N2 (Nitrogen)	64379 ppm
TDG:	9.99 %
TDCG:	2.05 %
THCG (O2N2):	5.75 %
THCG (Pressure):	. %

Graphs



Transformer Fault Gas Analysis

Results

Sample

Equipment ID: TAGAYTAY BK 1

Apparatus Type: TRN

Designation: BANK 1

Sampled By: RAM

Oil Temperature: 45 °C

Comment: Oil type: ASTM D3612

Serial Number: C-13210

Sampling Point: BUCHOLZ

Syringe ID:

Date Sampled: 2018/11/14

Tank Pressure:

Analysis Files

Method: 20181114 Daily Method.prm

Calgas: 20181114232158 Calibration.prs

Air: 20181114232825 Air.prs

Oil: 20181115001820 Oil.prs

Calgas O2N2: 20181114232158 Calibration.prs

Air O2N2: 20181114232825 Air.prs

Oil O2N2: 20181114235350 Oil O2N2.prs

Measurement Results

H2 (Hydrogen)	686 ppm
CH4 (Methane)	868 ppm
CO (Carbon Monoxide)	overflow ppm
CO2 (Carbon Dioxide)	9502 ppm
C2H4 (Ethylene)	63 ppm
C2H6 (Ethane)	477 ppm
C2H2 (Acetylene)	275 ppm
O2 (Oxygen)	3596 ppm
N2 (Nitrogen)	64379 ppm
TDG:	7.98 %
TDCG:	0.24 %
THCG (O2N2):	2.08 %
THCG (Pressure):	- %

