

# Bohol Island Transmission Development Plan (2016-2023)

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# 1 Existing Transmission System of Bohol

## 1.1 Bohol and the Visayas Grid

The Bohol transmission system is one of five (5) sub-systems or sub-grids in the interconnected Visayas Grid. The Bohol subsystem is radially connected to the rest of the Visayas Grid through a 1x90 MW 138kV submarine cable from the town of Ubay in Bohol to Maasin in Southern Leyte. This in turn is connected to a single-circuit 138kV line from the town of Maasin to Ormoc City. An outage in any of these two lines will isolate Bohol from its major power sources in Leyte and the rest of the Visayas and Luzon Grids.

A second line (138 kV 1-795 MCM ACSR, ST-DC2, 113.97 km) that will provide single outage or N-1 contingency for the Ormoc-Maasin line is expected to have been completed in August 2016.

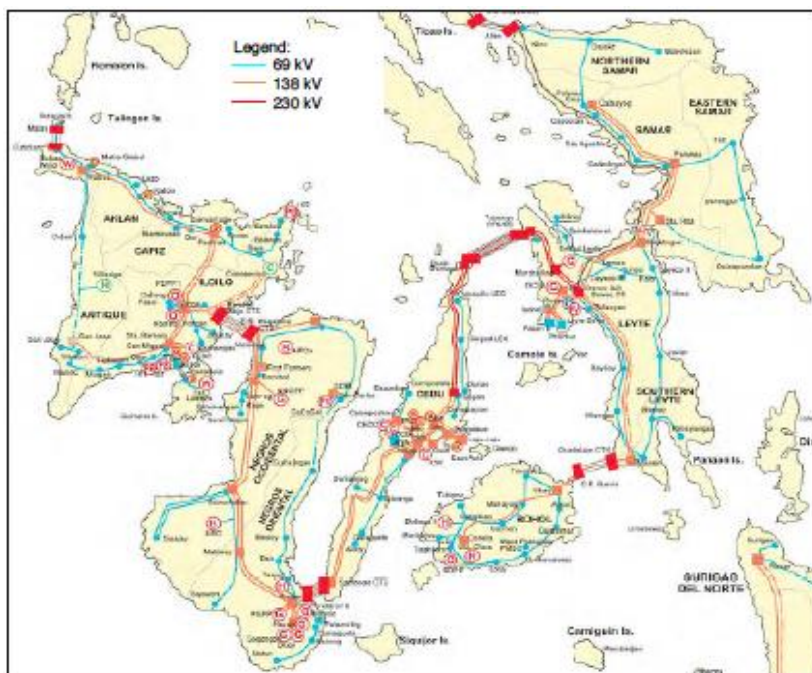


Figure 1-1. The Visayas Grid. [3]

## 1.2 Bohol Transmission Sub-System

The whole island of Bohol was originally supplied through a 100 MVA 138/69kV transmission substation located at Ubay, which receives power from Leyte through the Leyte-Bohol transmission interconnection. From this Ubay substation emanates a looped 69kV subtransmission line supplying all the substations of BOHECO I, BOHECO II, and BLCI as illustrated in Figure 1-2.

## 1.3 Recently Completed Bohol Transmission Sub-System Projects

Recent projects that have been completed are the 138 kV backbone line (Ubay-Corella line) connecting the Ubay Substation to a new 100 MVA 138/69kV Corella Substation. According to NGCP's 2014-2015 TDP, the Ubay-Corella 138 kV line is necessary to prevent

overloading of the Ubay-Trinidad line during outage of the Ubay-Alicia 69 kV line segment, and vice-versa. Furthermore, the new substation in Corella is expected to provide a new bulk power delivery point in Bohol, thereby reducing the load of the Ubay Substation. Both projects were completed in 2014.

