ILOILO PROVINCIAL RENEWABLE ENERGY PLAN

FIRST DRAFT

JULY 2021

Supported by the GEF-DOE-UNDP DREAMS Project

CSi Energy Solutions International

***** Tentative List of Messages for Consideration *****

DOE Secretary

DILG Secretary

Governor

Vice-Governor

UNDP

Foreword from PPDC Head

Contents

List of Tables

List of Figures

Acronyms

AIP	Annual Investment Plan
BAPA	Barangay Power Association
BAU	business as usual
BESS	Battery Energy Storage System
CASA	Central Azucarera de San Antonio
CDP	Comprehensive Development Plan
CLUP	Comprehensive Land Use Plan
CREZ	Competitive Renewable Energy Zones
CSP	Competitive Selection Process
DA	Department of Agriculture
DILG	Department of Interior Local Government
DOE	Department of Energy
DOST	Department of Science and Technology
DRE	distributed renewable energy
DREAMS	Development for Renewable Energy Applications Mainstreaming and Market Sustainability
DRRMP	Disaster Risk Reduction and Management
EC	electric cooperative
EIUP	Energy-Integrated Urban Planning
ELA	Executive Legislative Agenda
EPIRA	Electric Power Industry Reform Act
ESWM	Ecological Solid Waste Management
ER	Energy Regulation
ERC	Energy Regulatory Commission
EVOSS	Energy Virtual One Stop Shop
GEF	Global Environment Facility
GEAP	Green Energy Auction Program
GEOP	Green Energy Option Policy
HV	high voltage
IBRD	International Bank on Reconstruction Development
IEC	information, education, communication
ILECO	Iloilo Electric Cooperative
IPG	Iloilo Province Government
I-PREP	Iloilo Provincial Renewable Energy Plan
LCCAP	Local Climate Change Action Plans
LGU	Local Government Unit
LV	low voltage
MRF	materials recovery facility
NDC	Nationally Determined Contributions
NEA	National Electrification Administration
NGCP	National Grid Corporation of the Philippines
NPP	New Power Producer
NREL	National Renewable Energy Laboratory
NREP	National Renewable Energy Program
OTEC	ocean thermal energy conversion
PPP	public private partnership
PV	photovoltaic
RA	Republic Act
RE	renewable energy

REC	renewable energy certificate
RES	retail energy supplier
RET	renewable energy technology
REP-AFS	RE Program for the Agriculture and Fisheries Sector
RIS	River Irrigation System
RPS	Renewable Portfolio Standard
SDG	Sustainable Development Goals
SPUG	Small Power Utilities Group
TDP	Transmission Development Plan
TWG	Technical Working Group
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VRE	variable renewable energy
WTE	waste-to-energy

Units of Measurement

GJ	gigajoule
GW	gigawatt
ha	hectare
J	joule
Kg	kilogram
Km	kilometer
Km^2	square kilometer
kV	kilovolt
kW	kilowatt
kWh	kilowatt hour
L	liter
MJ	megajoule
MT	metric tonne
MW	megawatt
MWh	megawatt hour
s	second
sq km	square kilometer
TPD	tonnes per day

INTRODUCTION

BACKGROUND

The Province of Iloilo is one with the nation in attaining the long-term vision embodied by *AmBisyon Natin 2040* – to enjoy a *"matatag, magihanwa, at panatag na buhay."* This vision is even more pronounced by the impacts of the Covid-19 pandemic. AmBisyon 2040 reveals the many dimensions of well-being that every Filipino values the most: strong family and community ties, a comfortable lifestyle, and a secure future. It is the mission of the government to steer development processes to enable and empower every Filipino to achieve these aspirations[1]. The national vision is enhanced by the country's commitment to achieve the Sustainable Development Goals (SDGs) and Nationally Determined Contributions (NDCs) under the Paris climate agreement.

Energy is a critical component to achieve the common vision and goals. It powers economic activities that build industries, create jobs and livelihoods. Energy facilitates the delivery of social services and access to basic needs. And, it supports Filipinos to attain their individual aspirations.

The country's energy source has been dominated by fossil fuels. As of 2019, 61.4% of the total primary energy supply comes from coal and oil. In power generation, 71% of the country's electricity comes from conventional fuels (coal, oil, and natural gas). The large consumption of fossil fuels leads to environmental degradation – worsening air quality and greenhouse gas emissions that contribute to climate change.

Renewable energy (RE) is a clean alternative energy source for the Philippines. The country is endowed with abundant RE resources – biomass, geothermal, solar, hydro, ocean, and wind, which can supply the nation's growing energy demands. These are indigenous resources that can break our dependence on imported fossil fuels and promote ecological and sustainable development.

This document, the Iloilo – Provincial Renewable Energy Plan (I-PREP), is a testament of the Province of Iloilo's commitment to renewable energy and lays down the programs and activities to deploy RE in the province. The I-PREP was developed with support from the Department of Energy and from the GEF-DOE-UNDP Development for Renewable Energy Applications Mainstreaming and Market Sustainability (DREAMS) Project. The DREAMS Project aims to promote and facilitate the commercialization of renewable energy markets by removing barriers to investments in RE-based power generation projects.

RATIONALE AND OBJECTIVES

In 2008, the Philippines signed the Renewable Energy Act (RA 9513), which declared state policy to explore, develop, and utilize renewable energy. The RE Act stipulated RE policies and programs that led to more than 2,000MW of RE power plants since 2008. The national government is setting a new RE target – to increase the contribution of RE in the power generation mix to 35% by 2040[2].

A concerted whole-of-government approach is required to achieve this RE target. The DOE and the Department of Interior and Local Government, through the LGU Energy Code[3], prescribes

[1] Government of the Philippines. 2021. *Updated Philippine Development Plan 2017-2022*. http://pdp.neda.gov.ph/wp-content/uploads/2021/06/Updated-PDP-2017-2022-as-of-06_25.pdf
[2] In 2020, RE's contribution in the power generation mix is at 21%.
[3] DILG-DOE No 2020-01

LGUs to perform local renewable energy planning to facilitate identification of new RE sites and promote its development. The code mandates LGUs to integrate renewable energy in their spatial and development plans and streamline the local regulatory or permitting process for RE projects.

The Province of Iloilo developed the I-PREP in line with these national RE policies.

The objectives of the Iloilo-Provincial Renewable Energy Plan are:

- To institutionalize renewable energy planning in the development planning process
- To present the status of RE project development and deployment in the province
- To identify the plans, programs, and activities that will promote exploration, development, and commercialization of RE systems across the province
- To develop a renewable energy investment program for the public and the private sector
- To set the implementation strategies for the I-PREP that includes monitoring and evaluation, risk management, and communication strategies.

SCOPE

The I-PREP covers all the 42 municipalities and 1 component city of the Province of Iloilo.

Municipal LGUs are not required to prepare separate or individual RE plans. Instead, the LGU Energy Code prescribes municipal and city LGUs to incorporate RE in their spatial plans (CLUP) and development plans (CDP, AIP, LCCAP, DRRMP, etc.).

The I-PREP presents the Province's overall Renewable Energy strategy. However, it does not cover issues or opportunities on energy efficiency even if it often complements the RE agenda. Energy efficiency will have to be covered by a separate plan, the Local Energy Efficiency and Conservation Plan as mandated by RA 11285 Energy Efficiency and Conservation Act.

METHODOLOGY

The Iloilo Provincial Government (IPG) formed a Technical Working Group (TWG) to lead the development of the I-PREP with support from the GEF-DOE-UNDP DREAMS team of consultants.

Through a prioritization process that considered parameters such as population, electrification rate and experience with RE among others, three LGUs were selected as representative cases for the I-PREP since it is impossible to engage all the 43 local governments in the process. One LGU was selected from each of the three franchise areas of the three electric cooperatives operating in the province. The three LGUs are Concepcion (ILECO lll), Passi City (ILECO ll), and Miag-ao (ILECO 1). Each municipal/city LGU formed a TWG that participated in the consultions, workshops and other activities of the Project. The challenges for the localization of the implementation of the RE Act and the NREP, as well as in RE project development, were identified during these consultation. The results of these analyses were integrated in the formulation of strategies and identification of action plans for the whole province.

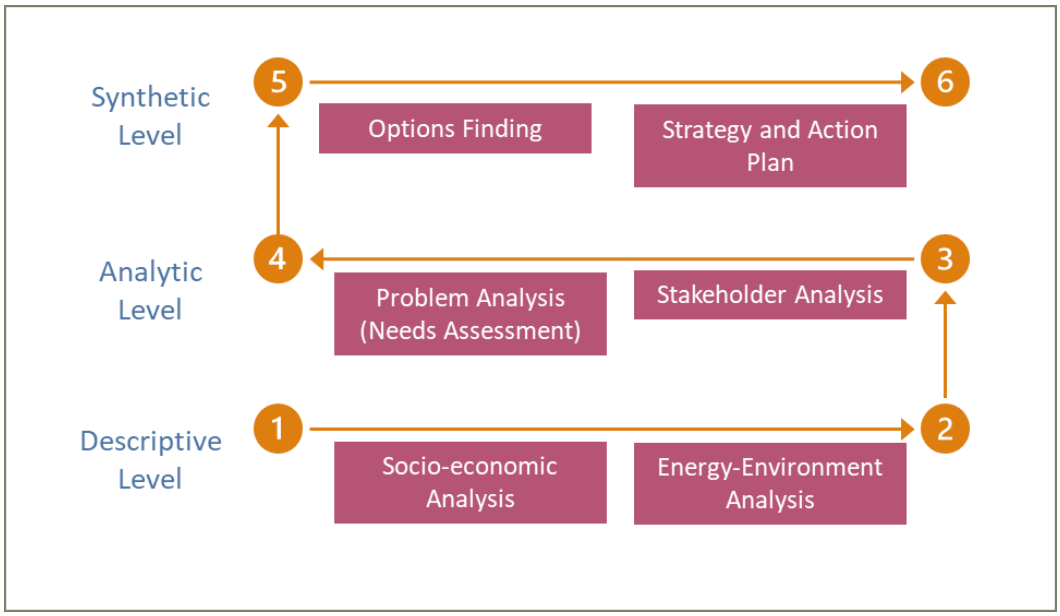
The overall methodology used for developing the I-PREP was the **Energy-Integrated Urban Planning (EIUP)**. The EIUP consists of the following steps:

- Socio-economic analysis
- Energy-environment analysis

- Stakeholder analysis
- Problem analysis (Needs assessment)
- Options finding
- Strategy and action plan definition

A general description of these steps and their relationships are depicted below:

Figure 1: The EIUP Methodology



Source: Adapted from Weihs, Gerhard 2006, "EIUP Methodology," Feasibility study for the implementation of energy integrated urban planning (EIUP) in ASEAN cities and of applicability of European approaches (EAEF-EIUP Project) and Todoc, Jessie L. 2008, "Integrating energy in urban planning in the Philippines and Vietnam" in Droege, Peter, ed. *Urban Energy Transition,* Elsevier, London.

The steps are grouped according to three levels of objectives.

Descriptive Level: The activities under this level aim to lay down the existing situation as regards to social, economic, energy, and environment aspects of the Province of Iloilo.

Analytic Level: This level aims to identify the scope of the required integration between renewable energy and provincial development planning under the view of pressing problems. The issues were determined in consultation with relevant stakeholders identified in the stakeholder analysis.

Synthetic Level: It aims to distill the possible options with respect to their feasibility to formulate a renewable energy strategy and action plan. The synthetic level will employ the *Portfolio Analysis* to identify the options to address the needs or resolve the problems identified in the Analytic level.

OVERVIEW OF THE CHAPTERS

This document is the First Draft of the I-PREP. It includes four chapters that consolidate the outputs from the completed activities.

Chapter 1 Socio-economic Situation – The chapter presents the socio-economic, and environmental profile of Province of Iloilo. It also presents an overview of the three case LGUs.

Chapter 2 Power Supply and Demand Situation Outlook – The chapter defines the province's existing power or electricity structures and the future developments defined in the power sector plans (distribution development plan, transmission development plan, etc.).

Chapter 3 RE Resource Assessment and Project Development – The chapter identifies RE power generation projects being developed by the private sector in Province of Iloilo. It then presents the theoretical level or quantity of RE resources available. Biomass, solar, hydropower, ocean, and wind energy potential are quantified in this chapter.

Chapter 4 RE Readiness and Capacity Assessment – The new RE policies and programs initiated by the DOE under the National Renewable Energy Program 2020-2040 demands new roles for LGUs and ECs. This chapter presents the capabilities, issues, and gaps that LGUs and ECs face in performing their enhanced functions within the energy sector.

Chapter 5 RE Strategy and Action Plan – This chapter identifies programs, plans, and activities to address the challenges and gaps identified in Chapter 3 to support LGUs promote and benefit from RE.

The second draft of the I-PREP will include additional chapters that are geared towards I-PREP's implementation, including the Investment plan, Capacity Building Plan, M&E Plan, Risks and Risk Management Plan, Communication Plan, and Proposed Local Ordinances.

I. Socioeconomic and Environment Profile

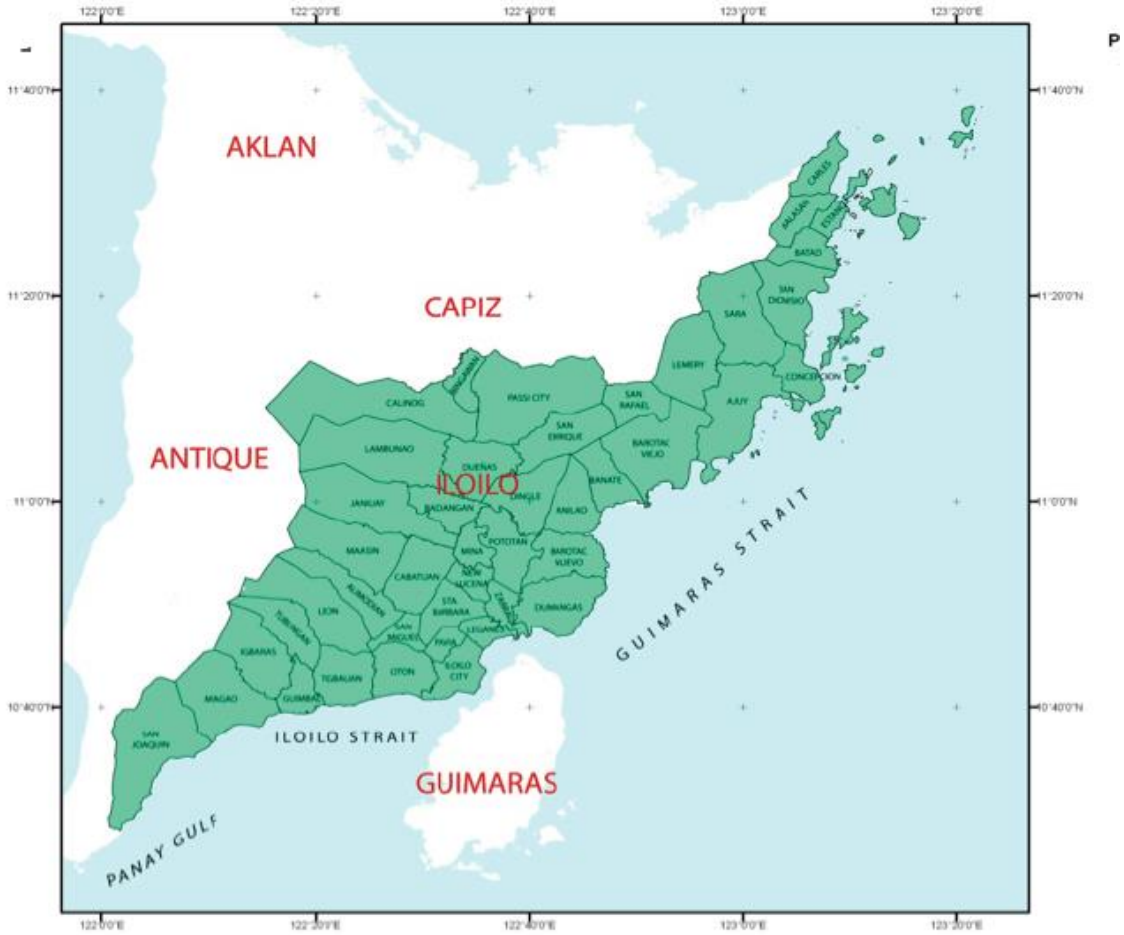
A. Geographic and Socio-Economic Profile

1. Province of Iloilo

a) Geographical Features

The Province of Iloilo is considered as the regional hub of Western Visayas (Region VI) and plays a crucial role in the region's socio-economic growth and development. The Province occupies the southern and the northeastern portion of Panay Island. It is bounded by the Province of Capiz and Jintotolo Channel in the north; Panay Gulf and Iloilo Strait in the south; Visayan Sea and Guimaras Strait in the east; and the Province of Antique in the west.

Figure 2. Province of Iloilo Administrative Map



Source: 2018 Iloilo Provincial Profile

The Province of Iloilo ha a total land area of 466,342 ha or 4,663.42 sq km. It is endowed with flat lands and rolling hills, mountain peaks and ranges. The flat lands comprise one-third of the total land area while the rest are mountain ranges that lies along the border between Iloilo and the provinces of Antique and Capiz, and roll down into flat plains towards the coastal towns.

Table 1. Land Area Classification, 2008

Land	Area (ha)
Alienable/Disposable Lands	**352,347.00**
Agricultural	344,744.27
Fishpond	5,707.58
Private Plantation	1,657.23
Others	237.92
Timberland	**113,995.00**
Upland	106,980.30
Mangrove	7,014.70

Almost one-third of the province lands is considered flat. The highest peak is Mt. Baloy in Lambunao which is 1,728 meters above sea level. Hills and mountains, with heights varying from 90 to 100 meters above sea level are found in the greater part of the northeastern section of the province. In terms of slopes, the following is the topography of the lands:

- Thirty-two percent of the province has a slope of 0-3 percent.
- Nine (9) percent of total land area with slopes of 3-8 percent (sloping and undulating) could be found in almost all areas with large portions in Leon and San Enrique.
- Fifteen percent of lands has a slope of 8-18 percent and are located in Cabatuan, Badiangan, Janiuay, Duenas and the island barangays of Concepcion.
- Slopes of 18-30 percent could be found in most of the municipalities.
- Slopes greater than 50 percent can be found in the municipalities of Calinog, Lambunao, Janiuay, Maasin, Alimodan, Leon, Tubungan, Igbaras, Miagao, San Joaquin and the island barangays of San Dionisio

The province has a total of 66 islands mostly situated in the northern part. Some of the islands are submerged during high tide. Also 159 rivers and creeks traverse the entire province. Major rivers that provide water for irrigation and potable use are: Jalaur River, Suague River, Tigum River, Aganan River, Serruco River, Jaro River and Iloilo River. The coastline of the province is approximately 451.83 kilometers. There are 19 coastal municipalities covering 230 coastal barangays in the province. The province also has a total forest land area of 114,083 hectares.

There are 159 rivers and creeks that traverse the entire province and these are identified as possible sources of irrigation water. The Jalaur river basin records the highest annual flow and is considered as the major source of irrigation water in the Province. It also has ample underground water supply, which is mostly tapped for domestic use.

