

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



IN THE MATTER OF THE  
APPLICATION FOR THE  
APPROVAL OF THE  
PAGBILAO EHV SUBSTATION  
PROJECT, WITH PRAYER  
FOR THE ISSUANCE OF A  
PROVISIONAL AUTHORITY

ERC CASE NO. 2015-078 RC

NATIONAL GRID  
CORPORATION OF THE  
PHILIPPINES (NGCP),  
Applicant.

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DOCKETED  
Date: JUL 23 2015  
By: *M*

## NOTICE OF PUBLIC HEARING

### TO ALL INTERESTED PARTIES:

Notice is hereby given that on April 27, 2015, the National Grid Corporation of the Philippines (NGCP) filed with the Commission an application for the approval of the Pagbilao EHV Substation, with prayer for the issuance of a provisional authority.

In the said application, NGCP alleged, among others, the following:

1. It is a corporation created and existing under the laws of the Philippines, with principal office address at NGCP Building, Quezon Avenue corner BIR Road, Diliman, Quezon City. It is the corporate vehicle of the consortium which was awarded the concession to assume the power transmission functions of the National Transmission Corporation

(TRANSCO) pursuant to Republic Act No. 9136 (R.A. 9136), otherwise known as the Electric Power Industry Reform Act of 2001 or the EPIRA. It was also awarded by Congress a franchise under R.A. 9511 (NGCP Franchise) to operate, manage, and maintain the nationwide transmission system of the Republic of the Philippines;

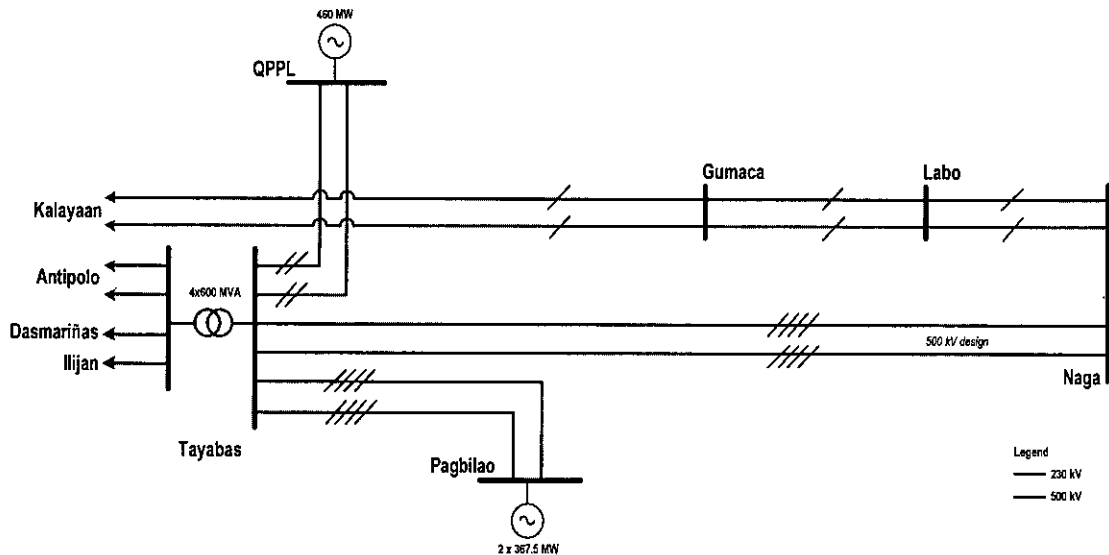
### STATEMENT OF THE CASE

2. One of its functions and responsibilities enumerated in Section 9 of the EPIRA is to *“improve and expand its transmission facilities, consistent with the Grid Code and the Transmission Development Plan (TDP) to be promulgated pursuant to this Act, to adequately serve generation companies, distribution utilities and suppliers requiring transmission service and/or ancillary services through the transmission system: Provided, That TRANSCO (now NGCP) shall submit any plan for expansion or improvement of its facilities for approval by the ERC”*;
3. In accordance with its mandate to ensure and maintain the quality, reliability, adequacy, security, stability and integrity of the Grid, it seeks authority from the Commission to immediately approve the implementation of the Mindanao 230 kV Transmission Backbone Project, (Project), which aims, among others, to meet the transmission capacity requirements of capacity additions and load centers;