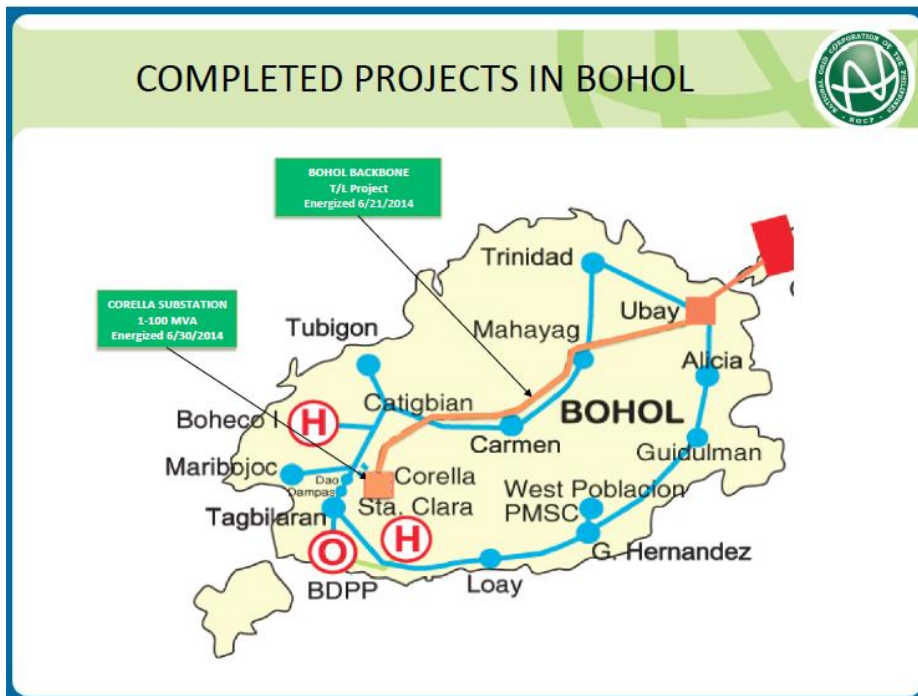


Figure 1-2. Recently Completed Transmission Projects in Bohol. [1]

## 2 Bohol Proposed Transmission Interconnection Projects

### 2.1 Bohol Transmission Constraint

Bohol Transmission System’s connection to the rest of the Visayas Grid is one of the major constraints of the island when it comes to the reliability and security of its supply. The single-circuit Leyte-Bohol transmission system is not compliant with the Philippine Grid Code’s N-1 reliability criterion. In the event of an outage of this line, the whole Bohol Island becomes isolated from the rest of the Visayas Grid and from its sources of power supply. Moreover, the total capacity of generating plants inside Bohol is insufficient to supply the total demand. This transmission constraint became evident when Super typhoon Yolanda heavily damaged transmission lines linking Bohol to Leyte. Bohol suffered a month-long outage, which was much more than what they experienced from the effects of the 7.2 magnitude earthquake that hit the island just a month before. Thus, alternative transmission interconnection of Bohol to other islands of the Visayas is required.

## 2.2 Leyte-Bohol (Line 2) Interconnection Project

The initial solution of the NGCP to Bohol's power situation is the planned construction of a second Leyte-Bohol submarine cable. NGCP's 2014-2015 TDP suggests this project was proposed to address the expected increase in Bohol's demand. However, this project is being deferred in favor of a Cebu-Bohol Interconnection Project which will not only address the growth in demand, but will also be a much improved solution to Bohol's N-1 contingency problem. NGCP's 2014-2015 TDP further explains that this project may still be implemented in the future to serve as a feasible interconnection scheme for long-term system requirements as shown in Figure 2-1.