These physical characteristic are important to note in determining the Province's potential for various renewable energy sources and usage.

b) Socio-economic Context

The Province of Iloilo is a first class province composed of one (1) component city and 42 municipalities. It is divided into 5 congressional districts, as follows:

Table 2. Iloilo Province Municipalities and City by District

District 1	District 2	District 3	District 4	District 5
Guimbal	Alimodian	Badiangan	Anilao	Ahuy
Igbaras	Leganes	Bingawan	Banate	Balasan
Miag-ao	Leon	Cabatuan	Btac. Nuevo	Batad
Oton	New Lucena	Calinog	Dingle	Barotac Viejo
San Joaquin	Pavia	Janiuay	Dueñas	Carles
Tigbauan	San Miguel	Maasin	Dumangas	Concepcion
Tubungan	Sta. Barbara	Lambunao	Passi City	Estancia
Zarraga	Mina	San Enrique	Lemery	
Pototan	San Dionisio			
San Rafael				
Sara				

In terms of income classification, there are 7 first class municipalities, 11 second class municipalities, 7 belonging to the third-class category, 13 municipalities in the 4th class category, 4 municipalities belonging to the fifth-class category and 1 city as follows:

Table 3. Municipalities'/City's Income Classification

	Municipality/Component City	Class		Municipality/Component City	Class
1	Ajuy	Second	23	Leganes	Fourth
2	Alimodian	Third	24	Lemery	Fourth
3	Anilao	Fourth	25	Leon	Second
4	Badiangan	Fourth	26	Maasin	Third
5	Balasan	Fourth	27	Miag-ao	First
6	Banate	Fourth	28	Mina	Fifth
7	Btac. Nuevo	Second	29	New Lucena	Fourth
8	Btac. Viejo	Third	30	Oton	First
9	Batad	Fifth	31	Passi City	4th Class City
10	Bingawan	Fifth	32	Pavia	Second
11	Cabatuan	Second	33	Pototan	First
12	Calinog	First	34	San Dionisio	Fourth
13	Carles	Second	35	San Enrique	Third
14	Concepcion	Third	36	San Joaquin	Second
15	Dingle	Third	37	San Miguel	Fourth
16	Duenas	Fourth	38	San Rafael	Fifth
17	Dumangas	First	39	Sta. Barbara	Second
18	Estancia	Second	40	Sara	Second
19	Guimbal	Fourth	41	Tigbauan	Second
20	Igbaras	Third	42	Tubungan	Fourth
21	Janiuay	First	43	Zarraga	Fourth
22	Lambunao	First			

As of 2015, the total population of the Province is at 1,936,423 persons, comprising of 435,723 households with a population density of 415 persons per square kilometer and an annual population growth rate of 1.34%.

Table 4. Total Population, Number of Households and Population per Municipality/ City

Municipality/ City	Total Population	Household Population	Number of Households	Municipality/ City	Total Population	Household Population	Number of Households
Ajuy	52,268	52,084	12,221	Leganes	32,480	32,377	7,033
Alimodian	38,408	38,380	8,067	Lemery	30,851	30,824	7,839
Anilao	28,684	28,679	6,561	Leon	49,875	49,795	10,755
Badiangan	27,005	27,005	5,897	Maasin	36,922	36,905	7,384
Balasan	33,088	33,070	8,090	Miag-ao	67,565	66,767	14,124
Banate	32,532	32,437	7,993	Mina	23,546	23,540	4,992
Btac. Nuevo	54,146	54,118	11,991	New Lucena	23,240	23,219	5,006
Btac. Viejo	45,808	45,500	11,091	Oton	89,115	88,988	20,460
Batad	21,298	21,298	5,154	Passi City	80,544	80,279	19,288
Bingawan	15,199	15,199	3,467	Pavia	55,603	55,414	12,825
Cabatuan	58,442	58,416	12,715	Pototan	75,070	74,170	16,000
Calinog	60,413	60,276	13,155	San Dionisio	38,775	38,750	9,013
Carles	68,160	68,123	15,278	San Enrique	33,911	33,874	7,638
Concepcion	43,159	43,110	10,202	San Joaquin	51,892	51,765	11,163
Dingle	45,335	45,318	10,414	San Miguel	27,686	27,686	6,046
Duenas	34,242	34,235	7,822	San Rafael	16,532	16,469	3,837
Dumangas	69,108	68,962	15,793	Sta. Barbara	60,215	59,883	13,608
Estancia	48,546	48,355	11,204	Sara	52,631	52,607	13,246
Guimbal	33,820	33,755	7,470	Tigbauan	62,706	62,698	13,359
Igbaras	32,004	31,918	7,022	Tubungan	22,449	22,445	4,848
Janiuay	63,905	63,836	13,865	Zarraga	25,605	25,476	5,853
Lambunao	73,640	73,527	15,934	**TOTAL**	**1,936,432**	**1,931,532**	**435,723**

Source: Philippine Statistics Authority

2. Case LGUs

Three (3) local government units within the Province were considered as representative LGUs for the preparation of the I-PREP. These were selected through a selection process that considered the following criteria:

- One LGU per electric power distributor franchise area
- Renewable energy projects under development
- Internal revenue allotment
- Electrification rate
- Current status in hosting RE projects
- Status of municipal solid waste projects

The three (3) representative LGUs are the municipalities of Miag-ao (ILECO 1), Concepcion (ILECO lll) and the City of Passi (ILECO ll). Their general information is summarized below:

Table 5. Number of Barangays, Land Area, Population, and Distance from Iloilo City (2015)

Case LGU	Barangays	Land Area[a] (ha)	Total Population	Number of Households	Distance from Iloilo City (km)
Miag-ao	119	15,680	67,565	14,124	40.5
Concepcion	25	9,327	43,159	10,202	111.4
Passi City	51	25, 139	80,544	19,288	50.0

[a]Data from LGU's respective CLUP

a) Miag-ao

Miag-ao is a first class municipality and is considered as an economic center in the southern part of the Iloilo Province. It is 40 kms southwest of Iloilo City and 58 kms from San Jose, the capital of neighboring Antique Province. It is overlooking the islands of Negros towards the Panay Gulf. Miag-ao's municipal waters have an area of 240 square kilometers and serves as fishing grounds for both local and migratory fishes. Its coastline stretches for 16 kilometers and crosses 22 of its barangays. Its inland waters are composed of five (5) rivers namely, Tumagboc, Oyungan, Bacauan, Naulid and Narat-an.

The power supplier of Miag-ao is the Iloilo Electric Cooperative I (ILECO I), which serves the seven (7) municipalities of southern Iloilo and the province's 2nd district. All 119 barangays of Miag-ao are already energized. There are 13,279 residential, 174 commercial, 148 institutional and 114 classified as other types of connections for Miag-ao as of 2016.

b) Concepcion

The Municipality of Concepcion, a third-class coastal municipality, is located in the northeastern part of Panay Island. It is bound in the north by the Municipality of San Dionisio, in the south by Municipality of Ajuy, in the west by the Municipality of Sara and in the East by the Visayan Sea.

The Municipality of Concepcion has a total land area is 9,327.4 hectares. Its municipal waters has an area of 94,482 hectares, considered among the widest in the country. This rich body of water is abundant with varied marine and aquatic resources. A considerable portion of the municipality includes 17 islands, the farthest being the Baliguian island. All the islands of Concepcion are highland masses except Baliguian which is a Coral Reef.

The major economic drivers of Concepcion are agriculture, fisheries, forestry and protected areas as well as a coal-fired power plant and tourism. Main agricultural crops include rice, corn, coconut, mango, and sugarcane as well as poultry (chicken) and livestock (carabao, cattle, swine and goat). Fisheries is another major industry with a total annual fish production of 10,186 metric tons. Production forests is at 783 has while protected forest lands stands at 1,593 has. Tourism is a growing industry due to the unique geographical attributes of the island barangays and the abundance of natural fauna and floral species.

The power supplier in Concepcion is the Iloilo Electric Cooperative III (ILECO III). Electrification rate is at 72%.

c) Passi City

City of Passi has a total land area of 251.3913 sq km and is composed of 13 urban barangays and 38 rural barangays. Seventeen percent (17.3%) or 43.38 sq kms of the total land area are steep mountain ranges, 76.3% (191.71 sq kms) are rolling hills while 6.4 % (16.3 sq km) are relatively flat land. The existing land use as of 2012 included 76.98% allotted as agricultural zone, 11.13% as forest land zone and 11.89% as residential, commercial, industrial, and other zones.

In 2010, it had a population of 79,663 and an income of PhP396,813,236.39 . The average density of the City of Passi at that time was 317 persons per square kilometer. It was expected to increase to 339 persons per sq km in 2015 and 373 persons per sq km in 2020.

The City of Passi lies in the central portion of Panay Island and is bounded on the South by the Municipality of Dumarao, Southeast by Bingawan, East by Calinog, Northeast by Dueñas, North by San Enrique, West by Lemery and South East by San Rafael. City of Passi can be reached by the International Bank on Reconstruction Development (IBRD) Expressway. It is 50 kms. Away from Iloilo City and 61 kms. to Roxas City, Capiz.

Major rivers found in the city are Jalaur River, Hin-ayan River, Asisig River, Lamunan River and Maliao River. There are also creeks and tributaries that can be used for irrigation purposes. Potable water is served by South Balibago Water Resources, Inc. in the urban areas. Some areas have their own waterworks system for their daily use like in the Barangays. of Agdayao and Quinagaringan. Natural springs and ground water are bountiful in the area of Imbang Grande, Bayan, Sarapan, Sablogon and Jaguimitan.

The City of Passi is being served by Iloilo II Electric Cooperative, Inc. (ILECO II) with an existing Sub-Station. It has a capacity of 10MVA Power Transformer, 69KV/13.8KV supplying the municipality of San Enrique, Dueñas and City of Passi. At present, 100% of all 51 barangays are energized.

Passi City is implementing an electrification program that involves the following:

- Special privilege of a free installation and preparation of electrical plan being given to residents who own structures made of indigenous/light materials;
- Upgrading of existing Single Phase to Three-Phase Primary Lines was done to cater to bigger loads of commercial/industrial establishments and additional distribution lines were constructed in sitios of some barangays in the City.

The average consumption per month of residential consumers is 629,659kW-hr., public buildings is 21,702kWh., streetlights is 137,782kWh., industrial buildings is 316,702kWh. and commercial buildings is 88,171kWh.

Economic Drivers

- The Central Azucarera de San Antonio (CASA) is the newest and modern sugar central in Western Visayas and has the capacity to grind sugarcane of 8,000 tonnes per day (TPD) and produces about 17,000 bags of raw sugar daily. Furthermore, CASA has a 15 MW Biomass power plant which is now operational and has an initial offering of 5 MW of power supply for commercial use and earmarked use under rates lower than the existing power rate in the area sufficient to meet the energy requirements of Passi City and the municipalities of Dueñas and San Enrique.

- The Commercial and Business Establishments constitute areas in the Central Business District, public market (main and annex), commercial strips, commercial complex, and malls. This economic group contributed to a total of more or less PhP9M of revenues coming from different types of businesses and trade in the city. Wholesale and retail trade headed the economic activities seconded by community and personal services, real estate renting and others.

- The Bus Terminal Complex located at Poblacion Ilawod along the national highway caters to passengers going in and out of the city where it traversed from Iloilo to Roxas City, Capiz and Kalibo, Aklan. More or less than PhP 4M revenue has been taken from the parking fees of public utility buses (CIBLA, Ceres, Modesta Liner, RO-RO buses).

- The “AA” Slaughterhouse and Auction Market services not only the local meat buyers but also an exclusive patronage of the giant Monterey Corporation which delivers at least 100 heads of swine and cattle for processing daily.

- The Banking Institution and Other Financial Institutions contribute to boosting up the local economy of the City of Passi. Banks like Land Bank of the Philippines, Philippine National Bank, Robinsons Bank, Rural Bank of San Enrique, Card Bank and some lending institution like Taytay sa Kauswagan and several pawnshops contribute to the economic growth of the City of Passi.

B. Ecological and Environment Profile

> "*A progressive, peaceful, ecologically-balanced, resilient, safe environment and habitation and vibrant Iloilo with sustainable agri-aqua, forest-based and tourism enterprises having adequate access to information, education, technology and other entrepreneurial opportunities, where men and women equitably share the benefits of development*."
>
> --Iloilo Province's development vision

1. Climate and associated hazards

The climate of the Province of Iloilo consists of two pronounced seasons: dry season from January to April and wet season during the rest of the year. Rainfall and number of rainy days is highest during the month of August and lowest on February to March. The annual rainfall for 2017 is 2,197.9 mm. The average temperature[4] is 27.8 degrees Celsius. Furthermore, a total of 154 days, or half of the year, of rain was recorded in 2010.

The benefits of the local climate and rainfall patterns include fertile land for agriculture. However, the province of Iloilo has identified flooding, rain induced landslides and storm surges as climate hazards that need to be mitigated.

In addition, other hazards such as ground shaking, earthquake induced landslide, tsunami and liquefaction also need to be mitigated as there are various earthquake generators that are present in the Province (i.e. West Panay Fault, Tablas Fault, Negros Trench, Central Negros Fault and Masbate Fault).

2. Environmental Impacts due to Economic Activities

The economy of Iloilo Province is anchored on two major sectors, agriculture, and services. Agriculture provides most of the employment while the services sector provides the critical support to agriculture.

Agriculture is extremely vulnerable to climate change. Potential effects include the following:

- Higher temperature may reduce yields of crops.
- Changes in precipitation patterns may increase the likelihood of short- run crops failures and long run production declines.
- Agricultural wastes (such as crop residues) when not managed properly may contribute to increased greenhouse gas emissions which further exacerbates climate change.

[4] As measured for the City of Iloilo

Furthermore, economic growth within Iloilo City and the adjacent municipalities are continuing at an increasing rate. Iloilo City, the capital of the province is considered as the center of regional governance, commercial, financial and educational hub in Panay.

Growth in the other parts of the province especially in the southern, central and north eastern portions is also happening fast. In the south, Miag-ao's growth is anchored on the presence of the University of the Philippines in the Visayas. In the central part, Passi City is the core growth area because of the presence of major service and industry facilities such as the sugar mills, and commercial trade facilities. The economy of Dumangas is steered by its agriculture and aquaculture industry, with plans for expanding its port. In the northeastern part of the province, the municipalities of Sara and Estancia are the two leading commercial and trade areas. Sara is the convergence of the municipalities of Ajuy, Lemery, Concepcion and San Dionisio and promotes its role as the trading and commercial area while the growth of Estancia is steered by its fishing industry.

Economic growth may lead to increased greenhouse gas emissions and other environmental related problems such as waste management, land use and food security if sustainable measures are not put in place. In the absence of emissions data for the province, Iloilo City's gross greenhouse gas emissions can provide an example. In 2012 alone Iloilo City's emissions amounted to 1,007,987 tCO_2e which was attributed to fuel use in transportation and electricity; and solid waste management.

Economic growth is also directly related to solid waste management. Iloilo Province's generated waste per capita is 0.38 kg per day or 735 tons of wastes per day, 56% of which is biodegradable.

II. Power Supply and Demand Situation and Outlook

A. Power Supply Profile

1. Power Distribution

Electricity supply in the whole province, excluding Iloilo City, is under three electric cooperatives (ECs), namely Iloilo Electric Cooperative (ILECO) I, ILECO II and ILECO III. ILECO I's franchise covers 794 barangays in 15 municipalities in the southwestern part of the province. ILECO II's franchise includes 587 barangays in 15 municipalities in the central part of the province, and ILECO III's franchise encompasses 340 barangays in the remaining 13 municipalities in the northeastern part of the province, including 31 off-grid barangays or barangays not connected to the main distribution network of ILECO III.

The following table provides a summary of the 2018 power status of the Province.

Table 6. Iloilo Province Status of Electricity Services

Item	ILECO I	ILECO II	ILECO III
Municipalities Covered	15	14 Municipalities and 1 City	13
Potential Consumers	163,500	157,100	120,200
Total Membership	160,421	131,335	89,304
Houses Connected	159,835	132,105	96,420
No. of Barangays	794	587	340
% Barangay Electrification	100%	100%	100%
No. of Sitios	1,958	2,603	1,679
% Sitio Electrification	92%	93%	87%

Source: 2019 Province of Iloilo Annual Provincial Profile, National Electrification Administration (NEA) Status of Electrification as of September 2019

The figures below show the franchise areas of the three electric cooperatives.

Figure 3. Franchise Areas of ILECO I, ILECO II, and ILECO III

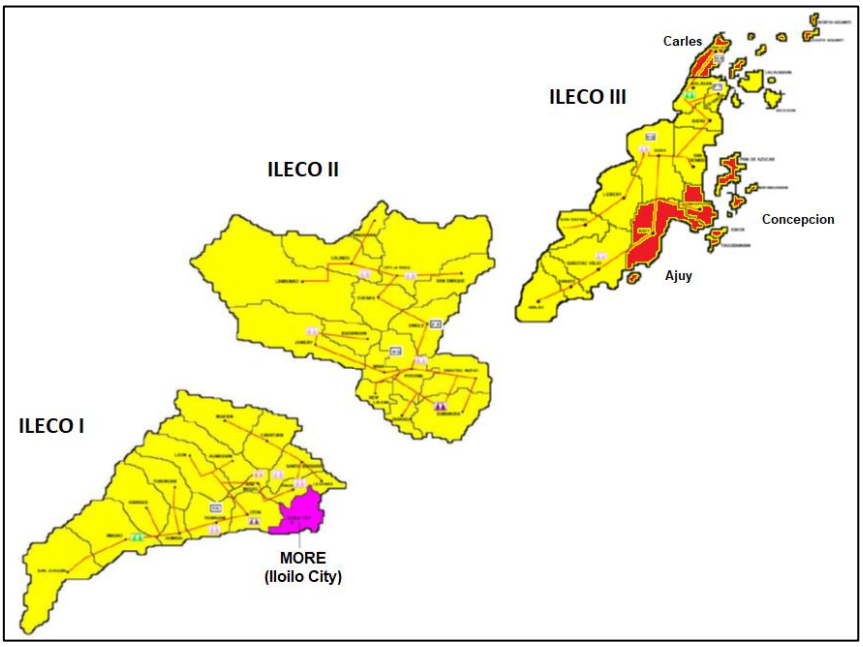
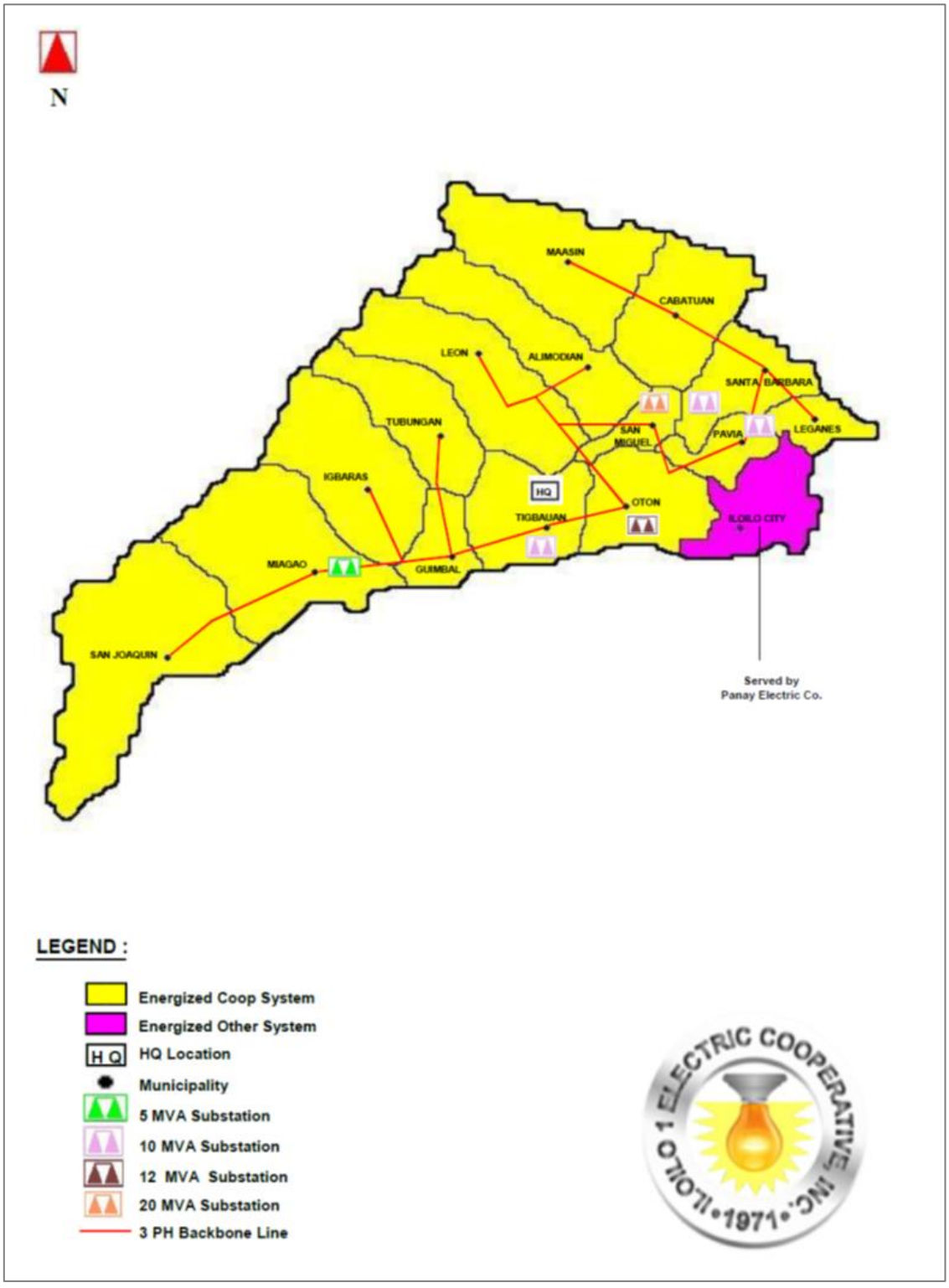
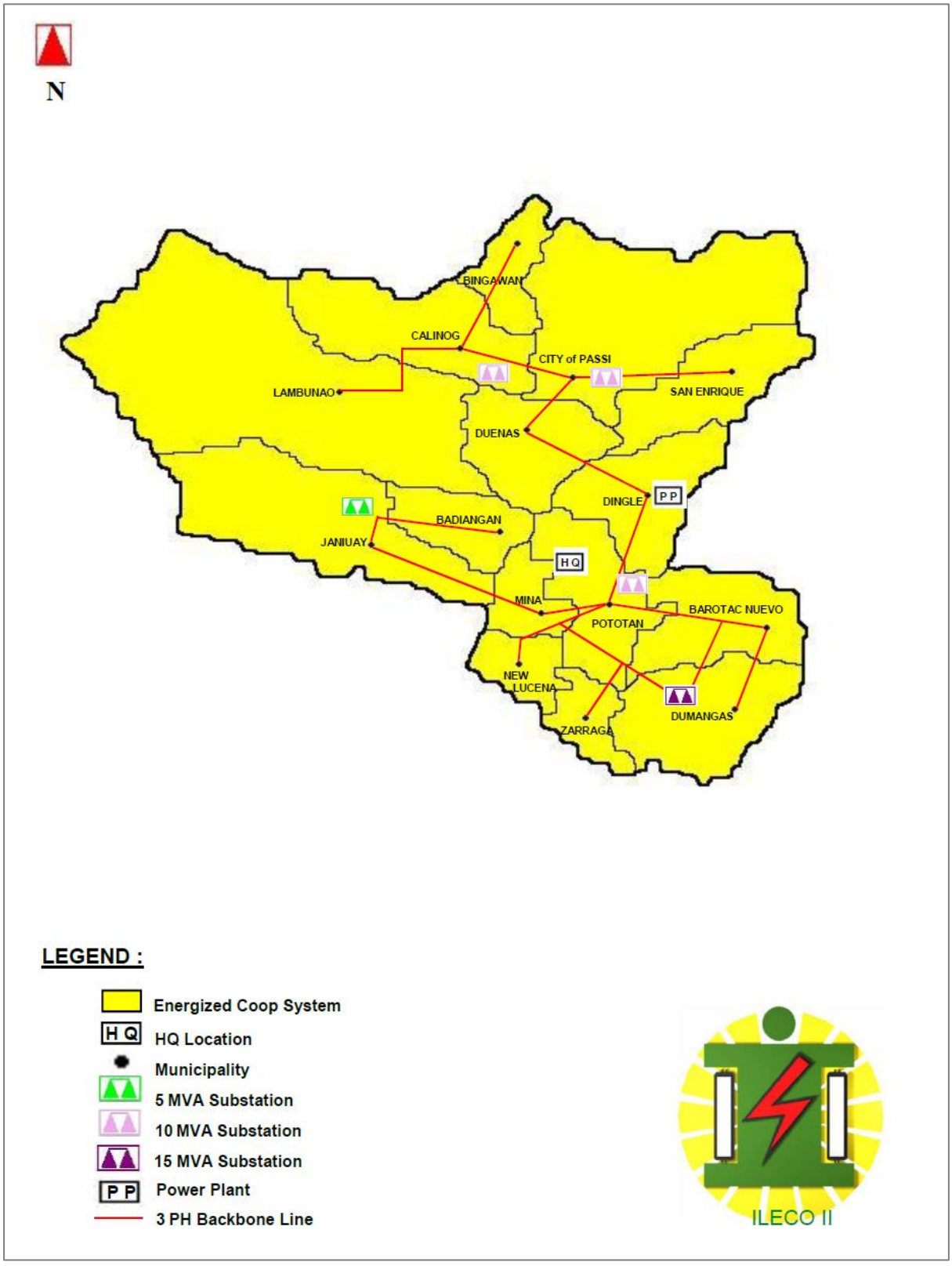