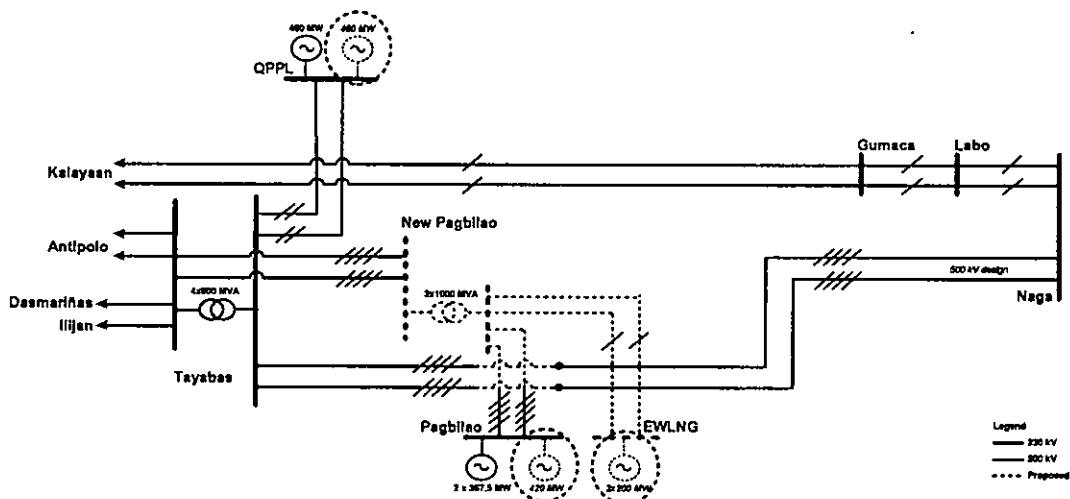
### STATEMENT OF FACTS

#### Brief Background

4. Presently, there are two (2) major power plants in Quezon Province that are connected to the existing Tayabas 500/230 kV Substation of the Luzon Grid: the 2 X 367.5 MW Pagbilao Coal-Fired Power Plant (CFPP) and the 500 MW Quezon Power Philippines Limited Co. (QPPL) CFPP. The existing transmission facility at the Tayabas 500/230 kV Substation is shown below:



5. Four (4) new power plants will be constructed in the Quezon province starting 2015, namely:
  - a. 420 MW Pagbilao CFPP Expansion;
  - b. 500 MW San Buenaventura Power Ltd. Co. (SBPL) CFPP;
  - c. 3X200 MW Energy World Corporation (EWC) Combined-Cycle Power Plant (CCPP); and
  - d. 1,200 MW Atimonan CFPP.
6. These incoming power plants will have a total capacity of 2,720 MW. However, the existing transmission facility at the Tayabas 500/230 kV Substation cannot accommodate this additional capacity. Thus, it proposes the implementation of the proposed Project in order to accommodate the incoming power plants;
7. Shown below is the future configuration of the transmission facility with the construction of the proposed Project and with the entry of the 420 MW Pagbilao CFPP Expansion, 500 MW SBPL CFPP, and 3X200 MW EWC CCPP. The connection of the 1,200 MW Atimonan CFPP will require additional transmission facility which will be covered by a separate project;