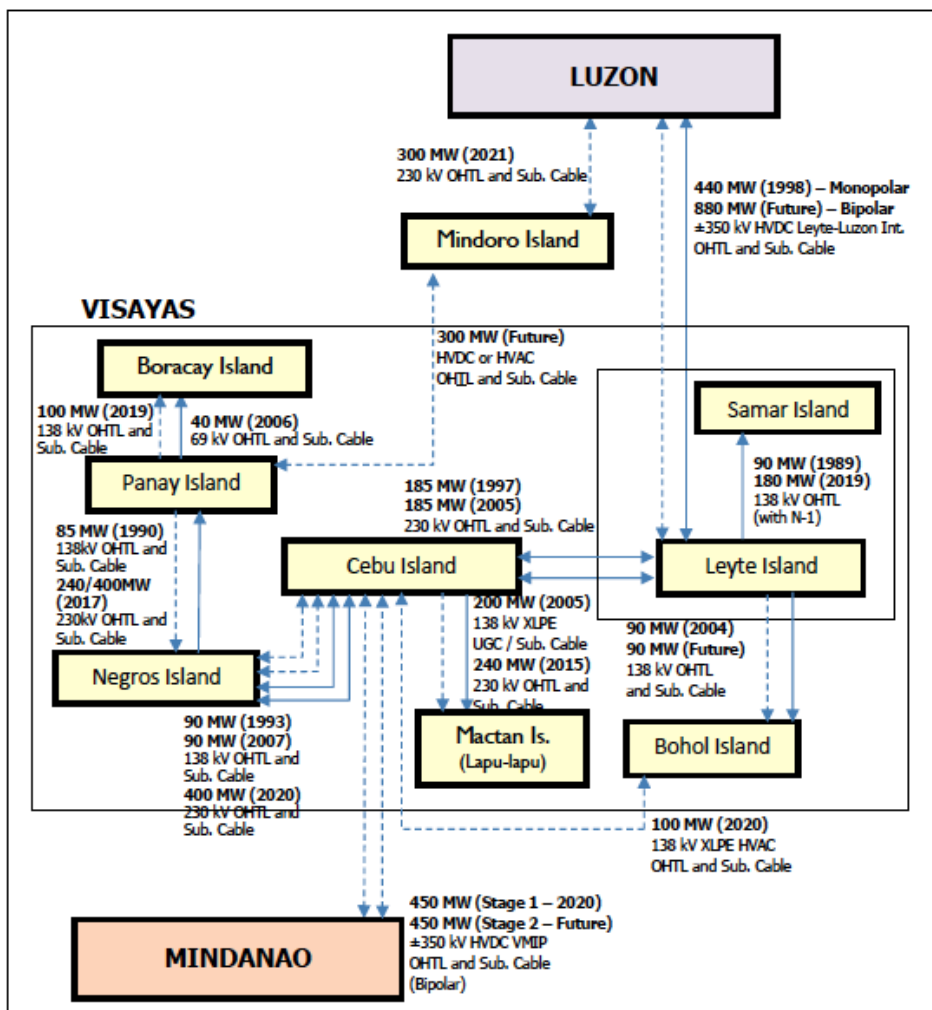


Figure 11.2 - Existing and Future Philippine Network Topology  
 OHTL – Overhead Transmission Line, Sub. Cable – Submarine Cable, UGC – Underground Cable and N-1 – Single Outage Contingency.

Figure 2-1. Existing and Future Philippine Network Topology. [3]

### 2.3 Cebu-Bohol Interconnection Project

The Cebu-Bohol Interconnection Project (CBIP) is proposed in the 2014-2015 TDP in place of the Leyte-Cebu Line 2 Interconnection Project. The CBIP connects Sibonga Substation in Cebu to the Corrella Substation in Bohol through a 200-MW, 138-kV submarine cable attached to the Sibonga and Loon Cable Terminal Stations (CTS), Bohol to Sibonga. The major components of this transmission project is summarized in Figure 2-2 and illustrated in Figure 2-3. Together with the Bohol 138 kV Transmission Backbone Line 2, the CBIP effectively loops the transmission sub-systems of Bohol, Cebu, and Leyte. This transmission system configuration will result in a much better reliability performance for the Bohol system and will make it compliant to the N-1 criteria set in the PGC. Outage of any of the two submarine cables, or any of the Ubay and Corella Substations, or any of the two 138 kV lines will still result in normal power delivery in the island of Bohol. The CBIP is expected to be complete by 2020.

Major Project Components	
▪	<b>Sibonga 138 kV S/S (New)</b> , 1-50MVA, 138/69 kV Transformer, 13-138 kV PCB and associated equipment, 3-40 MVAR Reactor, 3-69 kV PCB and associated equipment;
▪	<b>Corella 138 kV S/S</b> , 3-138 kV PCB and associated equipment;
▪	<b>Sibonga CTS-Corella CTS</b> , Single circuit submarine cable system of 200 MW capacity at 138 kV, 30km;
▪	<b>Loon CTS-Corella S/S</b> , ST-DC, 1-795 MCM, 17 km.

Figure 2-2. CBIP Major Project Components [3]