Figure 4. Franchise Area of ILECO I



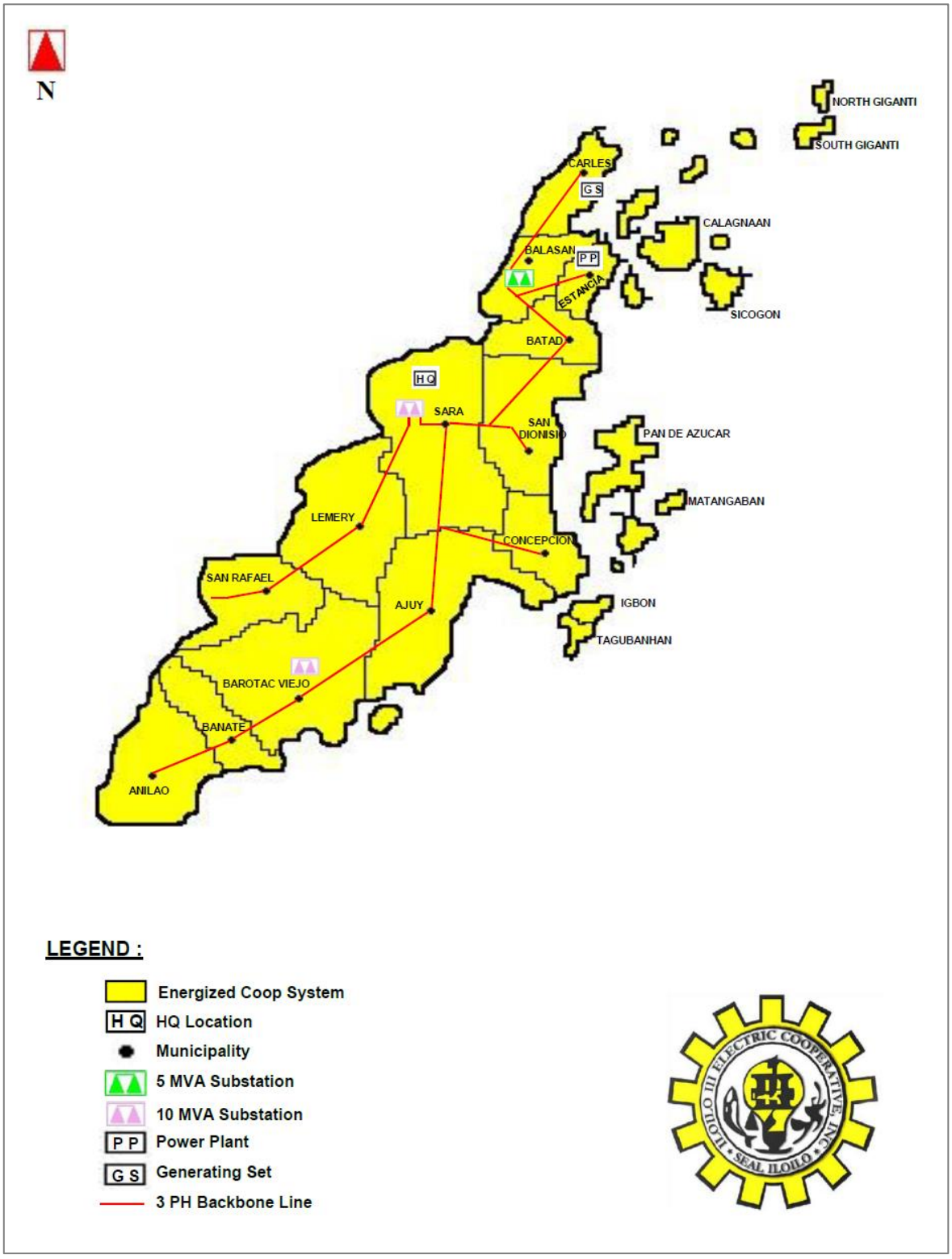
Source: NEA Rural Electrification Chronicle 2014-2016, p. 137.

Figure 5. Franchise Area of ILECO II



Source: NEA Rural Electrification Chronicle 2014-2016, p. 139.

Figure 6. Franchise Area of ILECO III



Source: NEA Rural Electrification Chronicle 2014-2016, p. 141.

2. Panay Grid and Luzon-Visayas Interconnection

The Province of Iloilo is part of the Panay Island Grid that is interconnected to the other major Visayas island grids as well as the distribution network of the island province of Guimaras and the Luzon and Mindanao Grids through the Cebu-Negros-Panay HV transmission network. The 18-km 138 kV Negros-Panay Interconnection was energized in 1990 with a rated capacity of 85 MW. In 2017, additional 230 kV designed submarine cable was installed between Negros and Panay.

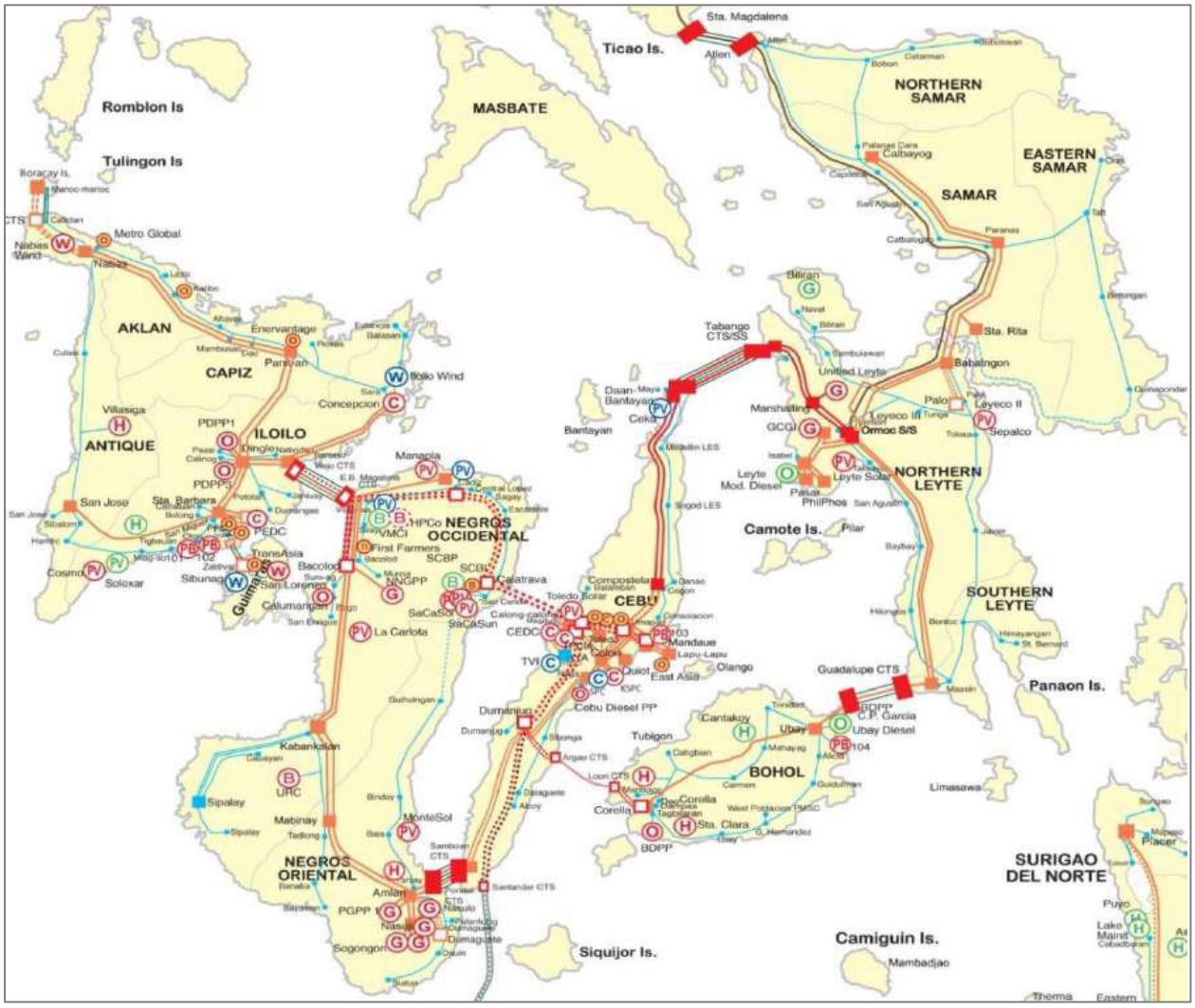
Figure 7. Negros-Panay and Cebu-Negros Transmission Interconnection

Source: NGCP 2020. *Transmission Development Plan 2020-2040: Volume 1 Major Network Development (Consultation Draft),*, p. 21.

The Visayas Grid or transmission system is divided into five different sub-systems or sub-grids: Panay, Negros, Cebu, Bohol, and Leyte-Samar. The sub-grids have existing AC interconnections with effective transfer capacity as of December 2018 as follows: Leyte-Cebu (2x200 MW), Cebu-Negros (2x90 MW), Negros-Panay (1x180 MW) and Leyte-Bohol (1x90 MW). These submarine cables provide the capability of sharing excess generation between islands to accommodate the Visayas region growing demand. The transmission backbone of the Visayas Grid extends from Allen Cable Terminal Station in Samar, all the way to Nabas Substation in Panay. This power delivery system comprises approximately 895 kilometers of transmission lines.[5]

[5] NGCP 2020, p. 18.

Figure 8. Visayas Grid



Source: NGCP 2020., p. 18.

3. Power Generation Sources

Panay Island hosts a couple of large coal power plants, several diesel power plants, and few on-grid renewable energy plants. In fact, most of these power plants are located in the Province of Iloilo. The installed and dependable capacities of these power plants in the Panay Island were respectively 729.1 MW and 671.0 MW as of June 2019, and accounted for about 20% of the total capacities in the Visayas Grid. Panay has become less reliant on power import from other islands via the 138 kV Negros-Panay Interconnection System and instead most of the time exports power to the rest of Visayas Grid through this interconnection.[6] Panay Island is also interconnected to the island province of Guimaras through a submarine cable and transfers the power to the rest of the region from the 54-MW wind farm in the municipality of San Lorenzo. There had been plans to develop more wind farms in Guimaras, including another one in San Lorenzo, to utilize the wind energy potential of the island for utilization by the rest of the Visayas region and in fact the interconnected Luzon-Visayas-Mindanao grids.

[6] NGCP 2020, p. 18.

Table 7. Power Plants in Iloilo and Panay Island (as of June 2019)

Power Plant	Technology	Installed Capacity (MW)	Dependable Capacity (MW)	Location	Commissioning Dates
PEDC U1, U2, U3	CFPP	83.7/83.7/150	83.7/83.7/150	Iloilo City	Nov 2010/Apr 2011/Dec 2016
PCPC U1	CFPP	135	135	Concepcion, Iloilo	Aug 2016
Avon-Nabas	DPP	7.5	6.8	Nabas, Aklan	Aug 2006
Avon-New Washington	DPP	5.0	4.5	New Washington, Aklan	Sep 2006
Panay DPP1	DPP	35.5	15.0	Dingle, Iloilo	1981-1983
Panay DPP2	DPP	106.6	62.0	Dingle, Iloilo	Mar 2005
PPC	DPP	94.9	78.8	Ingore, La Paz, Iloilo	Aug 1998
PB 101	DPP	32.0	24.0	Iloilo	1978/86/89
PB 102	DPP	32.0	24.0	Obrero, Iloilo	Apr 1981
PB 103	DPP	32.0	-	Estancia, Iloilo	Apr 1981
Villasiga HEPP	Small Hydropower	8.1	8.0	Bongasing, Antique	Apr 2016
CASA	Biomass	15.0	12.0	Passi, Iloilo	Nov 2010
Cosmo Solar	Solar	5.7	5.0	Miagao	Sep 2016
Nabas Wind Ph1	Wind	36.0	36.0	Nabas, Aklan	Jun 2015
		729.1	**671.0**		

Source: DOE

Some RE net-metering systems are operating in Iloilo Province. The RE net-metering scheme allows end-users to operate RE systems up to 100kW (usually solar PV rooftop) and export their surplus generation to the grid. Electric cooperatives facilitate the implementation of net-metering. The next table shows the number of net-metering systems in each of the EC's franchise areas.

Table 8. Solar PV Net-Metering Systems in the Province of Iloilo, as of Dec 2019

Franchise Area	Number of Qualified End-Users	Rated Capacity (kWp)
ILECO I	13	36.2760
ILECO II	11	66.0000
ILECO III	2	3.6200

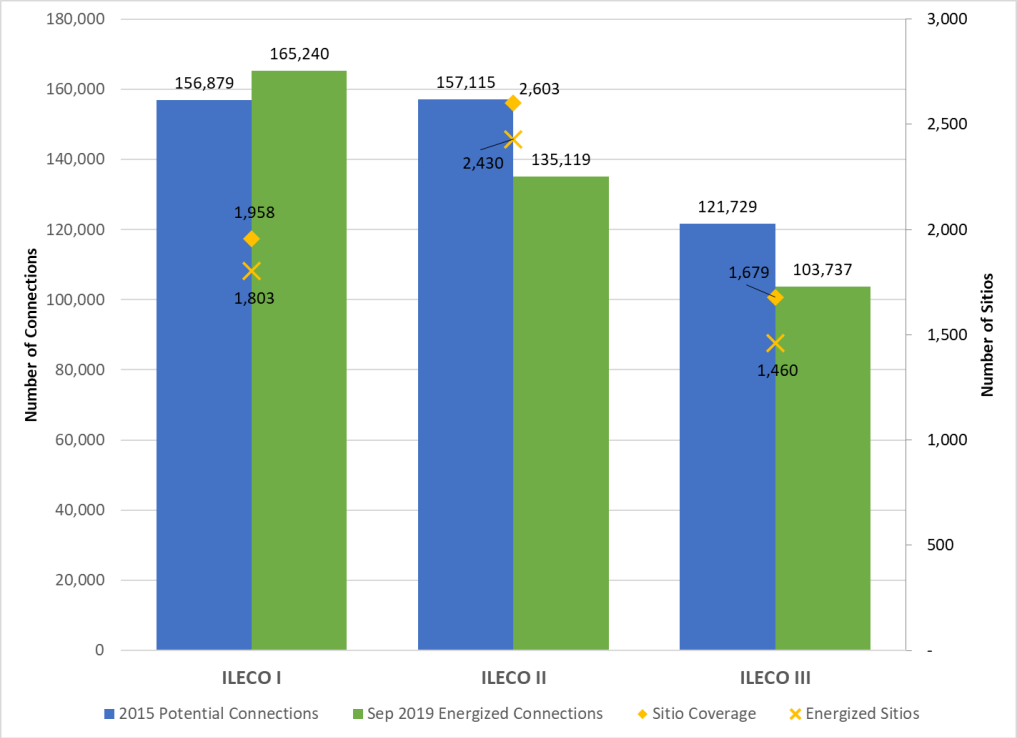
Source: DOE

B. Electricity Access and Consumption

Including only the franchise areas of the three electric cooperatives and excluding Iloilo City, which is served by a private utility, all the 1,721 barangays under the three ECs are considered energized. However, at the sitio level, 547 sitios remain unenergized, while more than 43,000 potential connections (practically all of which are households) as of September 2019 and based on 2015 population census remain without access to grid or off-grid electricity. Existing connections is equivalent to total electricity access of around 93%.

More than 22,000 (51%) of the total unenergized connections are in the franchise area of ILECO II, more than 18,000 (42%) in ILECO III, while around 3,000 (7%) in ILECO I.[7]

Figure 9. The Province of Iloilo's Electrification Levels



Note: The differences between 2019 energization status and 2015 potential connections do not take into account the growth in total potential connections during this period. Thus, in terms of total energization status, it would appear for example that ILECO I has more than 100% electrification rate. However, despite more than 100% reported electrification, there remains about 3,000 unserved connections, which is discussed in greater detail in the succeeding section (ILECO I Franchise Area, Table 11).
Source of basic data: NEA, http://www.nea.gov.ph/ao39/downloads/category/184-reference-for-the-preparation-of-the-total-electrification-masterplan-2015-census-without-growth-rates.

The succeeding tables show the energy demand and the comparative power rates among them.