**PROJECT DESCRIPTION**

8. The components of the proposed Project are as follows:

PROJECT COMPONENT	DESCRIPTION
<b>Transmission Line</b>	
Tayabas-Naga Line Swinging at Tayabas 500 kV Switchyard	500 kV, 4 X 795 MCM ACSR/AS, ST-DC, 0.5 km
Tayabas-Naga Line Extension to Pagbilao EHV Substation	500 kV, 4 X 795 MCM ACSR/AS, ST-DC, 0.5 km
Tayabas-Pagbilao 230 kV Line connection to Tayabas-Naga Line	230 kV, 4 X 795 MCM ACSR/AS, ST-DC, 2.75 km
Tayabas-Pagbilao 230 kV Line Extension to Pagbilao EHV S/S	230 kV, 4 X 794 MCM ACSR/AS, ST-DC, 2.75 km
<b>Substation</b>	
Tayabas EHV S/S Expansion	3-500 kV PCBs and Associated Equipment 1-230 kV PCB and Associated Equipment Line Protection System Breaker Failure Protection System Shunt Reactor Protection System
Pagbilao EHV S/S	3 X 1000 MVA, 500/230-13.8 kV Power Transformers and Accessories 8-500 kV PCBs and Associated Equipment 11-230 kV PCBs and Associated Equipment Line Protection System Transformer Protection System Bus Protection System Breaker Failure Protection System Network Disturbance Monitoring Equipment Substation Automation System

Communication System	
Tayabas EHV S/S Expansion	Fiber Optic Communication System Power line Carrier Communication
Pagbilao EHV S/S	Fiber Optic Communication System

### COST ESTIMATE OF THE PROJECT

9. The estimated cost of the project is Three Billion Six Hundred Twenty-Eight Million One Hundred Seventy-One Thousand One Hundred Thirty-Two and 13/100 Pesos (PhP3,628,171,132.13) and the time of completion is Year 2018;

### JUSTIFICATIONS

10. Considering the growing need for power supply in Luzon, additional generation is highly essential. However, the readiness of the grid to accommodate such significantly huge capacity from the incoming power plants is extremely necessary. Thus, it proposes the implementation of the proposed Pagbilao EHV Substation Project in order to accommodate the entry of new power plants in the Luzon Grid;
11. The system simulation scenarios considered to evaluate the Project are based on its 2013 Transmission Development Plan using the 2018 and 2020 system peak conditions. Further, the following are the generation dispatch assumptions in the study:

Major Power Plants	MW Net Dispatch to the Grid (Base Assumption)					
	2015	2016	2017	2018	2019	2020
Pagbilao CFPP (Existing)	735	735	735	735	735	735
Pagbilao CFPP (Expansion)			420	420	420	420
QPPL CFPP (Existing)	460	460	460	460	460	460
SBPL CFPP (Expansion)				500	500	500
EWC CCPP (New)	400	600	600	600	600	600

**System Conditions without the New Power Plants and without the proposed Project**

12. System simulations were conducted in order to determine the condition of the existing transmission facility without the entry of the new power plants and without the implementation of the proposed Project. Based on the Thermal Assessment, the existing transmission system will remain adequate up to year 2020 under normal and N-1 contingency if no power plants will be connected at the Tayabas 500/230 kV Substation. Further, based on the Short-Circuit Analysis, the fault level at the Tayabas 500/230 kV Substation and nearby substation is well within the interrupting capability of their installed Power Circuit Breakers (PCBs). Shown below are the results of the assessment and analysis:

Thermal Assessment							
Monitored Element		2015		2016		2017	
		Normal	N-1	Normal	N-1	Normal	N-1
Tayabas 4 X 600 MVA Transformer	MW	291.1	383.7	252.7	333.1	247.3	326.1
	%	48	64	41	54	41	54
Tayabas - San Jose 500 kV Line 1 / Line 2	MW	517.8	858.4	427	712.9	668.9	1116
	%	19	32	15	25	23	39
Tayabas - Dasmarinas 500 kV Line	MW	455.3	1034.3	479.5	1072.0	140.6	616.8
	%	16	37	17	39	5	22
Tayabas - Ilijan 500 kV Line	MW	380.2	1187.2	369.2	1187.3	533.1	1187.4
	%	14	42	13	42	19	42
Ilijan - Dasmarinas 500 kV Line	MW	818.5	1200	829.6	1200	664.4	1200
	%	29	42	29	42	23	42