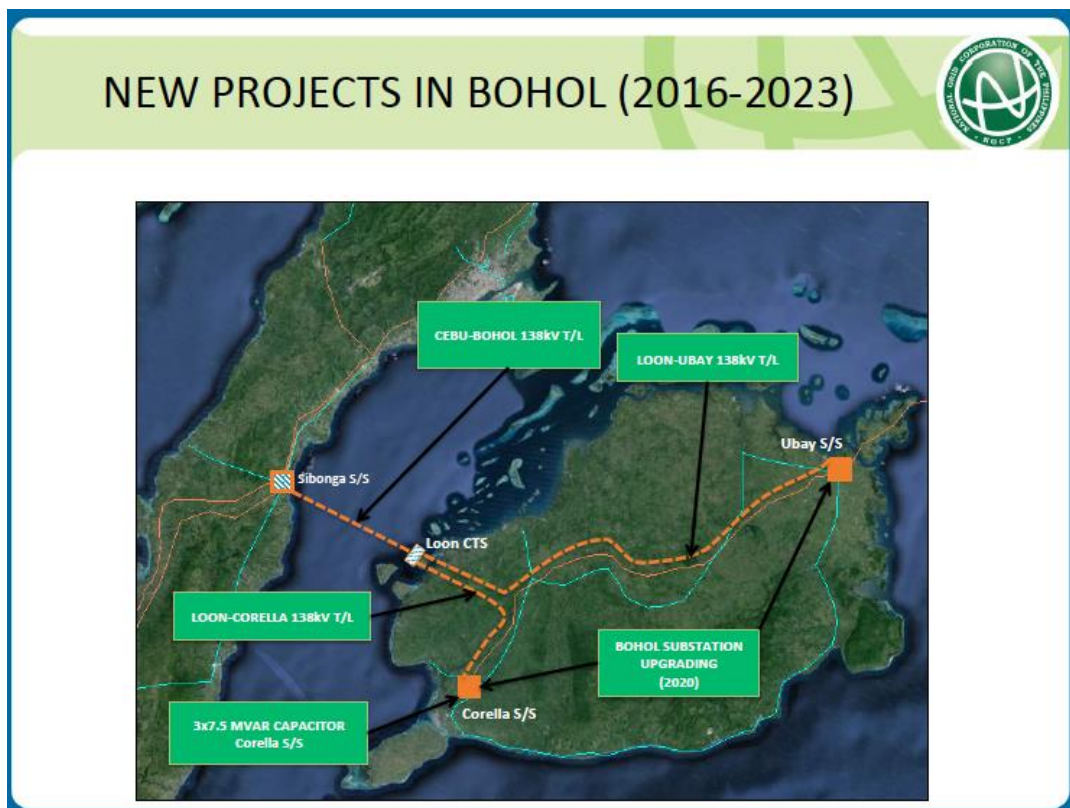


Figure 2-3: NGCP Major Projects

## 2.4 Cebu-Bohol Interconnection Project (New Scheme)

Another alternative Cebu-Bohol Interconnection Project is being proposed by the NGCP. Under this new scheme, the CIBP is upgraded to a 230kV system instead of a 138kV system originally proposed in the 2014-2015 TDP (see . This project involves the construction of 230kV lines from the 230kV Sibonga Substation (under the Visayas-Mindanao Interconnection Project) to Sibonga CTS, a 230 kV submarine cable from Sibonga CTS to Loon CTS, a 230kV line from Loon CTS to a new 2x300MVA 230/138kV Substation in Corella. This new proposed scheme illustrated in Figure 2-4 (b) will have similar effects as the originally proposed scheme in Figure 2-4 (a), except that the new scheme will make the Bohol subsystem a part of the main transmission corridor of the Visayas Grid. This will result in better access to power plants all over the Visayas Grid and encourage the building of larger power plants inside the island of Bohol that will result in a more reliable and more resilient power system for Bohol.

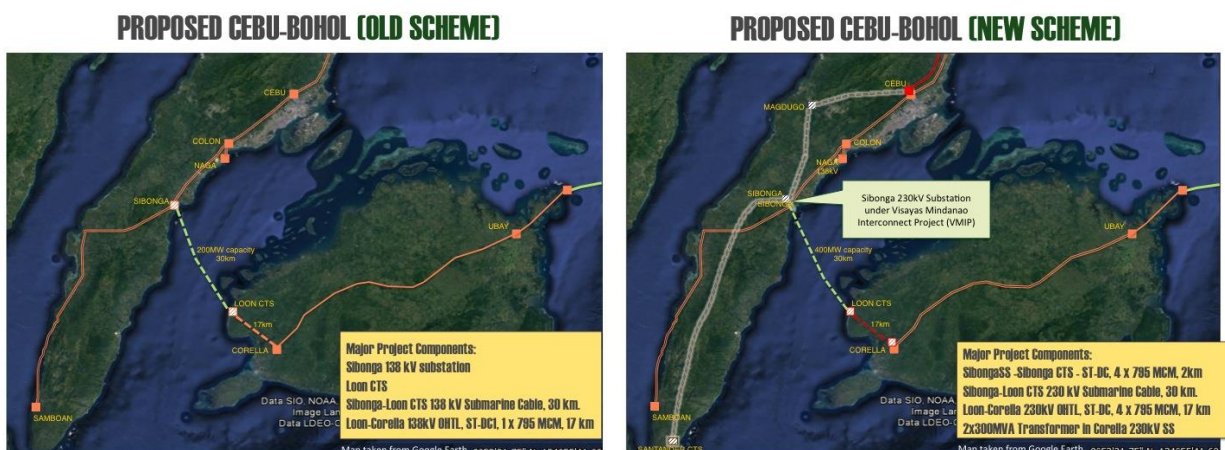


Figure 2-4. Proposed Cebu-Bohol Interconnection Project (a) Old Scheme under 2014-2015 TDP and (b) New Scheme. [2]

This new CIBP scheme is not yet included in the most recent TDP (2014-2015 TDP) published by NGCP. It was presented to the BEDAG by NGCP last June 16, 2017 (See Annex A). According to NGCP's representative, the NGCP will apply for Provisional Authority for the said project by 3<sup>rd</sup> Quarter of 2017. NGCP seeks the support of the Provincial Government of Bohol for a smooth Right of Way (ROW) procurement and permitting.