Table 9. Number of Consumers by Type of Service, 2018

	ILECO I	ILECO II	ILECO III
Residential	133,005	91,506	47,950
Commercial	2,597	3,539	1,770(LV) ; 6(HV)
Public Bldgs./City Offices	1,407	1,146	657
Street Lights	540	316	78
Industrial	254	91	28(LV) ; 12(HV)
BAPA	-	22,359	31,203
SPUG (Isla Gigantes)	-	-	1,945

Source: 2019 Province of Iloilo Annual Provincial Profile

Table 10. Power Rates, 2018

[7] These are all the sum of the unenergized connections as of Sep 2019 based on 2015 census in each electric cooperative (as against the difference between total 2015 potential connections and 2019 energized connections).

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
ILECO I			
Ave Rate per kWh	11.6974	10.3032	9.2464
Fix Charge (added to the bill as of January 2017)			
Per Meter	5.0000	35.9400	35.9400
Per Connection		42.9200	42.9200
Per kW	-	-	0.0000(DL) 219.6800(DH)
ILECO II			
Ave Rate per kWh	10.9386	9.9306	9.9817
Fix Charge	5.6	89.7524	96.8135
ILECO III			
Ave Rate per kWh	9.8082 (SPUG) 8.0132	8.6089 (LV) 7.5716 (HV)	8.6089 (LV) 7.5716 (HV)
Fix Charge	5.00	72.8000	72.8000

kWh = kilowatt hour, LV = low voltage, HV = high voltage
Source: 2019 Province of Iloilo Annual Provincial Profile

Residential customers account for largest electricity sales in terms of both number and consumption (in MWh) (Figure 10 and Figure 11).

Figure 10. Distribution of the types of electricity customers in the Province of Iloilo (2017)

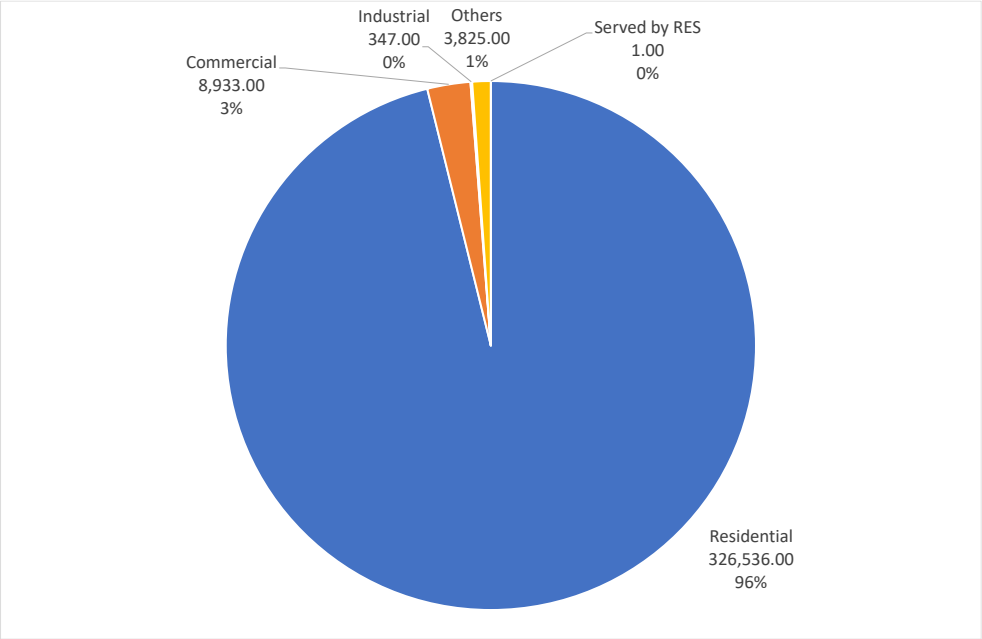
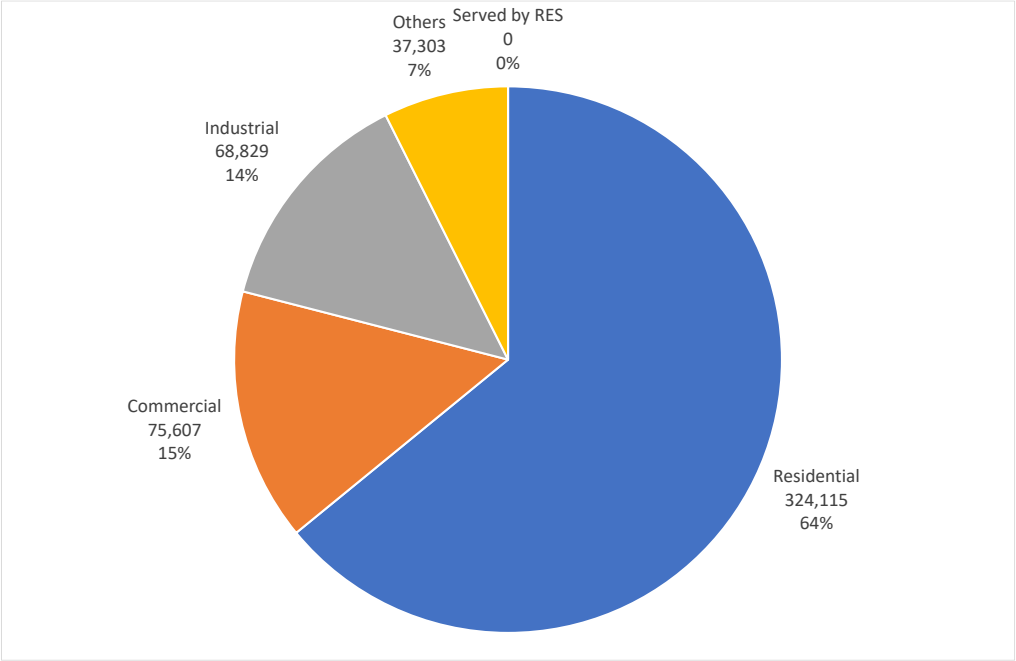
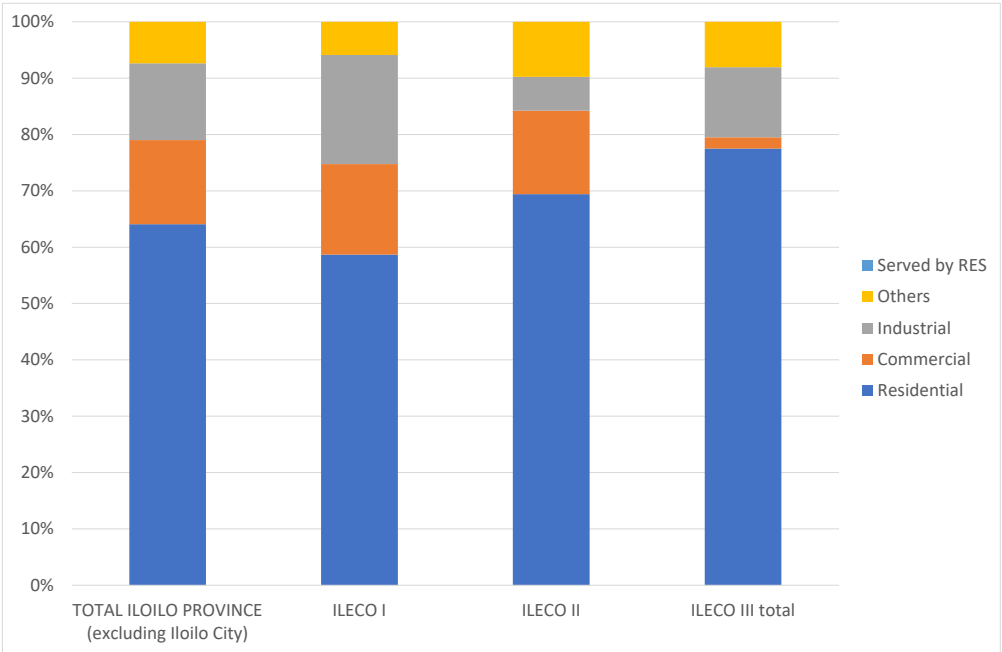


Figure 11. Distribution of electricity consumption by sector in the Province of Iloilo (MWh) (2017)



But there is some variability in terms of kWh sales, with ILECO III dominated by residential and industrial customers, ILECO II by residential and commercial customers, and ILECO I having significant shares from commercial and industrial customers.

Figure 12. Comparison of electricity consumption by end-user types in the three EC franchise areas and in the Province of Iloilo (MWh) (2017)



1. ILECO I Franchise Area

With respect to the potential connections based on 2015 census, ILECO I has achieved 100% electrification. However, a closer look at the status of electrification at the municipality level, more than 3,000 potential connections in five municipalities remain unserved. But this represents only 2% of the total potential connections based on 2015 census.

Table 11. ILECO I Status of Energization (2019)

STATUS OF ENERGIZATION
ILECO I

MUNICIPALITIES/CITY		Date of Energization	BARANGAYS				SITIOS				CONNECTIONS			
			Coverage	Energized/Completed		Unenergized	Coverage	Energized/Completed		Unenergized	Potential 2015 Census	Served		
Legislative District				Todate	%			Todate	%			As of Dec 2018	As of Sep 2019*	%
First District														
1	Guimbal		33	33	100	0	103	101	98	2	7,470	7,606	7,742	104
2	Igbaras		46	46	100	0	134	127	95	7	7,022	6,545	6,649	95
3	Miagao		119	119	100	0	124	117	94	7	14,124	14,061	14,283	101
4	Oton		37	37	100	0	136	122	90	14	20,460	21,099	21,843	107
5	San Joaquin		85	85	100	0	161	154	96	7	11,163	9,401	9,580	86
6	Tigbauan		52	52	100	0	149	134	90	15	13,359	13,678	14,006	105
7	Tubungan		48	48	100	0	187	166	89	21	4,848	4,397	4,504	93
Second District														
8	Alimodian		51	51	100	0	126	117	93	9	8,067	7,946	8,168	101
9	Leganes		18	18	100	0	76	71	93	5	7,033	6,582	6,780	96
10	Leon		85	85	100	0	185	166	90	19	10,755	10,817	11,027	103
11	Pavia		18	18	100	0	79	78	99	1	12,825	19,696	21,299	166
12	San Miguel		24	24	100	0	88	86	98	2	6,046	5,740	5,888	97
13	Santa Barbara		60	60	100	0	142	129	91	13	13,608	13,456	14,053	103
Third District														
14	Cabatuan		68	68	100	0	159	138	87	21	12,715	12,215	12,565	99
15	Maasin		50	50	100	0	109	97	89	12	7,384	6,596	6,853	93
Total			**794**	**794**	**100**	**0**	**1,958**	**1,803**	**92**	**155**	**156,879**	**159,835**	**165,240**	**105**

Source: NEA, http://www.nea.gov.ph/ao39/downloads/category/184-reference-for-the-preparation-of-the-total-electrification-masterplan-2015-census-without-growth-rates.

Peak demand in the ILECO I franchise area reached 51 MW in 2017 and projected to increase by 3.89% per annum to 75 MW by 2027. Residential customers represent the largest portion of this demand, accounting for 96% of the total number of customers and close to 60% of total electricity sales. The commercial and industrial sectors account for 16% and 19%, respectively, of total electricity sales.

2. ILECO II Franchise Area

In the franchise area of ILECO II, more than 22,000 connections based on 2015 census remain unserved, representing more than 14% of the 2015 potential connections. Only three municipalities in ILECO II have achieved 100% electrification, while the remaining 12 municipalities have electrification levels between 70% and 95%.

Table 12. ILECO II Status of Energization (2019)

STATUS OF ENERGIZATION
ILECO II

MUNICIPALITIES/CITY		Date of Energization	BARANGAYS				SITIOS				CONNECTIONS			
			Coverage	Energized/Completed		Unenergized	Coverage	Energized/Completed		Unenergized	Potential 2015 Census	Served		
Legislative District				Todate	%			Todate	%			As of Dec 2018	As of Sep 2019*	%
Second District														
1	New Lucena		21	21	100	0	97	86	89	11	5,006	5,054	5,144	103
2	Zarraga		24	24	100	0	62	58	94	4	5,853	5,583	5,695	97
Third District														
3	Badiangan		31	31	100	0	169	165	98	4	5,897	5,159	5,247	89
4	Bingawan		14	14	100	0	86	83	97	3	3,467	2,851	2,895	84
5	Calinog		59	59	100	0	195	178	91	17	13,155	9,475	9,662	73
6	Janiuay		60	60	100	0	211	178	84	33	13,865	11,159	11,454	83
7	Lambunao		73	73	100	0	404	371	92	33	15,934	12,757	13,128	82
8	Mina		22	22	100	0	110	109	99	1	4,992	4,432	4,501	90
9	Pototan		50	50	100	0	157	143	91	14	16,000	15,973	16,263	102
Fourth District														
10	Barotac Nuevo		29	29	100	0	177	175	99	2	11,991	11,036	11,233	94
11	Dingle		33	33	100	0	180	162	90	18	10,414	8,486	8,659	83
12	Dueñas		47	47	100	0	188	178	95	10	7,822	6,778	6,902	88
13	Dumangas		45	45	100	0	222	211	95	11	15,793	13,372	13,877	88
14	City of Passi		51	51	100	0	222	216	97	6	19,288	14,034	14,397	75
15	San Enrique		28	28	100	0	123	117	95	6	7,638	5,956	6,062	79
Total			**587**	**587**	**100**	**0**	**2,603**	**2,430**	**93**	**173**	**157,115**	**132,105**	**135,119**	**86**

Source: NEA, http://www.nea.gov.ph/ao39/downloads/category/184-reference-for-the-preparation-of-the-total-electrification-masterplan-2015-census-without-growth-rates.

Electricity peak demand in ILECO II is projected to increase from 32.23 MW in 2017 to 43.52 MW in 2027, or by 3% per year during this period. Residential customers accounted for 95% share in number and 69% share in electricity sales in 2017. The commercial sector accounted for 15% of electricity sales.

3. ILECO III Franchise Area

In ILECO III franchise area, only two municipalities have achieved 100% electrification. The rest of the 11 municipalities including 31 off-grid barangays, are home to more than 18,000 connections that remain unserved. These represent 15% of the 2015 census potential connections. And the electrification levels of these 11 municipalities are between 70% and 90%.

Table 13. ILECO III Status of Energization (2019)

STATUS OF ENERGIZATION
ILECO III

MUNICIPALITIES/CITY		Date of Energization	BARANGAYS				SITIOS				CONNECTIONS			
			Coverage	Energized/Completed		Unenergized	Coverage	Energized/Completed		Unenergized	Potential 2015 Census	Served		
Legislative District				Todate	%			Todate	%			As of Dec 2018	As of Sep 2019*	%
Fourth District														
1	Anilao		21	21	100	0	147	121	82	26	6,561	4,830	5,013	76
2	Banate		18	18	100	0	72	64	89	8	7,993	6,399	6,715	84
Fifth District														
3	Ajuy		34	34	100	0	184	173	94	11	12,221	11,584	12,524	102
4	Balasan		23	23	100	0	64	54	84	10	8,090	5,943	6,136	76
5	Barotac Viejo		26	26	100	0	119	111	93	8	11,091	9,126	9,628	87
6	Batad		24	24	100	0	44	40	91	4	5,154	4,078	4,168	81
7	Carles		33	33	100	0	137	113	82	24	15,278	9,532	11,172	73
8	Concepcion		25	25	100	0	124	88	71	36	10,202	6,458	7,321	72
9	Estancia		25	25	100	0	28	24	86	4	11,204	10,210	11,175	100
10	Lemery		31	31	100	0	219	184	84	35	7,839	6,337	6,655	85
11	San Dionisio		29	29	100	0	219	201	92	18	9,013	7,100	7,678	85
12	San Rafael		9	9	100	0	64	58	91	6	3,837	3,341	3,496	91
13	Sara		42	42	100	0	258	229	89	29	13,246	11,482	12,056	91
Total			**340**	**340**	**100**	**0**	**1,679**	**1,460**	**87**	**219**	**121,729**	**96,420**	**103,737**	**85**

Source: NEA, http://www.nea.gov.ph/ao39/downloads/category/184-reference-for-the-preparation-of-the-total-electrification-masterplan-2015-census-without-growth-rates.

Peak demand in the ILECO III franchise area would increase from 20 MW in 2017 to 34 MW in 2027, or by 5.53% per year during this period. Residential customers accounted for 97% of the total number of customers and 69% of total electricity sales, followed by commercial customers at 12%.

C. Power Sector Plans, Programs and Projects

1. Generation (Power Development) Plan

Few of the committed and indicative power generation projects will be hosted by the Province of Iloilo. The only two committed projects account for close to 30% of the total committed capacity in the Visayas Grid. On the other hand, the five identified indicative power projects in the province, all of them renewable energy projects, account for about 20% of the total indicative projects (excluding BESS). BESS projects total 443.5 MW in the Visayas Grid, but none has been identified in Iloilo.

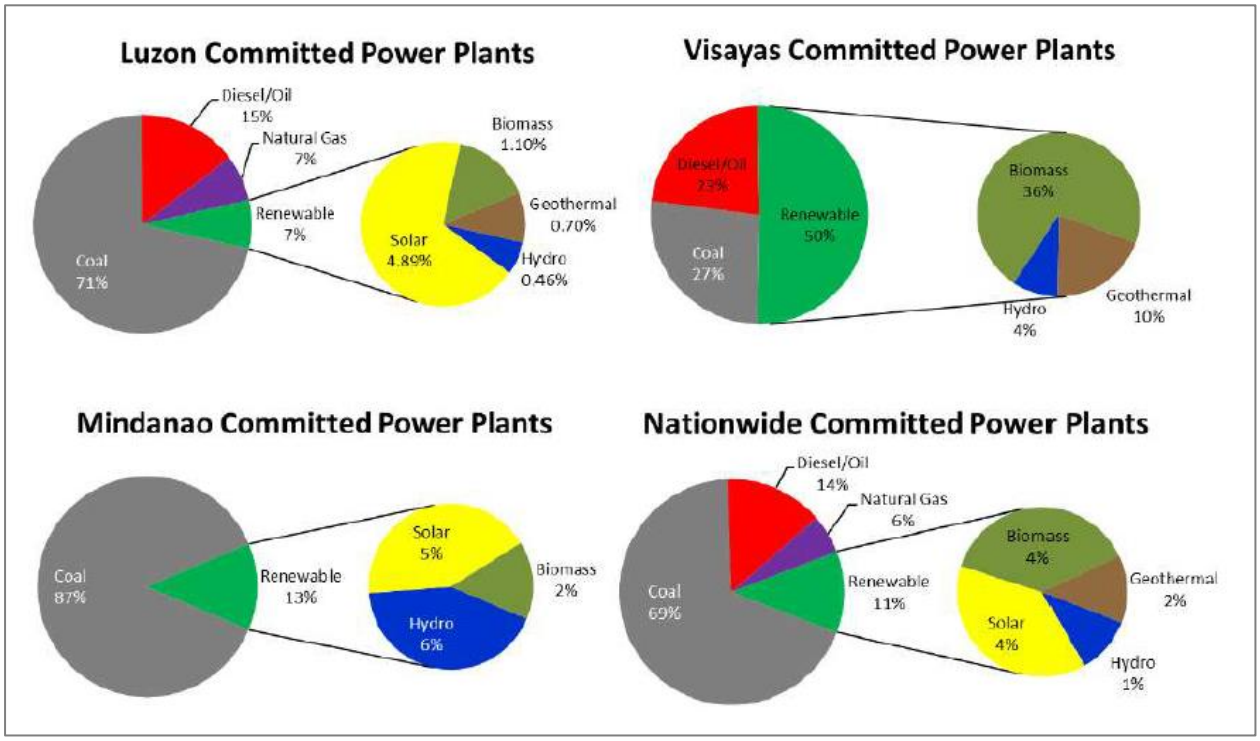
Table 14. Power Plants hosted by Iloilo Province

Projects	Technology	Capacity (MW)	Location	Commissioning Date
Committed				
1. Palm Concepcion CFPP	Coal	135	Brgy Nipa, Concepcion	Dec 2021
2. Igbulo (Bais) HEPP	Hydro	5.1	Igbaras	Nov 2019
TOTAL		**140.1**		
Indicative				
3. Tigbauan Solar	Solar	34.3	Brgy. Cordova Norte and Bantud	TBD
4. Gaisano Iloilo Solar	Solar	1.03	Iloilo City	TBD
5. Iloilo I Wind Power Project	Wind	213	Batad and San Dionisio	Jul 2020
6. Iloilo 2 Wind Power Project	Wind	500	Concepcion	TBD
7. GPPPI Biomass	Biomass	17.5	Mina	Nov 2022
TOTAL		**765.83**		

Source of basic data: NGCP 2020, pp. 37-40.