Thermal Assessment							
Monitored Element		2018		2019		2020	
		Normal	N-1	Normal	N-1	Normal	N-1
Tayabas 4 X 600 MVA Transformer	MW	274.7	362.3	245.7	324.4	234.9	309.7
	%	45	59	40	53	38	50
Tayabas - San Jose 500 kV Line	MW	693.6	1030.9	698.2	1033.7	598.2	902.3
	%	24	36	24	36	21	32
Tayabas - Taguig 500 kV Line	MW	635.5	1012.6	626.3	1005.8	578.2	900.6
	%	22	35	22	35	20	31
Taguig - San Jose 500 kV Line	MW	47.6	446.3	54.7	527.7	7	396.9
	%	2	17	4	19	4	16
Tayabas - Dasmarinas 500 kV Line	MW	214.9	678.3	148.1	520	215.7	679.5
	%	7	23	5	19	7	23

Tayabas - Ilijan 500 kV Line	MW	495.7	1187.8	528.5	1187.7	495.9	1187.7
	%	17	41	18	41	17	41
Ilijan - Dasmariñas 500 kV Line	MW	702.2	1200	669.1	1200	702	1200
	%	24	41	23	41	24	41

SHORT-CIRCUIT ANALYSIS							
Monitored Bus	PCB Rating	Fault Level (kA)					
		2015	2016	2017	2018	2019	2020
Tayabas 500 kV	40	18.5	18.5	18.8	18.5	18.8	18.9
Tayabas 230 kV	40	33.9	34.1	34.3	33.7	34.1	34.4
Dasmariñas 500 kV	40	16.5	16.5	17.4	17.0	17.2	17.3
Dasmariñas 230 kV	50	37.1	37.3	41.1	41.3	41.8	42.1
San Jose 500 kV	50	17.3	17.3	17.6	17.1	17.4	17.7
San Jose 230 kV	40	36.4	37.5	37.6	35.0	36.0	36.0
Taguig 500 kV	-	-	-	-	13.9	14.2	14.2
Taguig 230 kV	-	-	-	-	31.4	32.2	32.2
Ilijan 500 kV	40	15.3	15.3	15.5	15.3	15.4	15.5

**System Condition with the New Power Plants but without the proposed Project**

13. To determine the effect of the entry of the Pagbilao CFPP, QPPL CFPP and EWC CCPP power plants to the system condition of the existing transmission facility in the Luzon Grid, particularly in the Tayabas 500/230 kV Substation, but without the implementation of the proposed Project, Thermal Assessment and Short-Circuit Analysis were also conducted. Shown below are the results of the assessment and analysis:

Thermal Assessment							
Monitored Element		2015		2016		2017	
		Normal	N-1	Normal	N-1	Normal	N-1
Tayabas 4 X 600 MVA Transformer	MW	388	511.4	396.3	522.6	495.3	653
	%	64	85	64	85	82	108
Tayabas - San Jose 500 kV Line 1 / Line 2	MW	639.6	1059.5	624.8	1042	1013.1	1692.8
	%	23	38	22	37	35	60
Tayabas - Dasmariñas 500 kV Line	MW	539.6	1148.1	581	1211.6	312	848.4
	%	19	41	20	44	11	30
Tayabas - Ilijan 500 kV Line	MW	338.2	1187.1	318.5	1187	448.3	1187.1
	%	13	42	12	42	16	42
Ilijan - Dasmariñas 500 kV Line	MW	860.6	1200	880.5	1200	749.8	1200
	%	31	42	11	42	26	42

<b>Thermal Assessment</b>							
<b>Monitored Element</b>		<b>2018</b>		<b>2019</b>		<b>2020</b>	
		<b>Normal</b>	<b>N-1</b>	<b>Normal</b>	<b>N-1</b>	<b>Normal</b>	<b>N-1</b>
Tayabas 4 X 600 MVA Transformer	MW	620.6	818.4	605.8	799.5	593.9	783
	%	102	134	100	132	97	129
Tayabas - San Jose 500 kV Line	MW	1307.8	1839.1	1355	1896.5	1218.8	1723.3
	%	45	65	47	67	42	61
Tayabas - Taguig 500 kV Line	MW	1012.3	1711.1	1024	1745.6	967.4	1615.1
	%	35	61	36	63	33	57
Taguig - San Jose 500 kV Line	MW	410.2	1202.6	435	1242.6	344.6	1076.1
	%	14	44	17	47	12	39
Tayabas - Dasmariñas 500 kV Line	MW	434.2	972	368.5	889.3	457.8	1000.6
	%	15	34	13	31	16	35
Tayabas - Ilijan 500 kV Line	MW	386.1	1187.4	419.7	1187.2	377.8	1187.4
	%	14	42	15	42	13	42
Ilijan - Dasmariñas 500 kV Line	MW	812.4	1200	778.7	1200	820.9	1200
	%	28	41	27	41	28	41