### 3 Other Proposed Projects

Another proposed project is the construction of a 69/13.8kV 10-MVA Power Transformer in a Substation in Tagbilaran which will be completed by 2017. This additional transformer capacity will be used to supply power from hydroelectric plants owned by the Bohol Electric Incorporated (BEI) and the Loboc Hydroelectric Power Plant (LHEP). This project will help improve the reliability of the subtransmission system and security of supply through the accommodation of indigenous and renewable sources of power inside Bohol.

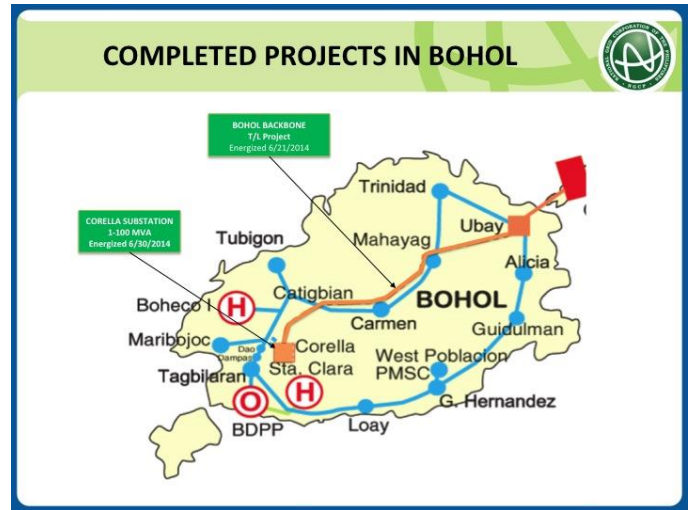
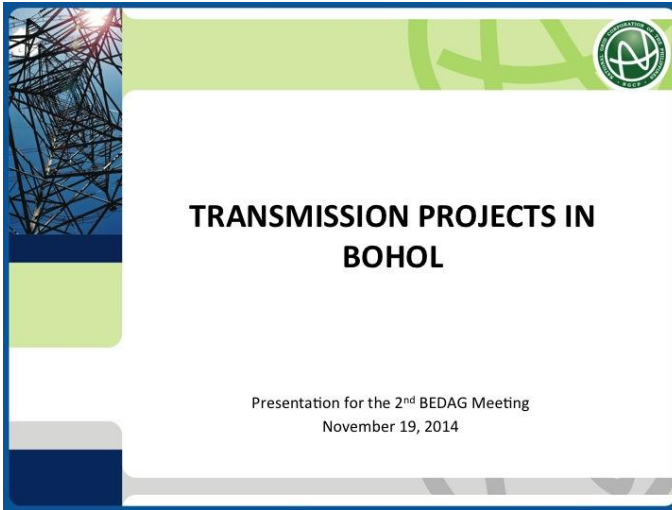
### 4 References

- [1] *NGCP Presentation to the Bohol Energy Development Advisory Group (BEDAG), November 16, 2014 at Amorita, Panglao, Bohol (See Annex A).*
- [2] *NGCP Presentation to the BEDAG, June 16, 2017 at the Bohol Provincial Capitol (See Annex B).*
- [3] *Transmission Development Plan (2014-2015) Volume 1: Network Development. National Grid Corporation of the Philippines (NGCP), December 2015. <https://www.ngcp.ph/transmission-development-plan.asp>*



## 5 Annexes


### 5.1 Annex A: NGCP Presentation to BEDAG (November 16, 2014)



**END OF PRESENTATION**


**THANK YOU**

5.2 Annex B: NGCP Presentation to BEDAG (June 16, 2017)



# CEBU- BOHOL INTERCONNECTION PROJECT

16 June 2017



## Outline


1. Cebu-Bohol Interconnection Project (Old Scheme)
2. Cebu-Bohol Interconnection Project (New Scheme)
3. Project Status



## PROJECT STATUS

ACTIVITY	TIMELINE
Application to ERC for Provisional Authority	3rd Quarter of 2017

Notes: Needs Bohol government's full support on RoW and permitting.



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