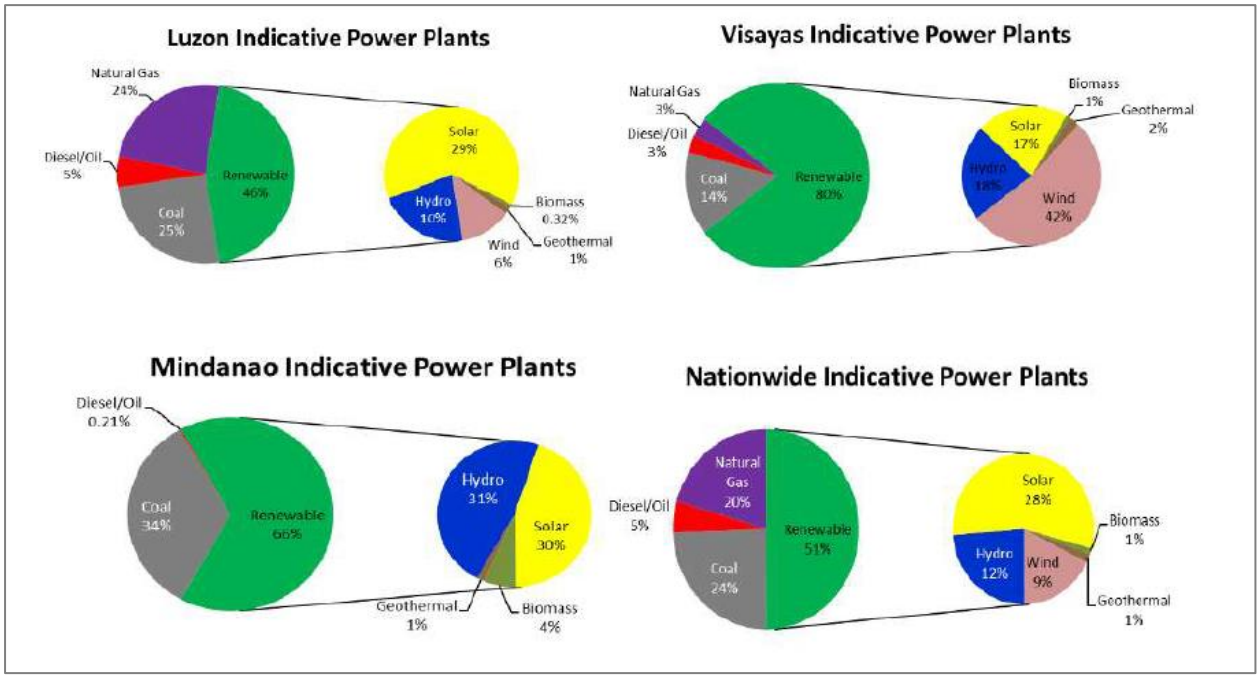
Indeed, the Visayas Grid has the largest share of committed and indicative RE projects, and Iloilo is contributing significantly to this growth in RE capacity.

Figure 13. Share of RE in Committed Power Projects



Source: NGCP 2020, p.46.

Figure 14. Share of RE in Indicative Power Projects

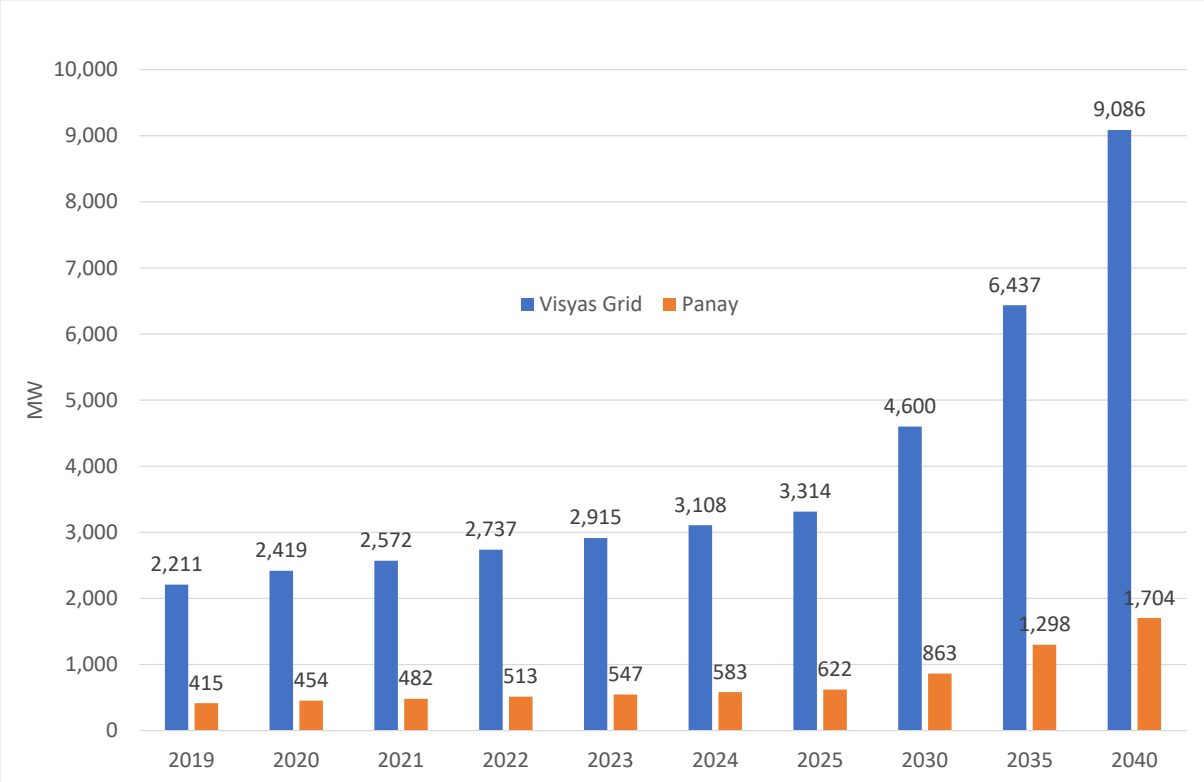


Source: NGCP 2020, p. 46.

2. Transmission Development Plan

The Panay sub-grid accounts for less than 20% of the demand of the whole Visayas Grid, and its demand is projected to grow at the same rate as the Visayas Grid, at an average of 7% per year or quadruple from 415 MW in 2019 to 1,704 MW in 2040.

Figure 15. Projected increase in power generation capacities in the Visayas Grid and the Panay sub-grid (MW), 2019-2040



Source of basic data: NGCP 2020, p. 26.

To accommodate this projected increase in transmission capacity, the NGCP has programmed or planned the following transmission projects shown in the table below.

Table 15. Planned Transmission Projects involving the Panay sub-grid through 2040

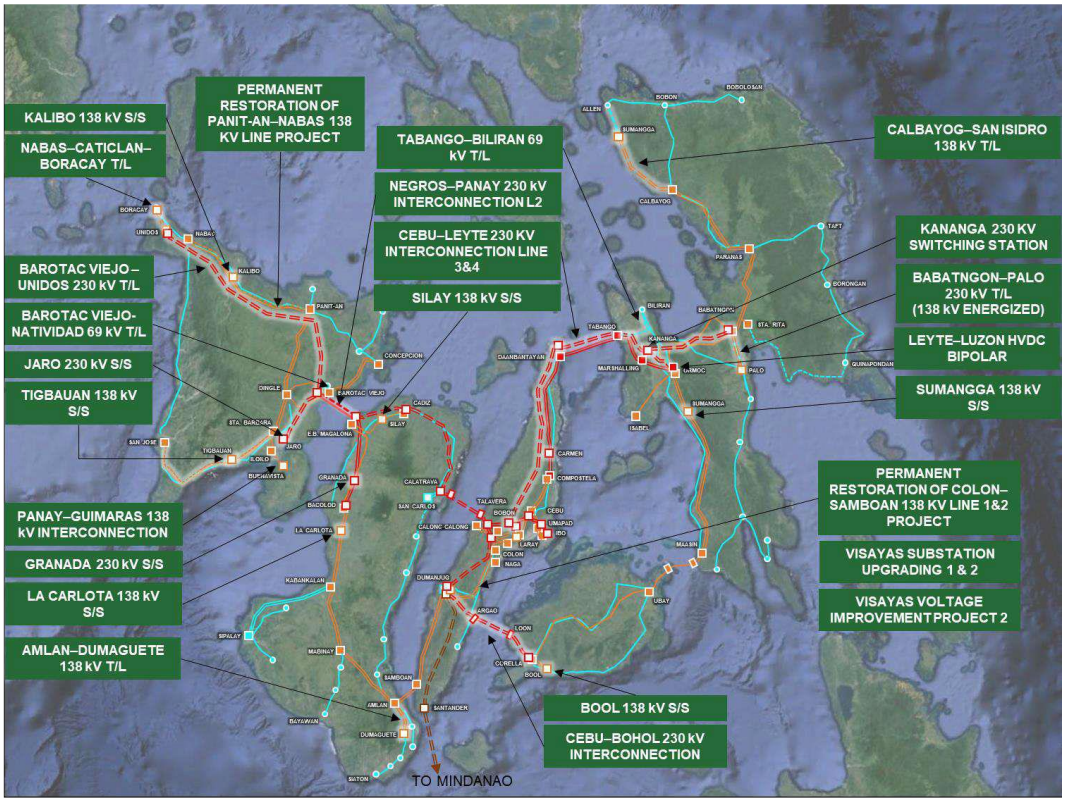
Project name	Components	Bulk Cost Estimate (million Php)	Commissioning Date
Panay – Guimaras 138 kV Interconnection Project	Substation and transmission	2,419	Nov 2021
Negros – Panay 230 kV Interconnection Line 2 Project	Substation and submarine cable	8,342	Feb 2022
Barotac Viejo–Unidos 230 kV Transmission Line Project	Substation and transmission	10,389	Dec 2024
Nabas–Caticlan–Boracay Transmission Line Project	Submarine cable, substation and transmission	8,519	May 2021

Project name	Components	Bulk Cost Estimate (million Php)	Commissioning Date
Kalibo 138 kV Substation Project	Substation and transmission	1,087	Dec 2024
Tigbauan 138 kV Substation Project	Substation and transmission	1,384	Dec 2023
Jaro 230 kV Substation Project	Substation and transmission	4,257	Jun 2025
Visayas Voltage Improvement Project 2	Substation	638	Dec 2022
Barotac Viejo–Natividad 69 kV Transmission Line Project	Substation and transmission	58	Jul 2022
Visayas Substation Upgrading Project 2	Substation	10,662	Jul 2022
Permanent Restoration of Panitan–Nabas 138 kV Line affected by Typhoon Ursula	Transmission		Dec 2020
Panay–Guimaras 138 kV Interconnection Line 2 Project	Submarine cable		Dec 2026
Visayas Substation Upgrading Project 3	Substation		Dec 2027
Visayas Substation Upgrading Project 4	Substation		Dec 2031
San Jose–Nabas 138 kV Transmission Line Project	Substation and transmission		Dec 2033
Visayas Substation Upgrading Project 5	substation		Dec 2036

Source of basic data: NGCP 2020, pp. 149-175.

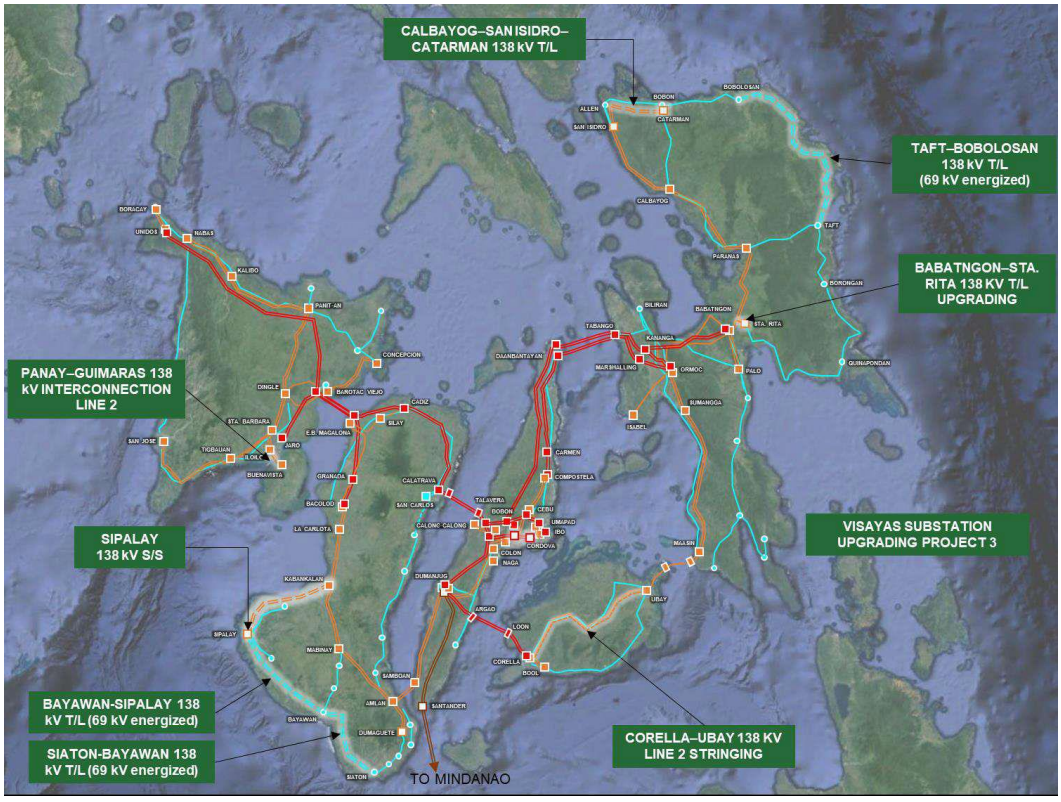
These projects are depicted in the figures below together with the other major grids.

Figure 16. Transmission Outlook 2025



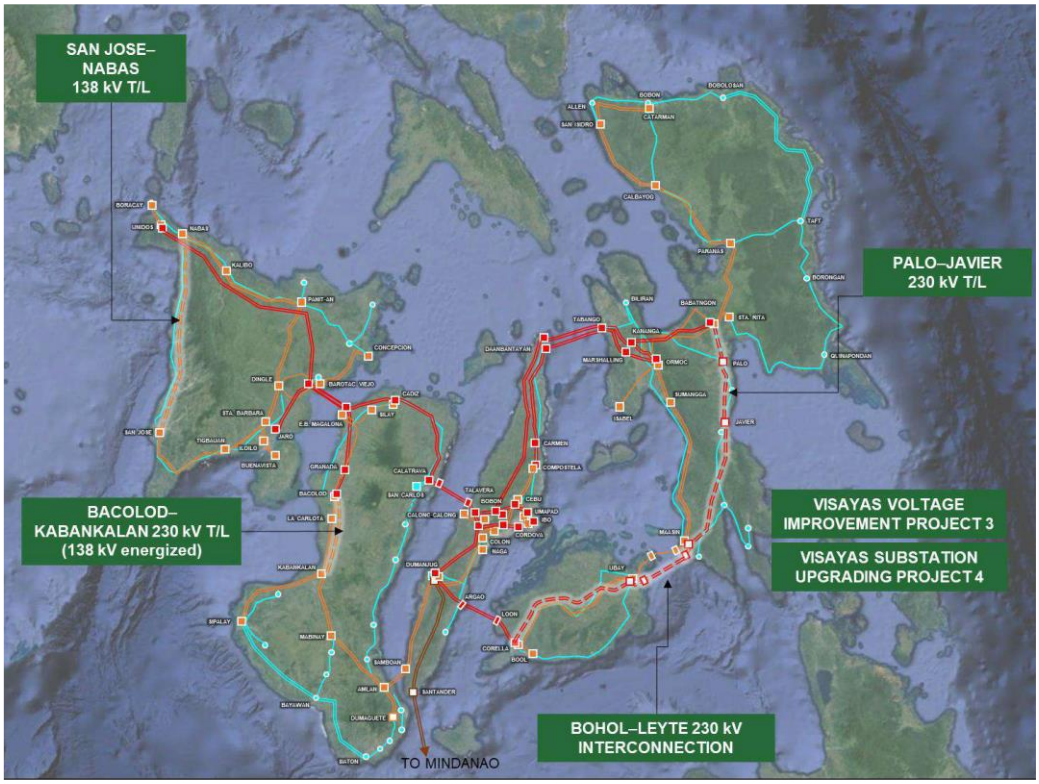
Source: NGCP 2020, p. 157.

Figure 17. Transmission Outlook 2030



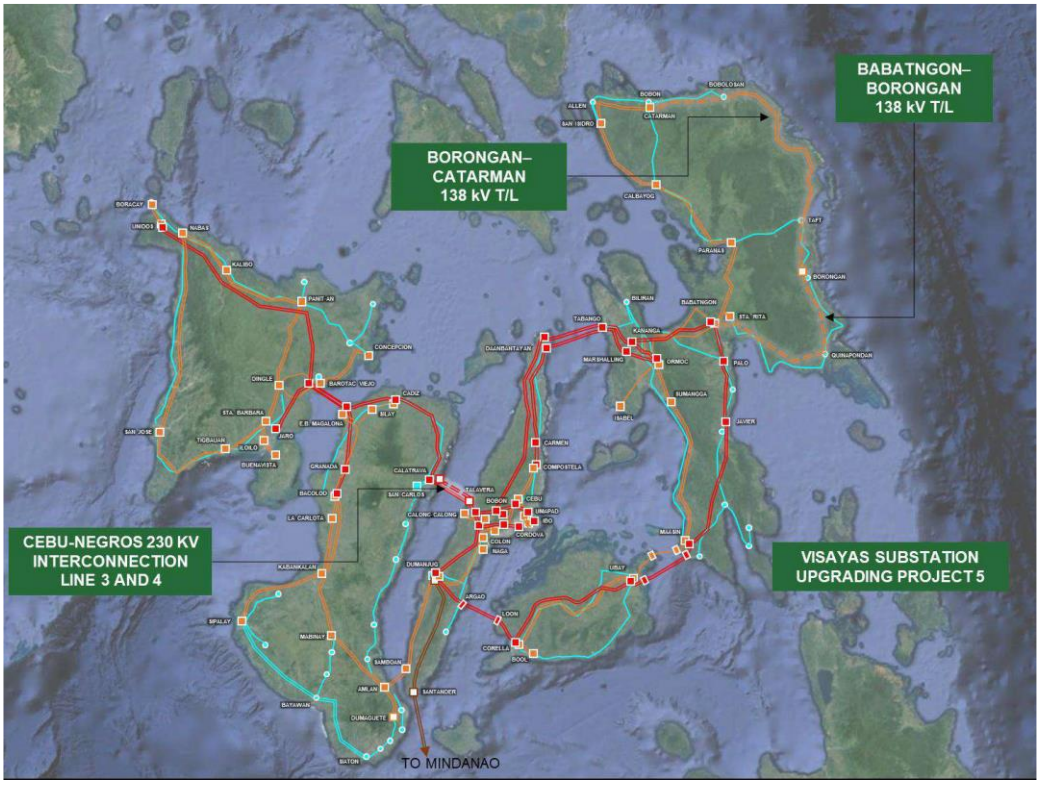
Source: NGCP 2020, p. 169.

Figure 18. Transmission Outlook 2035



Source: NGCP 2040, p. 171.