<b>SHORT-CIRCUIT ANALYSIS</b>							
<b>Monitored Bus</b>	<b>PCB Rating</b>	<b>Fault Level (kA)</b>					
		<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
Tayabas 500 kV	40	19.3	19.9	20.9	21.2	21.7	21.9
Tayabas 230 kV	40	36.6	38.3	41.0	43.2	44.0	44.2
Dasmariñas 500 kV	40	16.8	16.9	18.0	17.8	18.0	18.2
Dasmariñas 230 kV	50	37.5	37.9	42.1	42.6	43.5	43.9
San Jose 500 kV	50	17.6	17.8	18.2	17.5	18.1	18.7
San Jose 230 kV	40	36.7	38.1	38.4	35.6	36.9	38.9
Taguig 500 kV	-	-	-	-	14.5	14.9	15.0
Taguig 230 kV	-	-	-	-	32.3	33.3	33.6
Ilijan 500 kV	40	15.5	15.6	16.0	16.0	16.2	16.3

14. Thus, Based on the Thermal Assessment, the entry of the three (3) power plants in the Luzon Grid will definitely result in the overloading of the 4X600 MVA, 500/230 kV power transformers in the existing Tayabas 500/230 kV Substation. Furthermore, based on the Short-Circuit Analysis, the resulting fault level at the existing Tayabas 500/230 kV Substation will already breach the 40kA rating of the installed PCBs in the said substations;

15. Based on the Thermal Assessment and Short-Circuit Analysis, the three (3) power plants cannot be all connected to the existing Tayabas 500/230 kV Substation without the Pagbilao EHV Substation Project;



**System Condition with the New Power Plants and with the proposed Project**

16. On the other hand, Thermal Assessment and Short-Circuit Analysis were also conducted in order to determine the effect of the of the entry of the Pagbilao CFPP, SBPL CFPP, and EWC CCPP to the system condition of the Luzon Grid, with the implementation of the proposed Project. Shown below are the results of the assessment and analysis:

Thermal Assessment							
Monitored Element		2018		2019		2020	
		Normal	N-1	Normal	N-1	Normal	N-1
New Pagbilao 3X1000 MVA Transformer	MW	583.5	875.2	583.4	875.2	583.5	875.2
	%	57	86	57	86	57	86
Tayabas 4 X 600 MVA Transformer	MW	176.6	232.8	164.1	216.6	159.5	210.3
	%	29	38	27	36	26	34
New Pagbilao – Tayabas 500 kV L1/L2	MW	875.2	1750.4	875.2	1750.3	875.2	1750.4
	%	30	60	30	60	30	60
Tayabas - San Jose 500 kV Line	MW	1327.4	1866.3	1373.1	1924.1	1255.6	1774.5
	%	46	66	47	68	43	63
Tayabas - Taguig 500 kV Line	MW	1025.3	1732.2	1038.2	1771.7	992.9	1660.3
	%	35	61	36	63	34	59
Taguig - San Jose 500 kV Line	MW	416	1218.9	440.2	1258.3	360.8	1114.1
	%	15	44	17	47	13	40
Tayabas - Dasmariñas 500 kV Line	MW	449.3	991.4	382.1	902	478	1027.3
	%	15	34	13	32	16	36
Tayabas - Ilijan 500 kV Line	MW	380.1	1187.6	414.8	1187.5	369.5	1187.5
	%	14	41	15	41	13	41
Ilijan - Dasmariñas 500 kV Line	MW	818.6	1200	783.7	1200	829.3	1200
	%	28	41	29	41	28	41