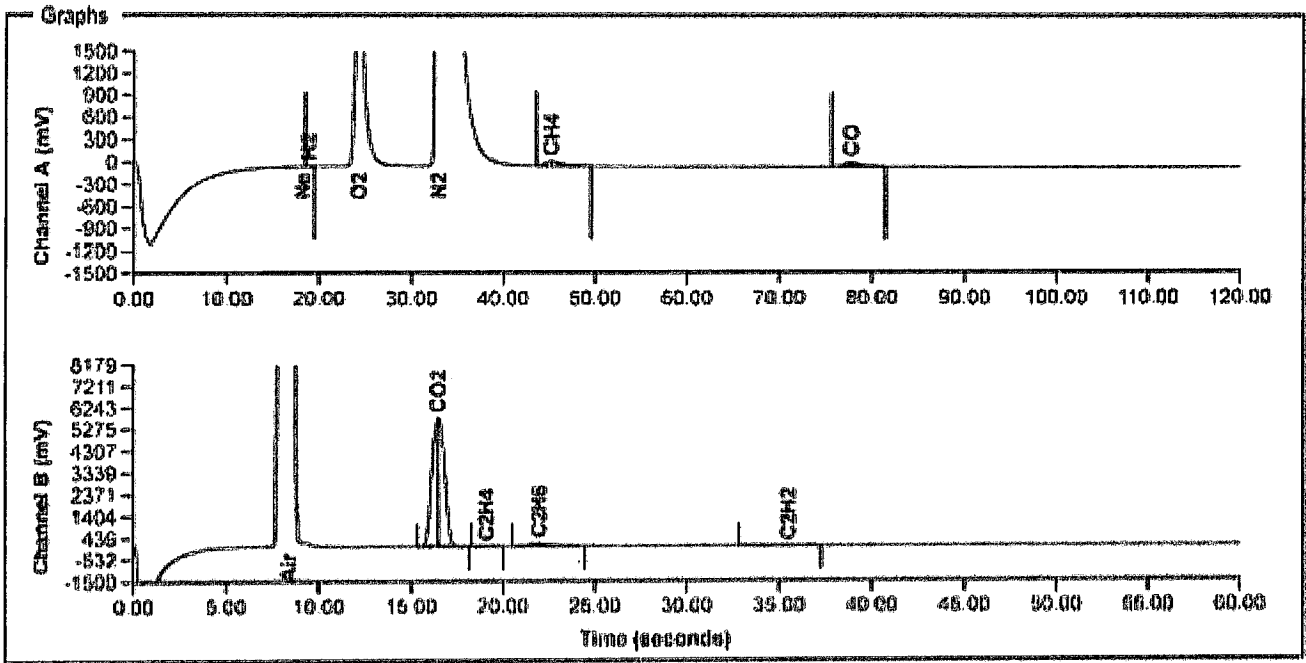
Analysis Identification

Analyzed By: ICF

Date Acquired: 2018/11/15

Instrument ID: 11745000

Version: PPMreport 3.0.0



Republic of the Philippines
ENERGY REGULATORY COMMISSION
San Miguel Avenue, Pasig City

**IN THE MATTER OF THE
APPLICATION FOR
APPROVAL OF THE
EMERGENCY REPLACEMENT
OF ONE (1) 33-MVA POWER
TRANSFORMER AT
TAGAYTAY SUBSTATION,**

ERC Case No. 2019- ____ RC

**MANILA ELECTRIC COMPANY
(MERALCO),**

Applicant.

X-----X

**JUDICIAL AFFIDAVIT
OF ENGR. MARIO DELOS REYES**

The following examination of witness, **ENGR. MARIO ANGELITO A. DELOS REYES**, of legal age, with office address at 4th Floor, Technical Services Building, Ortigas Avenue, Barangay Ugong, Pasig City, Philippines, who is an employee of the Manila Electric Company ("MERALCO") with the rank of Manager and Head of Substation Services Asset Management (SSAM) Office, was conducted by Atty. Carmen Grace S. Ramos, at the 7th Floor, Lopez Building, Ortigas Avenue, Barangay Ugong, Pasig City, on ____ January 2019.

The testimony of **ENGR. MARIO ANGELITO A. DELOS REYES** is being offered for following purposes:

1. To prove the justification and necessity for the emergency replacement of One (1) 33 MVA Power Transformer at Tagaytay Substation and the benefits that would result due to the implementation of the emergency project;
2. To prove the cost of the emergency Capital Expenditure (CAPEX), project financing plan and project schedule;
3. To show and prove the results of the tests conducted on the defective Tagaytay Power Transformer Bank No. 1;

4. To show and prove the impact to MERALCO's distribution system and customers if the emergency project was not implemented;
5. To prove that the approval of the Application is warranted;
6. To identify the documents in relation to this case; and
7. Other matters relevant to the instant Application.

X-----X

I, **ENGR. MARIO ANGELITO A. DELOS REYES**, Filipino, of legal age, married, with office address at 4th Floor, Technical Services Building, Ortigas Avenue, Barangay Ugong, Pasig City, Philippines after having been sworn to in accordance with law, fully conscious that I am answering the questions under oath and with knowledge that I may face criminal liability for false testimony and perjury, hereby depose and state:

Q1: What are your professional and educational qualifications?

A1: I am a licensed Professional Electrical Engineer (PEE). I passed the PEE Board Examination in 4 February 1991. I hold a Bachelor of Science degree in Electrical Engineering from the Mapua Institute of Technology.

Q2: Where are you presently employed?

A2: I am currently the Manager and Head of Substation Services Asset Management (SSAM) Office of MERALCO, effective 1 May 2016. Prior to this, I was the Team Leader of Substation South Operation and the Maintenance and Team Leader of Substation North Operation and Maintenance.

Q3: How long have you been employed by MERALCO?

A3: I have been employed by MERALCO for the past twenty-nine (29) years.

Q4: What are your duties and responsibilities as Manager and Head of SSAM Office?

A4: My major duties and responsibilities as Manager and SSAM Head include substation process management, substation maintenance planning and performance Management and development of substation standards.