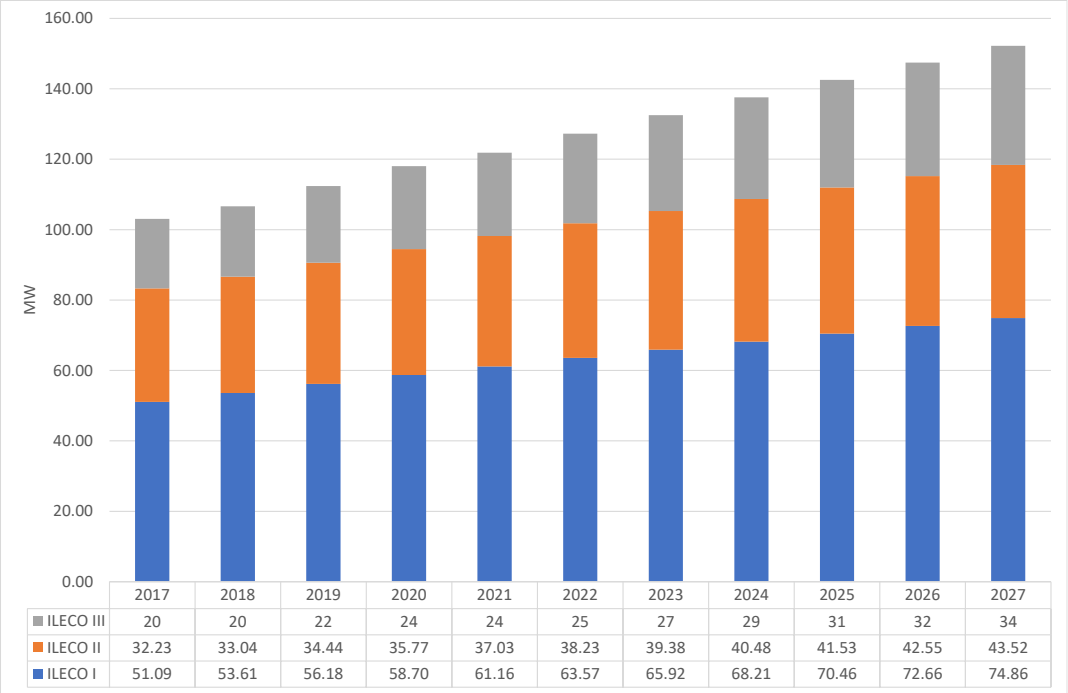
Figure 19. Transmission Outlook 2040



3. Distribution Development Plan

Peak demand for the whole province (excluding that of Iloilo City) totaled 103 MW as of 2017. ILECO I accounted for half (50%) of this total demand, while ILECO II for 31% and ILECO III (including the off-grid areas) for 19%. Based on consolidated DDPs by the DOE, total peak demand for the whole province prior to COVID-19 was expected to reach 152 MW in 2027, or by an average increase of close to 4% per year during this 10-year period. This is also more or less the expected growth in demand in the franchise area of ILECO I, while that in ILECO II would be 3% and ILECO III 5.53%.

Figure 20. Forecasted Peak demand in Iloilo Province 2017-2027 (MW)

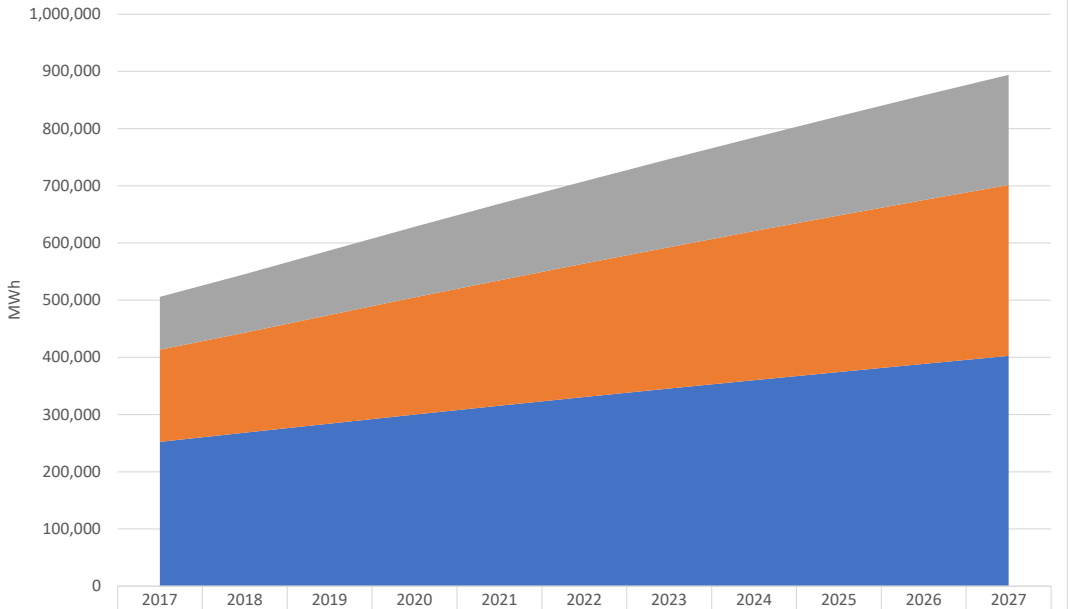


	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ILECO III	20	20	22	24	24	25	27	29	31	32	34
ILECO II	32.23	33.04	34.44	35.77	37.03	38.23	39.38	40.48	41.53	42.55	43.52
ILECO I	51.09	53.61	56.18	58.70	61.16	63.57	65.92	68.21	70.46	72.66	74.86

Source of basic data: DOE 2020. *2018-207 Distribution Development Plan*.

In terms of electricity sales, ILECO I accounts for 50% of total electricity sales of the whole province, while ILECO II and ILECO III for 32% and 18%, respectively. Total electricity sales are projected to increase from 505,854 MWh in 2017 to 893,964 MWh in 2027.

Figure 21. Forecasted Electricity Sales in Iloilo Province 2017 - 2027 (MWh)



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ILECO III	92,293	102,262	112,814	123,297	133,646	143,864	153,928	163,849	173,584	183,169	192,598
ILECO II	161,309	174,968	190,061	204,885	219,374	233,502	247,257	260,645	273,673	286,355	298,705
ILECO I	252,252	268,371	284,298	299,990	315,424	330,586	345,470	360,074	374,486	388,704	402,661

Source of basic data: DOE 2020. *2018-2017 Distribution Development Plan*.

4. Missionary Electrification Development Plan

The province of Iloilo has a total of 66 islands mostly situated in the northern part. The municipality of Carles within the franchise area of ILECO III has 29 islands with Calagna-an as the biggest. The municipality of Concepcion has 17 islands with Pan de Azucar as the largest and Bocot Island, the smallest. Some of the islands are submerged during high tide. Ajuy has seven small islands while Estancia has six with Bayas as the largest. It is no surprise if many of these islands could not be connected to the main distribution networks. All four above-mentioned municipalities are within the franchise area of ILECO III.

Indeed, thirty-one barangays under ILECO III are declared off-grid (or cannot be connected to the ECs main distribution network). As of 2017, only 1,685 households out of the total 12,669 households had been energized, for a rural electrification rate of a low 13%. Demand in this off-grid barangays is projected to reach 760 kW in 2027 from 240 kW in 2017, with an increase by 12.22% per year during this period. Meanwhile, electricity purchases are projected to increase by 26% per year, indicating large system losses, which true enough worsened from 13% in 2017 to 41% in 2027.

The electrification of these off-grid islands and barangays is under the Missionary Electrification Development Program of the government through the NPC-SPUG and overseen by the DOE.

The umbrella Household Electrification Program of the government coordinated by the DOE also provides electricity access to remote areas through grid extension and the solar PV mainstreaming program that installs SHS in remote off-grid households. The electrification of the 10 barangays under the Municipality of Calinog within the franchise area of ILECO II is under this program, which installed a total of 460 kW of generating capacities in 2019 in these remote barangays.

Table 16. Electrification of New Areas, 2016 - 2020 (MW)

Areas	ECs	2016	2017	2018	2019	2020
1. Calagnaan Island, Carles	ILECO III	0.200				
2. Tagunbanhan Island, Concepcion and Ajuy	ILECO III	0.160				
3. San Fernando, Sicogon Island, Carles	ILECO III		0.135			
4. Tinigban, Calagna-an Island, Carles	ILECO III		0.080			
5. Guibonyugan, Calinog	ILECO II				0.035	
6. Hilwan, Calinog	ILECO II				0.030	
7. Caratagan, Calinog	ILECO II				0.040	
8. Aglonok, Calinog	ILECO II				0.040	
9. Binolosan Grande, Calinog	ILECO II				0.060	
10. Manaripay. Calinog	ILECO II				0.030	
11. Supanga, Calinog	ILECO II				0.045	
12. Tigbayog, Calinog	ILECO II				0.035	
13. Marindig, Calinog	ILECO II				0.065	
14. Binolosan Pequeno, Calinog	ILECO II				0.080	
15. Naborot Island, San Dionisio	ILECO III					0.015
16. Manipulon Island, Estancia	ILECO III					0.030
17. Botlog Island, Concepcion	ILECO III					0.030
	Total	**0.360**	**0.215**	**-**	**0.460**	**0.075**

Source of basic data: DOE, 2016-2020 Missionary Electrification Development Plan.

III. RE Resource Assessment and project Development

A. Renewable Energy Projects in the Pipeline

Province of Iloilo hosts several private sector-led renewable energy projects (Table 17). Two projects are already commercially operating – the Miag-ao Solar Power Project and Central Azucarera de San Antonio's Cogeneration Plant (CASA). CASA has completed the first phase of the project (15MW) with a remaining 8MW for expansion. Projects being developed can generate an additional 77.56MW of RE capacities.

Table 17. RE Projects under development in Iloilo Province, as of June 2021

RE	Location	Project Name	Company/Owner	Potential Capacity (MW)	Installed Capacity (MW)
Biomass	Mina	17.5MW Biomass Power Project	Green Power Panay Philippines	17.50	0
	Passi City	23MW Biomass Cogeneration Plant	Central Azucarera de San Antonio	8.00	15.00
	Total Biomass			**25.50**	**15.00**
Solar	Miag-ao	Miag-ao Solar Power Project	Cosmo Solar Energy	0	5.67
	Oton	Vistamall Iloilo Solar Power Project	Kratos Res, Inc	0.66	0
	Tigbauan	Tigbauan Solar Power Project	Solexar Energy International	34.30*	0
	Total Solar			**34.96**	**5.67**
Hydro	Igbaras	Igbulo (Bais) Hydroelectric Power Project	Century Peak Corporation	5.10	0
	Total Hydro			**5.10**	**0**
Wind	Dumangas	Dumangas Wind Power Project	Phinma Renewable Energy Corp	12.00	0
	Batad and San Dionisio	Iloilo 1 Wind Power Project	Iloilo 1 Renewable Energy Corp	-	-
	Total Wind			**12.00**	**0**
		Total Iloilo Province		**77.56**	**20.67**

*According to ILECO III, only 3 – 5MW will be developed.
SOURCE: DOE

The following discussions estimate the potential renewable energy resources in the Province of Iloilo from secondary references and from available RE databases and web-based tools. The figures are *theoretical potentials* that provide a general indication of the available resources. The estimates do not consider cost-effectiveness, access to the resource, or technology performance, unless specified in the discussions. The theoretical potential is expressed in Joule (primary energy) and converted to potential electricity production (MWh).

B. Biomass Resources

Crop residues or agricultural wastes can be used as fuel or feedstock to produce energy. Utilizing such resources avoid food security issues and environmental concerns while contributing to local energy security. The central region of the province is a developed agri-industrial area that produces a wide array of products including corn, rice, bananas, fruit vegetables, and mungo, among others. The production of sugar is centered in Passi City, Lambunao, Duenas, San Enrique, and Bingawan.

DOE and USAID conducted a biomass resource assessment using 2011 production data for Visayas. It estimated a total of 129.59MW biomass potential for Province of Iloilo as shown in the table below.

Table 18. Calculated Biomass Energy derived from 2011 Production data by DOE & USAID

Agricultural Product	Waste Products	Potential MW
Rice	Rice Hull	6.93
	Rice Straw	20.56
Corn	Corn Cons	2.76
	Corn Stalk	7.03
	Corn Leaves and Husk	7.95
Sugarcane	Bagasse	13.16
	Cane Trash	10.10
Coconut	Coco Husk	3.17
	Coco Shell	1.71
Livestock	Chicken	25.16
	Hog	20.33
	Solid Waste	10.72
	TOTAL	**126.59**

SOURCE: Transmission Development Plan 2020-2040

The Province of Iloilo's biomass potential is re-estimated based on more recent (2019/2020) crop production data. Theoretical biomass energy refers to the energy contained in raw, and unprocessed agricultural by-products with no constraints on availability or cost-effectiveness[8]. It is calculated here using the same methodology conducted by a GIZ study[9] on biomass RE resources. Appendix A shows how the biomass potential is estimated.

Theoretical biomass energy was calculated for rice, corn, and sugarcane; crops that generated the most volumes of agricultural wastes. These estimates are based on total crop yields. It does not exclude the feedstock that may already be committed to existing biomass power plants such as the Central Azucarera de San Antonio Inc (CASA) that uses its bagasse for its 15MW biomass power plant.

[8] EU and Northern Periphery and Arctic Programme. 2018. *Generating Renewable Energy Business Enterprise*.
[9] Ortwein, Andreas and Militar, Jeriel G. 2015: Use of Biomass as Renewable Energy Source in Panay. Final Report. Manila, Philippines: GIZ GmbH

Table 19. Potential Biomass Resource in Iloilo Province

Agri Product	Annual Production (metric ton)	Agri Waste	Estimated Annual By-product (metric ton)	Energy Output (GJ/y)	Potential (MWh/y)	Potential Capacity at 8000 hours/year (MW)
Rice (2020)	952,724	Husk	190,545	1,282,748	71,320	8.9
Corn (2020)	80,818	Corn stover*	56,572	525,275	83,235	10.4
Sugarcane (2019)	1,555,519	Bagasse	388,879	6,369,849	1,151,031	143.9
TOTAL				**8,177,872**	**1,305,586**	**163.2**

*Corn stover includes leaves or straw, stalks, husks, and cobs.
DATA SOURCES: PAO and Iloilo Province 2018 Profile

C. Solar Resource Potential

The National Renewable Energy Laboratory's RE Data Explorer (www.re-explorer.org), a web-based resource assessment tool, was used to estimate the solar technical potential for the Province of Iloilo. The technical potential includes the achievable capacity (MW), electricity generation (GWh), and suitable land area (km^2) calculated under performance, topographic, environmental, and land-use constraints[10].

Solar technical potential was calculated for open and barren land, shrubs, built-up land, wooded grasslands, and grasslands. Open and unused non-agricultural land can be used for ground-mounted utility-scale solar PV farms. Built-up land includes land developed for residential, commercial, and industrial use, land use to deliver public services, mixed-use land, and recreational land. While built-up land may already have standing buildings, these can still be used for rooftop solar PV projects.

The modelling excluded land used for annual crops, fishponds, closed forest, inland water, fallows, mangrove forest, marshland swamp, open forests, and perennial crops.

Table 20. Solar Technical Potential in Iloilo Province

AC Generation	98,509,900 MWh/year
Total Land Area	1,983 km^2
Capacity	71,297 MW
Land Area by Technical Potential	
< = 332 MWh/yr	16 km^2
332.04 – 351.41 MWh/yr	58 km^2
351.41 – 370.79 MWh/yr	88 km^2
370.79 – 390.17 MWh/yr	248 km^2
390.17 – 409.55 MWh/yr	779 km^2
409.55 – 428.92 MWh/yr	670 km^2
428.92 – 448.30 MWH/yr	127 km^2

*Parameters: Limit by Solar Resource = 2-9 kWh/sqm/day; Power density = 36 MW/Km^2

[10] NREL. *Technical Potential Tool*. https://www.re-explorer.org/technical-potential-tool/index.html

The acceptable solar irradiance for commercial power generation starts at 4kWh/sqm/day. The simulation also included areas from 2kWh/sqm/day to capture potential for smaller solar PV systems such as for household rooftops.

The available solar energy resources in the investigated land types can generate a total of 98.5GWh/year, from a total of 71GW solar PV facilities. The distribution of solar energy potential in the Province of Iloilo is shown in the next figure.

Figure 22. Iloilo Province Solar Potential

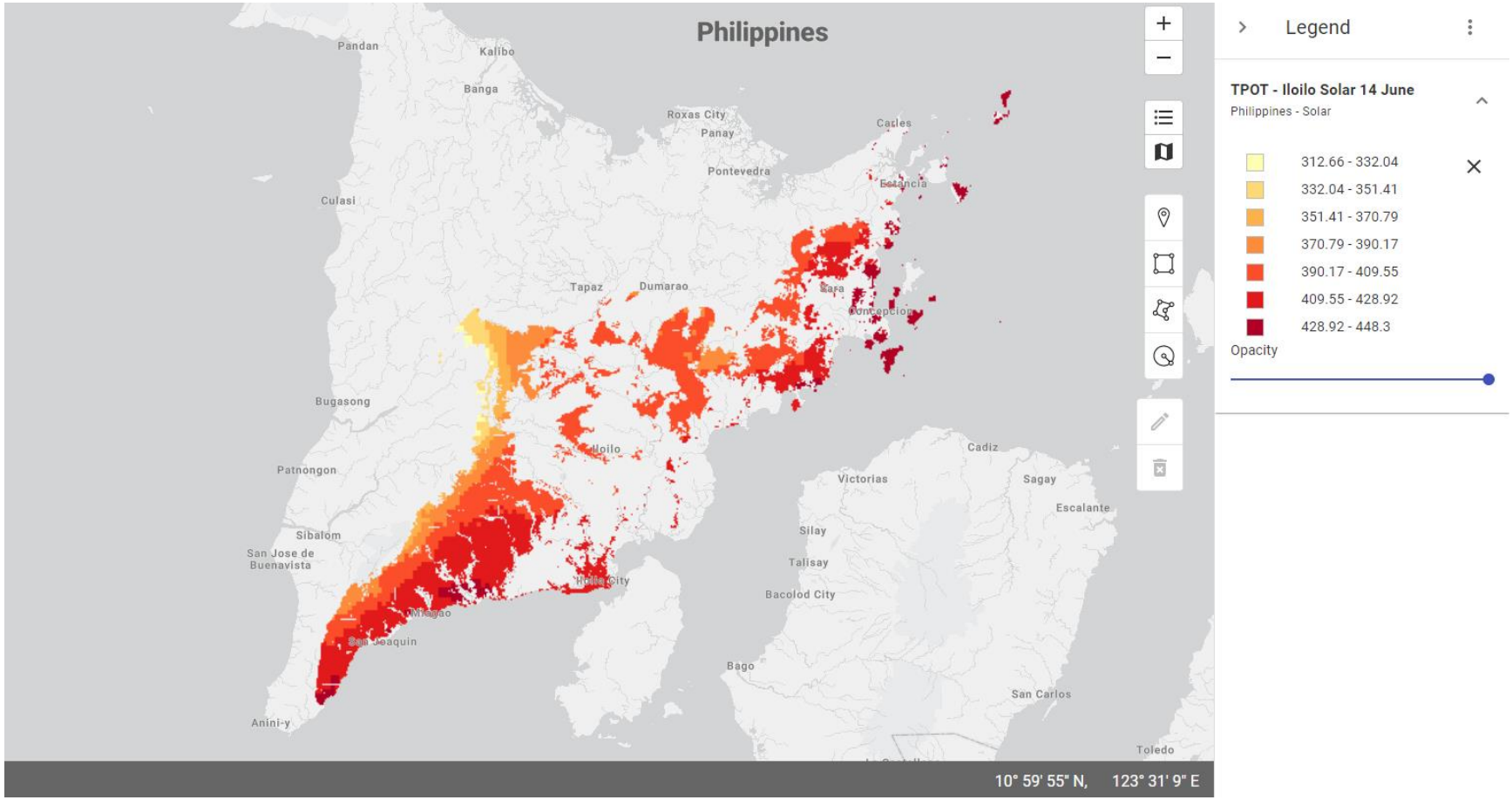
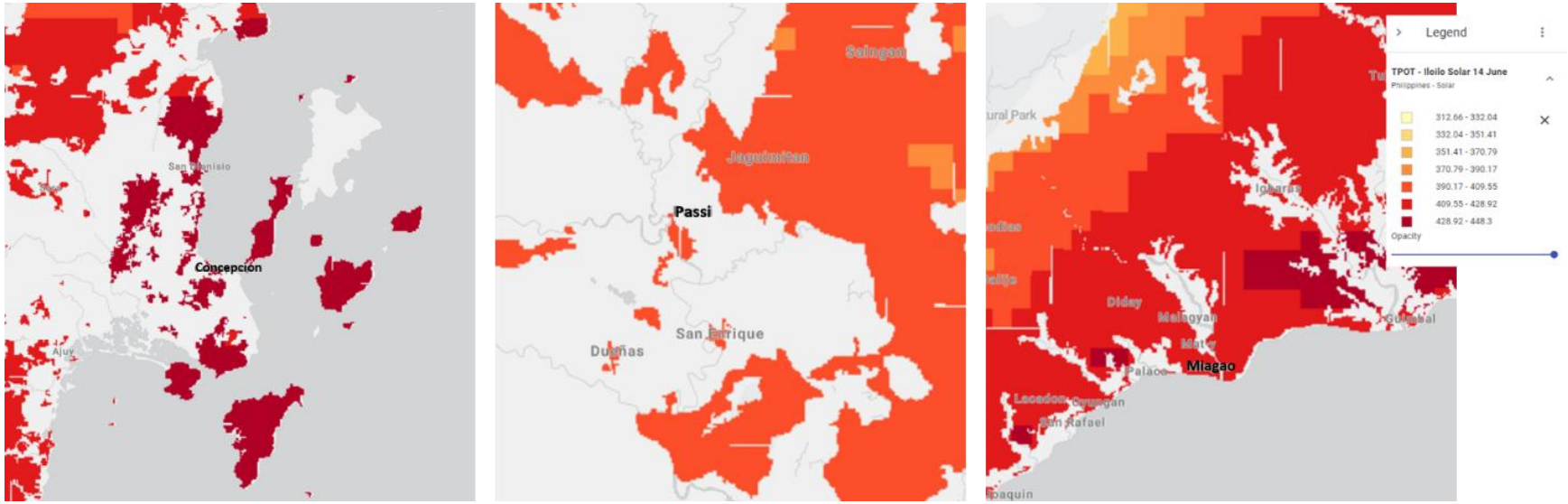


Figure 23. Solar energy potential of the three case study LGUs



Above shows the indicative potential for solar power generation in Concepcion, Passi City, and Miagao. All three have high solar energy resources appropriate for power generation. It must be highlighted that for developing individual projects, it will be necessary to conduct more detailed site-specific analysis of the available resource and availability of area, among other techno-economic analyses.