SHORT-CIRCUIT ANALYSIS							
Monitored Bus	PCB Rating	Fault Level (kA)					
		2015	2016	2017	2018	2019	2020
Tayabas 500 kV	40				22.5	23.0	23.1
Tayabas 230 kV	40				35.3	35.8	36.2
New Pagbilao 500 kV	-				20.3	20.7	20.8
New Pagbilao 230 kV	-				35.0	35.8	35.8
Dasmariñas 500 kV	40				18.1	18.3	18.5
Dasmariñas 230 kV	50				43.1	43.9	44.3
San Jose 500 kV	50				17.8	18.3	18.8
San Jose 230 kV	40				35.8	37.2	39.0
Taguig 500 kV	-				14.7	15.1	15.2
Taguig 230 kV	-				32.7	33.6	33.8
Ilijan 500 kV	40				16.2	16.4	16.5

17. Based on the Thermal Assessment and Short-Circuit Analysis, the construction of the proposed Pagbilao EHV Substation (with a transformer capacity rating of 3X1000 MVA) will prevent the existing Tayabas 500/230 kV Substation from overloading, and the fault level at the latter substation will be within the acceptable limits even with the entry of the three new power plants;

#### **JUSTIFICATION FOR PROVISIONAL AUTHORITY**

18. Considering the need for additional capacity in order to meet the fast growing demand of electricity, it is very crucial to implement the proposed Project in order to accommodate the entry of new power plants injecting around 2,720 MW to the Luzon Grid. As such, pre-construction activities are needed to be undertaken in 2015 in order to meet the target completion of the proposed Project in 2018;
19. Hence, the need to file an application with prayer for the issuance of provisional approval before the Commission to be able to implement the Project within the target date established in the system study;
20. A copy of the Judicial Affidavit of Engr. Redi Allan B. Remoroza, the Deputy Head of the Transmission Planning Department and Head of Luzon System Planning Division of NGCP in support thereof is attached to the application as Annex "B";
21. It prays that the Commission:
- a. Issue, immediately upon filing of the application, a provisional authority for the implementation of the Pagbilao EHV Substation Project; and
  - b. Approve, after notice and hearing, the application for the implementation of the Pagbilao EHV Substation Project and render judgment making provisional approval permanent.

The Commission has set the application for jurisdictional hearing, expository presentation, pre-trial conference and evidentiary hearing on **August 26, 2015 (Wednesday) at ten o'clock in the morning (10:00 A.M.) at the ERC Hearing Room, 15<sup>th</sup> Floor, Pacific Center Building, San Miguel Avenue, Pasig City.**

All persons who have an interest in the subject matter of the proceeding may become a party by filing, at least five (5) days prior to the initial hearing and subject to the requirements in the ERC's Rules of Practice and Procedure, a verified petition with the Commission giving the docket number and title of the proceeding and stating: (1) the petitioner's name and address; (2) the nature of petitioner's interest in the subject matter of the proceeding, and the way and manner in which such interest is affected by the issues involved in the proceeding; and (3) a statement of the relief desired.

All other persons who may want their views known to the Commission with respect to the subject matter of the proceeding may file their opposition to the application or comment thereon at any stage of the proceeding before the applicant concludes the presentation of its evidence. No particular form of opposition or comment is required, but the document, letter or writing should contain the name and address of such person and a concise statement of the opposition or comment and the grounds relied upon.

All such persons who may wish to have a copy of the application may request the applicant, prior to the date of the initial hearing, that they be furnished with a copy of the application. The applicant is hereby directed to furnish all those making such request with copies of the application and its attachments, subject to reimbursement of reasonable photocopying costs. Likewise, any such person may examine the application and other pertinent records filed with the Commission during the usual office hours.

**WITNESS, the Honorable Commissioners, ALFREDO J. NON, GLORIA VICTORIA C. YAP-TARUC, JOSEFINA PATRICIA A. MAGPALE-ASIRIT and GERONIMO D. STA. ANA, Energy Regulatory Commission, this 20<sup>th</sup> day of July, 2015 at Pasig City.**



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**ATTY. FRANCIS SATURNINO C. JUAN**  
Executive Director III