Q5: Are you familiar with the Application of MERALCO, entitled: **"IN THE MATTER OF THE APPLICATION FOR APPROVAL OF THE EMERGENCY REPLACEMENT OF ONE (1) 33-MVA**

**POWER TRANSFORMER AT TAGAYTAY SUBSTATION,
MANILA ELECTRIC COMPANY, APPLICANT”?**

A5: Yes. I am familiar with said Application as I have participated in the preparation of said Application as well as its supporting documents.

Q6: What are the supporting documents that you prepared in relation to the Application?

A6: In connection with the Application, I prepared the following documents:

(1) Emergency CAPEX Project Information Summary with supporting documents: (i) Technical and Economic Analysis, (ii) Cost Estimates; (c) Expenditure Summary; (iii) Cost Benefit Analysis Calculation; and (iv) Gantt Chart, which were attached as Annex “A” of the Application.

(2) Documents showing the results of the tests conducted on Power Transformer Bank No. 1, which were attached as Annex “B” of the Application.

(The witness showed and identified the original copies of the above-mentioned documents to the counsel. It is requested that the same be marked as Exhibits “A” and “B” respectively.)

Q7: What is the legal basis for filing of the instant Application?

A7: The Application is being filed pursuant to the Honorable Commission’s Resolution No. 26, Series of 2009, entitled: “Resolution Amending the Rules for Approval of Regulated Entities’ Capital Expenditure Projects.” Emergency Capital Expenditure projects are those that require immediate implementation during an event that is not a force majeure or fortuitous event in order to maintain a safe, reliable, secure and efficient operation of the power system.

Q8: What is the emergency Capital Expenditure (CAPEX) project that is subject of the instant Application?

A8: The Tagaytay Substation is located at Nasugbu Highway, Brgy. Maharlika West, Tagaytay City, Cavite and serves the entire City of Tagaytay, including portions of the municipalities of Indang, Silang, Amadeo, and Trece Martires, Cavite. The Tagaytay Substation has one (1) 33 MVA, 110kV-13.8kV power transformer bank.

On 14 November 2018, the 33 MVA 110kV – 13.8 kV Tagaytay Power Transformer Bank was tripped out by the transformer differential relay, with targets at phases A and B, due to the turn-to-turn short on the H1H2 windings. The power transformer was

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immediately subjected to a series of tests. The results of the tests revealed that the transformer had low percentage (%) turns ratio, measured on the H1H2-X0X2 windings, compared with the H2H3-X0X3 and H1H3-X0X1 windings. Similarly, it was found out that the excitation tests could not be conducted between the H1H2 and H2H3 windings.

Furthermore, the Transformer Fault Gas Analysis done for both gas and oil samples on 15 November 2018 taken from the Buchholz relay showed high values of combustible gas such as Acetylene (C₂H₂), Hydrogen (H₂), Methane (CH₄), Carbon Monoxide (CO) and Ethane (C₂H₆).

Given these adverse test results, MERALCO had to replace the defective Tagaytay Power Transformer Bank No. 1. Pending the replacement, Applicant was also constrained to temporarily transfer its loads to the adjoining transformer banks with 110kV-13.8kV rating, namely: Silang 33 MVA Bank No. 1 and Tagaytay West Bank No. 1.

This set-up resulted in the Silang Bank No. 1 and Tagaytay West Bank No. 1 operating above critical level at 93.0% and 89.0%, respectively.

With the critical loading of the said power transformers, any outage of those power transformers will result to prolonged and massive interruption in the municipalities/towns of Indang, Amadeo, Silang, Cavite, Tagaytay City, and Trece Martires, Cavite. In particular, any outage will critically affect the supply of electricity to vital customers in said areas, such as the Bangko Sentral ng Pilipinas Training Facility, Philippine Public Safety College, Filinvest Land, Inc., Ayala Land Inc., Alveo Land Corp., and Globe Telecom Inc.