D. Hydropower Resource Potential

More than a hundred rivers and creeks traverse the entire Province of Iloilo, which are identified as possible sources of irrigation water. Some rivers may be tapped for hydropower generation as well. According to the Department of Energy (DOE), the Province of Iloilo has a cumulative 49.51MW hydropower potential[11].

The Jalaur river basin records the highest annual flow and is considered as a major source of irrigation water. It is also one of the sites identified by the National Electrification Administration (NEA) for mini-hydropower development.

Table 21. Identified Mini-hydropower sites in Iloilo Province

Site	Municipality	Head (m)	Discharge, Q (m^3/s)	Potential (kW)
Jalaur 1	Dingle	7.00	18.90	1,060
Jalaur 2	Dingle	8.00	10	640
Ulian	Duenas	10	15	1,200
Sibalom	Tigbauan	8	4.20	270
Nagsadjan Falls	Igbaras	-	-	3,600
Jalauar RIS	Calinog	5	12	480
Ulian 2*	Lambunao	-	-	1,000
			Total	**8,250**

*Ulian 2 is one of the offered sites in DOE's Open and Competitive Selection Process (OCSP) for private sector development. Projects included in the OCSP will usually have at least a completed pre-feasibility study, if not a feasibility study.
Source: DOE, NEA

Irrigation systems may also be co-developed as hydropower systems. With proper design, the two systems do not compete over the water resource. The National Irrigation Authority supports such projects having successfully developed four. These are the 8.5MW MARIS Main (South) Canal Hydroelectric Power in Isabela, 1.0MW Rizal Plant in Nueva Ecija, 1.0MW Bulanao Mini-hydropower plan in Kalinga, and 500kW Marbel #1 in South Cotabato. The only condition set by NIA is that the hydropower project should not obstruct irrigation water delivery. Jalaur RIS, one of the identified possible mini-hydropower sites in **Error! Reference source not found.**, is an irrigation system. Other irrigation systems in the Province of Iloilo are detailed in Table 22.

Table 22. Irrigation Systems in Iloilo Province (2018)

	Jalaur RIS	Suague RIS	Sta. Barbara RIS	Aganan RIS	Btac. Viejo RIS	Sibalom RIS
River Source	Jalaur River	Suague River	Tigum River	Aganan River	Btac. Viejo River	Sibalom River
Month of Maximum Flow	July	September	June	August	August	September

[11] Based on studies conducted by the National Electrification Agency (NEA) and the National Power Corporation (NPC).

Maximum Discharge Volume (L/s)	17.72 cms	1.62 cms	2.49 cms	2.39 cms	6.22 cms	4.96 cms
Month of Minimum Flow	March	May	April	April	April	April
Minimum Discharge Flow (L/s)	2.42 cm	0.19 cms	0.36 cm	0.12 cms	0.41 cms	0.16 cms

Source: 2019 Iloilo Annual Provincial Profile

The Province maintains watersheds to ensure water supply. These will also be vital in ensuring water resources of hydropower plants. The next table lists the watersheds in the province and the rivers they feed to. Small rivers and creeks can be viable for pico-, micro-hydro systems that can be used for non-power applications or hybridized with other RE technologies.

Table 23. Watersheds and rivers in Iloilo Province

Watershed	Municipal Coverage	Rivers
1. San Joaquin	San Joaquin	Siwaragan-Antolan River, Tiolas-Nagsipit River, Cataan River, Lawigan River, Guibongan-Bayunan River, Sinogbuhan River
2. Miag-ao	Miag-ao	Uyongan River, Bakawan River, Tumagbok River, Naulid River, San Rafael River
3. Jar-ao-Tangyan-Guimbal	Tubungan	Jar-ao River
	Igbaras	Tangyan River
	Guimbal	Guimbal River
4. Tigum- Aganan	Maasin, Cabatuan, Sta. Barbara, Pavia	Tigum River
	Leon, Alimodian, San Miguel, Pavia	Aganan River
	Pavia, Jaro, Iloilo City	Jaro River
5. Sibalom- Baguinguin	Leon, Tubungan	Sibalom River, Tacuyong River
	Tigbauan	Sibalom River, Tacuyong River, Bayunan River, Baguinguin River
	Alimodian, Oton	Baguinguin River
6. Alibunan- Upper Jalaur	Calinog	Alibunan River, Jalaur River
7. Ulian	Labunao, Duenas	Ulian River
8. Magapa-Suague	Janiuay, Badiangan	Magapa River
	Janiuay, Maasin, New Lucena, Mina, Pototan	Suague River
9. Janipaan- Jelicuon	Cabatuan, Mina, New Lucena, Sta. Barbara, Zarraga, Leganes	Janipaan River
	Cabatuan, New Lucena	Jelicuon River
	Leganes, Jaro, Iloilo City	Buntatala River
10. Jalaud	Barotac Nuevo, Dumangas	Jalaud River
11. Agutayan- Tulip	San Enrique, Anilao	Agutayan River
	Dingle	Tulatulaan Creek, Lip-ac Creek

12. Asisig- Lamunan	San Rafael, San Enrique	Asisig River
	Passi City, Bingawan	Lamunan River
13. Sigangao	Pototan, Zarraga	Sigangao Creek
14. Abangay-Mananiw	Lambunao, Badiangan, Pototan	Abangay River
	Duenas, Dingle	Mananiw River
15. Assue- Serruco-Lanjagan	Lemery, Sara	Assue River
	San Dionisio, Concepcion	Serruco River
	Ajuy	Lanjagan River, Gubaton River
16. Barotac Viejo	Lemery, San Rafael, Barotac Viejo	Barotac Viejo River
17. Alacaygan	Banate, Barotac Viejo	Alacaygan River
18. Sibajao- Balantian-Binon-an	Batad, San Dionisio, Estancia	Sibajao River
	Balasan, Carles	Balantian River
	Batad	Binon-an River
19. Estancia Island	Estancia	Estancia Island River
20. Carles Island	Carles	Carles Island Rivers
21. Concepcion Island	Concepcion	Badbaran River, Gerungan River
22. Concepcion Mainland	Concepcion	Badbaran River, Gerungan River
23. Anilao – Dangulaan	Anilao	Anilao River
24. Badbaran-Gerungan	Lemery, San Rafael	Badbaran River, Gerungan River
25. Dingle	Dingle	Jalaur River, Ilajas Creek
26. Catipayan-Maayon	Sara, San Dionisio	Catipayan River, Maayon River

Sources: 2018 Iloilo Province Profile

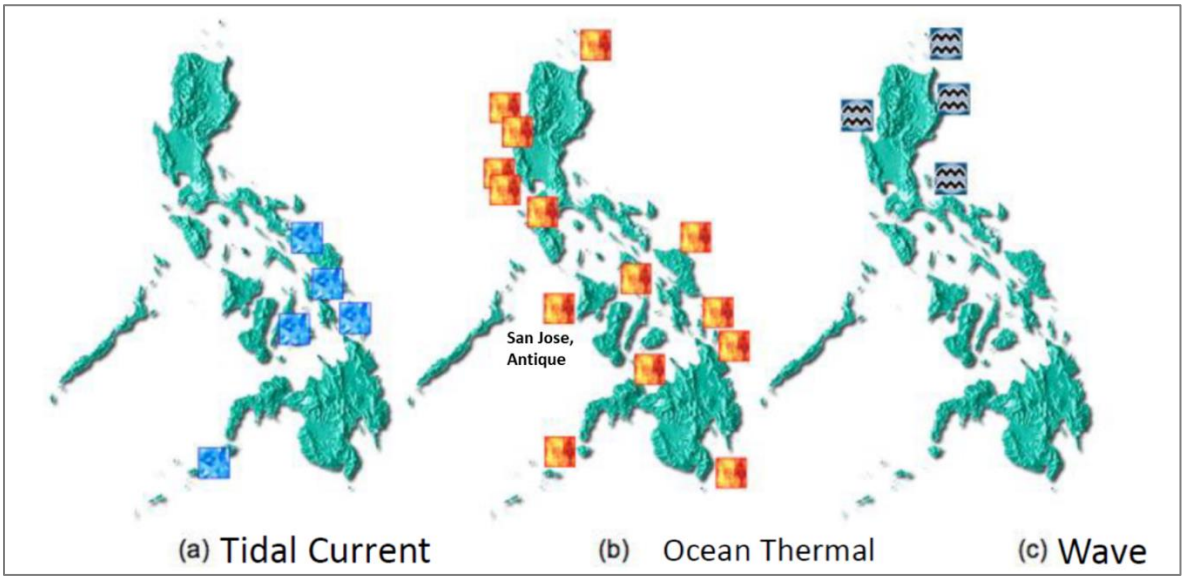
Using the rivers for mini-hydropower and micro-hydropower systems will not compete with the rivers' use for irrigation and water supply. Project developers will need to conduct multi-year hydrologic resource assessment to evaluate the technical and economic viability of a hydropower site for commercial power generation. Many hydropower technologies are emerging that can tap low water resources ideal for non-power applications. These small systems are often 'plug-and-play' installations that do not require extensive resource assessment.

E. Ocean Resource Potential

Ocean energy has three forms: ocean thermal energy conversion (OTEC), tidal, and wave. According to a study conducted by the Mindanao State University, the country's total potential ocean energy is estimated at 170GW. However, resource assessment investigations are limited.

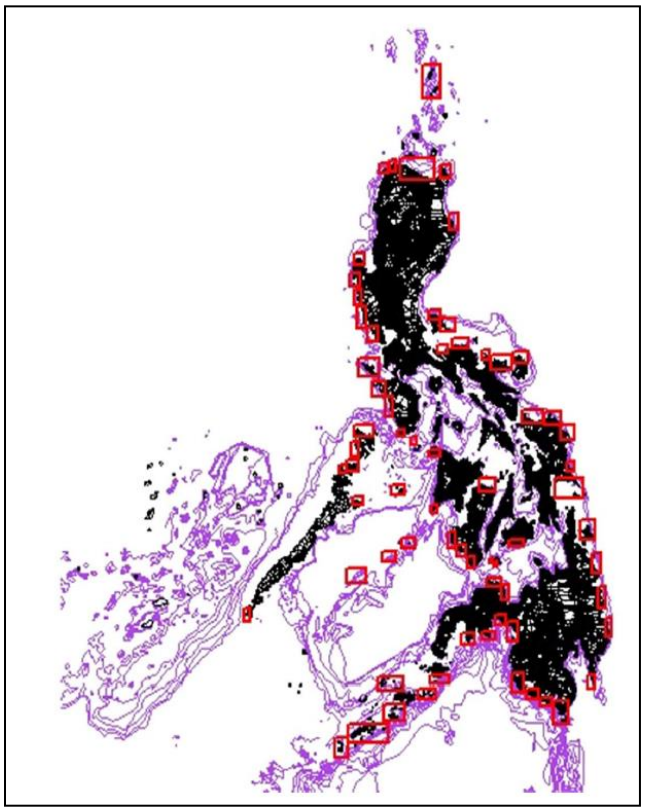
Figure 24 maps the identified sites with potential ocean energy resource. The southern region of Panay island, near San Jose, Antique, has been identified with potential ocean thermal resources (center of Figure 24). The same region was also identified by the UP Marine Science of Institute to have wave energy resource potential (Figure 25).

Figure 24. Ocean Renewable Energy Resources in the Philippines



Source: Quitoras et al. 2018. *A techno-economic assessment of wave energy resources in the Philippines.* Renewable and Sustainable Energy Reviews. 88 (2018) 68-81

Figure 25. Probable Sites for wave energy in the Philippines



Source: Quitoras et al

F. Wind Resource Potential

The RE Data Explorer was also used to investigate the wind resource potential of the province. Similar to the solar energy resource scanning, the modelling tool was used to calculate the wind technical potential that included probable energy generation (GWh), and achievable capacity (MW). These were calculated under wind performance, topographic, environmental, and land-use constraints[12].

The technical wind potential was calculated in built-up land, grasslands, marshland/swamp, open and barren land, and wooded grassland. Wind energy projects are ideally developed in open spaces to maximize the resources. The analysis included built-up land to account for the unused empty areas allocated for industrial development. Offshore wind potential was not included in the analysis.

Wind resource assessment excluded lands used for annual crops, fishponds, closed forest, inland water, fallow, mangrove forest, open forest, and perennial crops.

The cumulative achievable wind capacity in the province is 4,648MW that can generate 8.9GWh/year. Wind project developers will need to conduct multi-year wind resource assessment to examine the viability of the site for commercial development. Table 24 summarizes the technical wind energy potential for the Province of Iloilo.

Table 24. Wind power technical potential of the Province of Iloilo

Generation	8,897,329 MWh/year
Total Land Area	1,549 km^2
Capacity	4,648 MW
Land Area by Technical Potential*	
<= 20.4 MWh/yr	1 km^2
20.40 – 31.58 MWh/yr	1 km^2
31.58 – 42.76 MWh/yr	443 km^2
42.76 – 53.95 MWh/yr	865 km^2
53.95 – 65.13 MWh/yr	145 km^2
65.13 – 76.31 MWh/yr	86 km^2
76.31 – 87.49 MWh/yr	11 km^2

*Land area refers to the cumulative area with the identified energy potential.

The distribution of the wind energy potential in Province of Iloilo is shown in the next page.

[12] NREL. *Technical Potential Tool*. https://www.re-explorer.org/technical-potential-tool/index.html

Figure 26. Wind energy technical potential in Iloilo Province

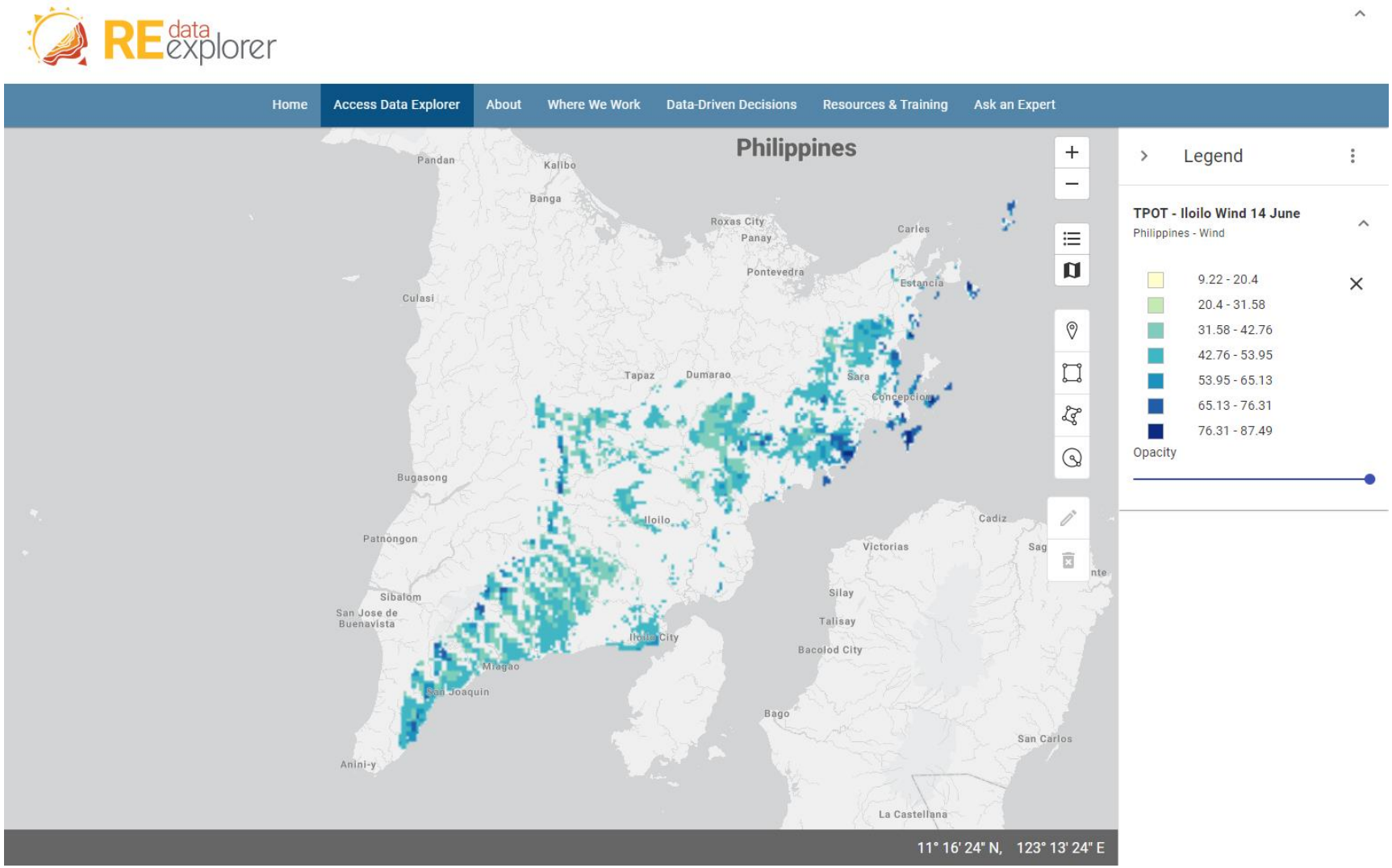
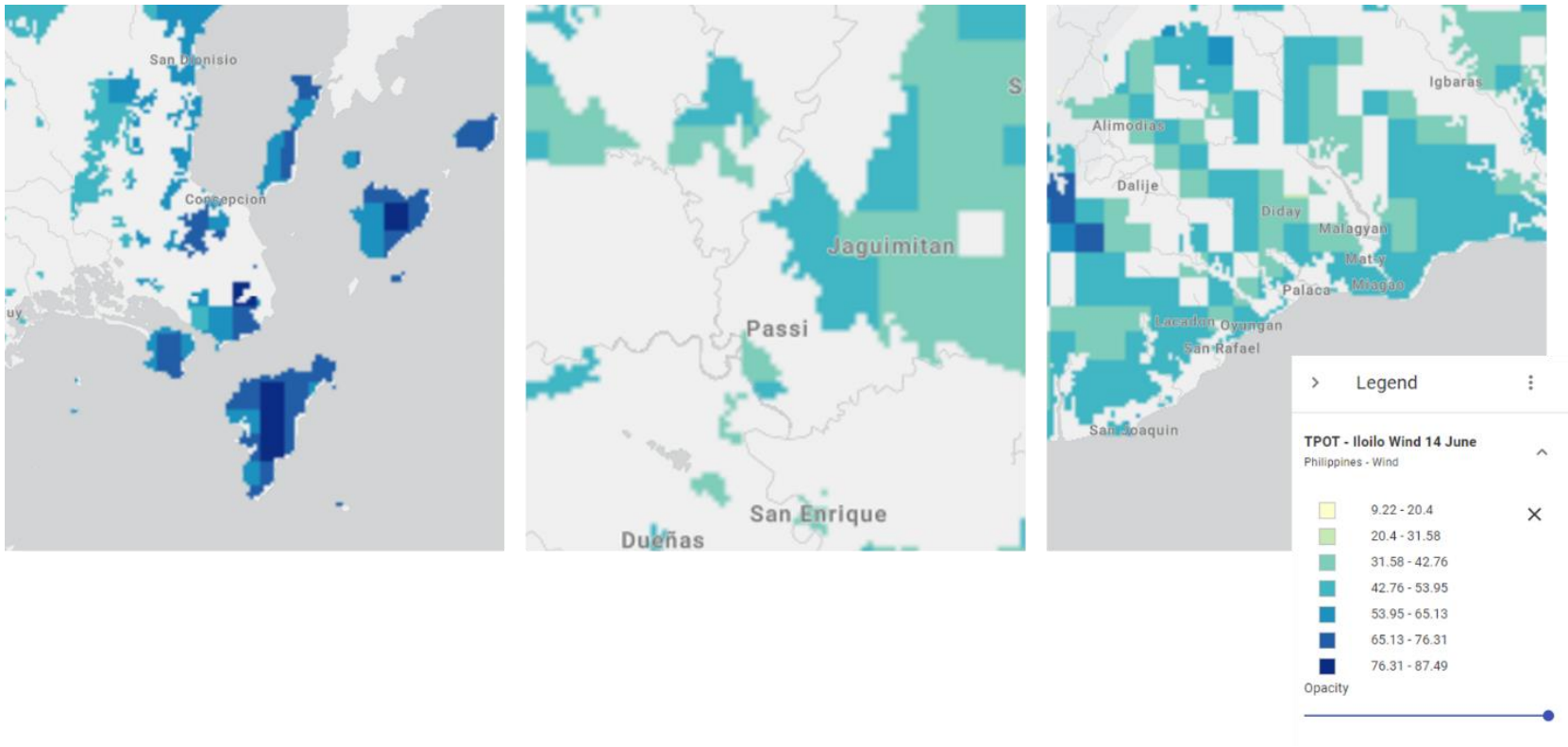


Figure 27. Technical wind energy potential in Concepcion, Passi City, and Miagao



Sites with high wind energy resources are concentrated in the northern and southern parts of the Province of Iloilo. The islands in the northern area (Concepcion, Estancia) have the highest wind energy potential. The southern part, including in Miag-ao have the most potential sites but the intensity is not as high as in the islands.