Considering the imminent risks posed by shifting the loads to the adjoining power transformers, MERALCO was constrained to undertake an interim solution. Thus, on 19 November 2018, MERALCO replaced the defective Tagaytay Power Transformer Bank No. 1 with a 41 MVA, 110kV-13.8kV power transformer pulled out from the Los Baños Substation. The temporary solution was done to relieve the critical loading of the Silang and Tagaytay West power transformer banks.

Since this is only an interim solution, the 41 MVA Power Transformer should be returned to Los Baños Substation as soon as possible to serve its intended purpose. A new 33 MVA Power Transformer shall also be purchased and installed to permanently replace the defective power transformer.

Q9: Why was there a need to implement the emergency project?

A9: The implementation of the project was necessary for the following reasons:

(a) The test results of the Tagaytay Power Transformer Bank No. 1 showed that the same was defective, and thus, needed to be immediately replaced; and

(b) The failure of said power transformer necessitated the transfer of its loads to the adjacent 110kV-34.5 kV Silang Power Transformer Bank No. 1 and Tagaytay West Power Transformer Bank No. 1, which caused both power transformers to operate above critical levels. As such, an outage of the Silang and Tagaytay West power transformers would result to power interruptions to customers in the affected areas. Shown below are the projected loadings of the Silang and Tagaytay West power transformers with and without the replacement of Tagaytay Power Transformer Bank No. 1.

Table 1: Without Project

Parameter Under Consideration	
Loading of Silang Bank 1	93.0%
Loading of Tagaytay West Bank 1	89.0%
System Loss	18,377,060 kWh

Table 2: With Project

Parameter Under Consideration	
Loading of Tagaytay Bank 1	77.0%
Loading of Silang Bank 1	68.0%
Loading of Tagaytay West Bank 1	80.0%
System Loss	13,080,423 kWh

i.As shown in the tables above, the implementation of the project would improve the loadings of the power transformer banks; and

ii.The emergency replacement of the power transformer will ensure the reliability and quality of electric service on the areas being served by the power transformer as well as ensure the safety of the people in the affected areas.

Q10: How much is the cost for the Emergency Project?

A10: The cost for the temporary installation of the power transformer is **EIGHT HUNDRED EIGHTY SEVEN THOUSAND SEVENTY SIX & 98/100 PESOS (Php 887,076.98)**. The amount includes the temporary installation of the 41 MVA, 110 kV–13.8 kV three-phase power transformer with OLTC from the Los Banos Substation and the costs of transformer oil and trucking services.

The cost for the permanent installation of the power transformer is **FORTY THREE MILLION EIGHT HUNDRED SIXTY NINE THOUSAND THREE HUNDRED FORTY & 06/100 PESOS (Php 43,869,340.06)**. This amount includes the cost of acquiring a new 33 MVA, 110 kV –13.8 kV, three-phase power transformer with OLTC and the costs for transformer oil, taxes, duties, brokerage, trucking services and installation.

Thus, the total cost for the emergency replacement of the power transformer at the Tagaytay Substation is **FORTY FOUR MILLION SEVEN HUNDRED FIFTY SIX THOUSAND FOUR HUNDRED SEVENTEEN & 04/100 PESOS (Php 44,756,417.04)**.

Q11: How will the cost of this emergency capital project be recovered from the consumers?

A11: For purposes of recovering the capital cost of the emergency project through the MERALCO's rates, the same will go through the process of evaluation by the Honorable Commission during the regulatory reset process, unless there is basis for a rate-reopening in the current regulatory period, in accordance with the Rules for the Setting of Distribution Wheeling Rates (RDWR) for Distribution Utilities (DUs).

Q12: Can you tell us why you are executing this Judicial Affidavit?

A12: I am executing this Judicial Affidavit to attest to the truthfulness and veracity of the foregoing statements and in support of MERALCO's Application.

IN WITNESS WHEREOF, I have hereunto affixed my signature this 11th day of January 2019 at Pasig City, Philippines.


MARIO ANGELITO A. DELOS REYES
Affiant