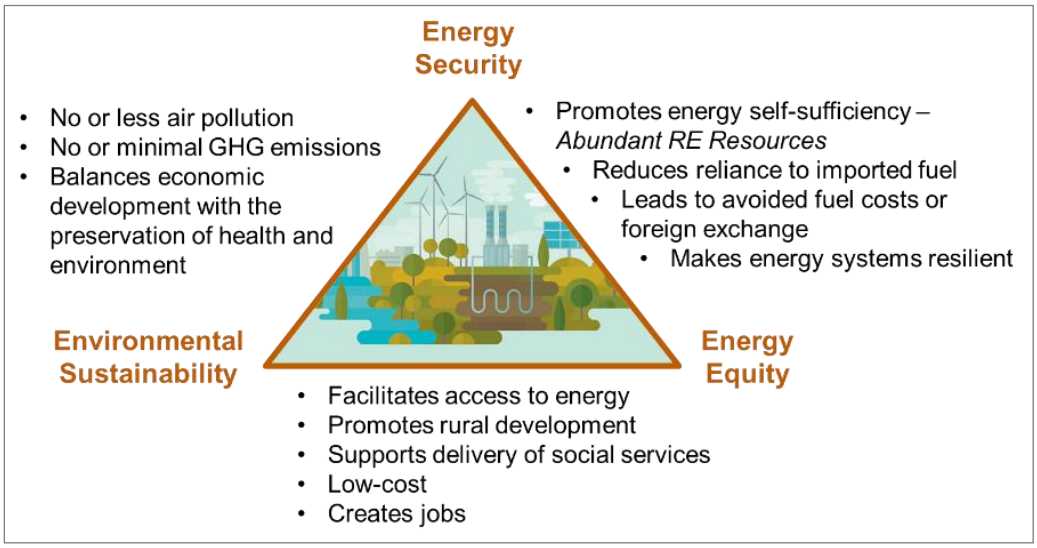
IV. RE Readiness and Capacity Assessment

A. The RE Act and NREP 2020-2040 and the Role of LGUs

The Renewable Energy Act of 2008 or RA 9513 is the national policy for advancing the exploration and development of renewable energy. Utilization of indigenous RE resources will reduce the country's dependence on imported fossil fuels, reduce harmful emissions, and balance the goals of economic growth with the protection of health and the environment.

RA 9513 supports the development and commercial application of utility-scale RE power plants and end-user RE technologies by providing fiscal and non-fiscal incentives. The RE Act also made it a state policy to institutionalize capacity building on RE technologies at the national and local levels.

Figure 28. Renewable Energy addresses the Energy Trilemma



RE solves the country's energy trilemma:

Energy security – Using RE contributes to energy self-sufficiency as it reduces dependence on imported fossil fuels.

Energy equity – RE can lead to lower electricity generation costs and facilitates access to energy in off-grid or unenergized areas.

Environmental sustainability – RE produces less or no pollution and GHG emissions, leading to a better environment.

The National Renewable Energy Program 2020 -2040 (NREP) is the implementation plan of the RE Act. NREP aims to raise RE's contribution in the generation mix to 35% by 2030 and drive RE's share to 50% by 2040, dominating the energy mix. To complement this power generation target, the NREP also aims to promote higher adoption of RE technologies in the rural areas to reach 100% electrification and

foster inclusive growth. To accomplish these goals, the NREP is adopting a whole of society and a whole of government approach.

The role of LGUs in relation to the RE Act is to implement the NREP at the local level. The NREP incorporates specific provisions that encourages and facilitates greater participation of local government units in the RE sector. At the forefront is local renewable energy planning as stipulated in the LGU Energy Code[13]. The Code aims:

- To establish, strengthen and integrate the national energy plans, programs, policies, and mechanisms into the local development plans, with respect to energy safety practices, energy efficiency and conservation, energy resiliency, and energy planning which includes energy access and resource development.
- To harmonize and fast-track the implementation of the Energy Virtual One Stop Shop (EVOSS) Act, EO 30 and AO23 with the establishment of unified and streamlined permitting process for energy projects
- To maximize the benefits from energy projects to the host communities
- To implement the other necessary energy programs and projects to spur the total development of the LGUs.

RA 11234 or the EVOSS Act fosters transparency and efficiency in processing permits. It is a web-based monitoring system for energy applications used by all agencies and local governments involved in the approval process. The LGUs' role in the permitting process of RE projects are shown in

Figure 29. All LGUs can register and participate in the EVOSS platform to help them process applications more efficiently.

Figure 29. LGUs' Role in the Permitting Process

The national government is encouraging the use of productive or non-power uses of renewable energy. One of the priorities is to deploy RE technologies in the agricultural and fisheries sectors to enhance food security. The DOE and the DA forged a MOA for the *RE Program for the Agriculture and Fisheries Sector* (REP-AFS) that can support all LGUs with relevant projects in terms of building capacity, technical support, and deployment of RE-based agri-fishery equipment.

Another RE opportunity for LGUs is the use of waste-to-energy (WTE) technologies to manage municipal solid wastes and support compliance to *RA 9003 Ecological Solid Waste Management Act*. WTE is only considered renewable if majority of the wastes are biodegradable (such as kitchen and garden

[13] DILG-DOE Joint Memorandum 2020-01

wastes). Appropriate waste quantification, analysis and characterization studies must be completed to investigate if WTE is technically and economically feasible.

All LGUs will benefit from the 100% electrification of their municipalities and cities. Access to electricity/clean energy promotes livelihood creation, improves the delivery of social services (health, education, security, water, sanitation, etc.), and enhances the quality of lives of all constituents. The LGUs can participate in the electrification efforts by coordinating and working together with their electric cooperatives to identify strategies for energy access.

LGUs can also use RE to enhance their Local Climate Change Action Plans (LCCAP) and Disaster Risk Reduction and Management (DRRM) plans. The wide adoption of RE will reduce GHG emissions and contribute to national and global climate targets. In relation to disaster response, RE ensures power supply during calamities when the grid is disabled. The modularity of many RE technologies also allows it to be deployed in challenging terrain and in difficult situations.

B. The role of the Electric Cooperatives/Distribution Utilities and NPC-SPUG in the implementation of the RE Act and NREP 2020-2040

The electric cooperatives, distribution utilities, and NPC-SPUG play a critical role in the implementation of the RE Act and NREP 2020-2040. Although energy generation has been privatized under EPIRA, there are policy mechanisms under the RE Law that are mandatory for utilities to comply such as the RPS requiring that at least 1% of the energy delivered should come from RE, the voluntary market under the Green Energy Option (GEOP) mandating utilities to facilitate connection between RE generators and consumers preferring RE sources, and Net Metering that allows consumers to sell its excess generation from RE sources, to the grid.

To meet the RPS requirement, the ECs have included RE sources in their procurement plan through the competitive selection process (CSP). Bundling the RPS requirement with their regular energy and capacity purchases complicates the procurements process as it has to deliver the lowest cost of energy to the consumers to be approved by ERC. Bidders for the CSP are also constrained by the available RE resources in the areas that can be connected to the EC through the transmission line or as embedded generation. The electric utilities in Panay and Guimaras Island have joined together to collectively procure their bulk energy and RPS requirement that will attract larger generating companies with competitive prices and better terms.

The Green Energy Auction Program (GEAP) serves as an option for RPS mandated energy players to source their RPS requirement from RE generators who will offer their generation through the auction mechanism to be initially administered by DOE. If the RE generating plants cannot be physically connected to the utility, the utility can purchase Renewable Energy Certificates (REC) to meet their RPS requirement. It was expressed by the group of electric cooperatives in Panay Island that they will have to proceed with their CSP if it will take some time for DOE to implement the GEAP.

Consumer initiative such as rooftop solar for Own Use and for Net Metering need the support of electric cooperatives for integration into their network though the consumer connection.

There are large solar rooftop installations in the Province of Iloilo that fall under the Retail Electricity Supplier (RES) contract where the building owner as a contestable customer sources its energy supply from an RES including embedded generation from a solar rooftop installation. Under the Green Energy Option

Program (GEOP), consumers with at least 100kW demand can purchase clean energy from RE generators using the distribution network of the electric utility compliant to RCOA rules. This will eventually remove the cap of 100kW set under Net Metering. The electric cooperatives should be aware of these policy and regulatory changes that are intended to increase the share of RE in the energy mix. They also have a role in ensuring the safety, reliability, and efficiency of the distribution system with higher penetration of variable RE generation.

NPC-SPUG generates power in missionary off-grid areas and sells this power to the electric cooperatives for distribution. At times, NPC-SPUG also distributes power that it generates in agreement with the EC. Either way, NPC-SPUG is covered by the RPS requirement for RE generation in off-grid areas. In areas with New Power Producers (NPP) taking over NPC-SPUG generation function, they are also required to meet the RPS for off grid areas.

Although the primary type of electric generation used by NPC-SPUG in missionary areas is from a diesel generator, there were pilot installations of solar-diesel-battery-genset hybrids done by NPC-SPUG. Experience in the design and implementation of hybrid systems are gained by NPC-SPUG with expertise and technologies provided by its private sector suppliers. Business models are also introduced in the hybridization of the power generation in off-gird areas where the private sector provides the RE generators, battery energy storage system and system integration with the existing diesel gensets of NPC-SPUG. These efforts are not only geared towards meeting the RPS requirement for off-grid areas but also to reach the lowest levelized cost of electricity with higher penetration of RE and reduced use of diesel fuel. It also improves the resilience of the power systems from natural and man-made disasters.

C. Challenges for the LGUs

The challenges of the Province of Iloilo as regards the implementation of the national RE policy and programs and local RE development are investigated in terms of organizational or governance aspects from the perspectives of the Provincial Government of Iloilo, municipal or city governments of the three representative or case study LGUs, and the electric power supply actors. The perspectives of the above-mentioned actors on the challenges of the province with respect to physical aspects of RE development are also examined.

1. Province of Iloilo

The main challenges of the province in its entirety from the perspective of the PGI/IPG in terms of governance and physical aspects are summarized below:

Governance Aspects	Physical Aspects

• No local plan specifically for RE
• Lack of RE investment-enabling policy for the Province
  • IPG personnel has no technical capability to evaluate RE resources, technologies, and investments
  • No personnel has participated in energy/power systems training
  • Lack of IEC programs and initiatives
	• Tedious process of Land Conversion for potential RE locations
	• Municipal and Agricultural Waste produced and segregated is not sufficient to meet RE technology requirements
	  • Inappropriate technology
	  • Oversizing of rooftop solar installations
	  • Limited availability of appropriate/suitable RE supply replacement

• Lack of advocacy on Climate Change initiative on the community level • RE is less prioritized • No in-depth knowledge at LGU level what system is beneficial to them • Upcoming elections which may affect the direction of the Province on RE investments	• Commercial interest over LGU benefit • Improper assessment • Frequent brownouts in Iloilo Province • Rising cost of fuel and electricity • Calamities • Unstable Peace and Order situation in upland Off-Grid areas • Pandemic: disrupted (RE) projects

a) Governance/Administrative Challenges and Issues

Renewable energy, in principle, has been formally integrated in the local development planning at the provincial level. "Renewable Energy Program" has been identified under the environment and ecology strategic theme of the IPG. The IPG has also launched the "solarization" of 13 government hospitals under the Hospital Management Office of the IPG —the HMO plans to install rooftop solar PV in each of these government-owned hospitals.

However, although significant, these are the closest to RE integration and there are no province-wide RE plan or programs. Indeed, the lack of local RE plans, enabling local policy environment, local capacity, and general public awareness are the main challenges.

In addition, the results of the upcoming 2022 elections might jeopardize any effort to address these challenges in the short-term.

b) Physical Aspects

With respect to local RE development, the main challenges concern the private sector intentions and actions, particularly in recommending the appropriate technologies and design, adequacy of the supply chain, and commercial interest prevailing over public interest.

There are also challenges that are largely or entirely beyond the control of the provincial government, including land conversion, frequent power interruptions, high cost of electricity, peace and order, calamities, and the present pandemic. These all negatively impacts local RE development.

2. Case LGU: Miag-ao

a) Governance/Administrative Challenges and Issues

Miag-ao has a pro-active local government that aims to promote RE investments in the Municipality. Its Municipal Investments Promotion Office is committed to promote robust RE investments, incorporate such in their local development plan and has been keen on looking for opportunities to fund & promote the use of its RE resources.

Miag-ao also anticipates strong RE demand in the future, particularly in utilizing its RE resources and in incorporating an RE component in the municipality's planned projects, such as the proposed sanitary landfill.

However, the local government acknowledges that at present, it lacks sufficient technical capacity to evaluate RE resources, technologies and investments. Its personnel have not participated in any energy or power systems training that will enable them to provide sufficient inputs to draft their local RE plan and include RE in their AIP. This lack of capacity has also hindered them in crafting responsive RE-related information, education and communication programs and initiatives as well as in complying with the tedious and often technical intensive permitting requirements for its projects.

b) Physical Aspects

Tourism and Business

Miag-ao has a strong tourism potential brought about by Miag-ao Church which is included as one of UNESCO's heritage churches in the Philippines. It also has a lucrative *hablon* weaving industry that has brought pride to the Province of Iloilo. Miag-ao is also endowed with natural scenic attractions such as lakes, waterfalls, rock formations, a 16-kilometer wide shoreline and a strong river system (Tumagboc, Naulid, Bacauan and Oyungan), which can all be potential for RE development. It is also a choice location for the national greening program of the national government.

All of these contribute to favorable local RE potential and anticipated energy demand. It is expected that as tourism booms and businesses flourish, potential risks will have to be mitigated. These risks include those brought about by natural calamities and disasters and other potential ecological impacts associated with economic development, such as issues on land conversion. Add to these risks is the low community awareness on environmental issues, particularly on RE utilization and benefits.

Infrastructures

Miag-ao also hosts Camp Monteclaro, a vast military camp strategically located within the municipality and is poised to be developed partly as an economic zone. Coupled with a thriving business community, Miag-ao needs to address frequent brownouts, which is not unique to the municipality but a frequent occurrence all throughout the province. Also included are threats of rising costs of fuel and electricity. It also needs to have a clear RE policy to complement the opportunities poised by these developments.

Also, while the military camp effectively deters insurgents not only within the municipality but in the nearby areas and the neighboring Province of Antique, these insurgent threats are not to be discounted as they still occur.

Technology, Research and Development

Miag-ao hosts two state universities: the University of the Philippines in the Visayas and the Iloilo Science and Technology University. It also hosts the Cosmo Solar and Via Solis Power Plants, and boasts of a 100% electrification rate in its area.

Given these resources within the area, there is a challenge to utilize these effectively for RE development. The availability of support funds within these institutions and a strong linkage among these academic institutions, NGOs and other support groups can foster a strong research and development opportunity for RE development. The lack of skills, technological know-how and manpower can be partly addressed by these institutions.

3. Case LGU: City of Passi

a) Governance/Administrative Challenges and Issues

The City of Passi has already taken initial steps to support RE development in the city. It hosts the CASA biomass power plant, an own-use grid-tied cogeneration plant and implemented solar streetlights in different barangays (Imbang Grande, Agdayao, Sto. Tomas, Alimono, Aglalana, Sarapan, Sablogan, Talongonan, Buenavista). The local government of Passi City has also identified an RE zone in its CLUP.

The City LGU acknowledges that some administrative challenges and gaps need to be addressed to sustain RE's growth momentum and support the local RE industry. One of the primary gaps is the lack of a local RE plan/need to integrate RE in the city's development plans. Passi City's CLUP needs to be updated where areas with potential RE resources are identified and plotted. The current CDP includes provisions for ensuring sufficient electric power supply for the residential, commercial, and agro-industrial sectors. However, the use of RE is currently limited for streetlighting. RE can be incorporated as a strategy for energy resilience in the CDP when it is updated.

Currently, the city does not have any dedicated office or task force that will handle RE-related private sector concerns and coordinate development of potential public sector RE projects. The RE task force/office needs to build knowledge on various aspects of RE to allow them to strategically incorporate RE in their city's development plans (CDP, CLUP, AIP, LCCAP, DRRM, etc.), and enable them to identify RE opportunities for their city. RE opportunities include technologies for social services (health, water, security, livelihood, etc.), investments/businesses on RE to stimulate local economy, and use of RE systems in public buildings to reduce electricity expenditure.

The constituents' awareness and appreciation of RE needs to be raised to facilitate deployment of end-user-based systems and support utility scale projects being developed in the city. All sectors can benefit from the net-metering scheme (solar PV rooftop) to reduce their electric bills. Promotion of the net-metering program by the LGU and the EC can increase interest among end-users.

b) Physical Challenges

RE Project Development

The City of Passi has inadequate power supply to support its growing agro-industrial sector. Ironically, agro-industries have a high potential for biomass power generation using their by-products or agri wastes. The Central Azucarera de San Antonio is a prime model for the other companies to generate their own power and sell the surplus to the grid. It is a biomass co-generation plant that qualified under the Feed-in-Tariff program.

The topography of Passi City is dominated by rolling hills and narrow valley plains. A significant portion of the city rises to a slope of 8-18% from Buyo, Mulapula, Sto. Tomas, Aglalana, and Tagubong14. The sloping areas may be challenging for RE project development, even for ground-mounted solar farms.

Passi City has been exploring the use of waste-to-energy technologies for city waste management. The current available feedstock (city wastes) volume is not sufficient to meet techno-economic viability

[14] Passi City 2018-2022 CDP

requirements of prevalent technologies. It will investigate the viability of integrating a landfill gas recovery system in its on-going sanitary landfill project.

The limited RE projects initiated by the private sector indicates lack of local investments on RE, including for solar PV rooftop systems (net-metering). Only the CASA and a limited number of rooftop solar PV were initiated by the private sector. Rice, sugarcane, and coconuts are the most significant agricultural products where by-products may be tapped for other biomass projects. More detailed resource assessment is necessary to quantify the available by-products/agri-industrial wastes for power generation to attract more project development/private investments.

Low Household-level electrification rate

All 51 barangays of Passi City are connected to ILECO 2 except for several sitios that are unelectrified. According to NEA's electrification baseline, 6 out of 222 sitios are unenergized. As of 2019, 14,397 out of the 19,288[15] potential household connections have been connected, which represents 75% household level electrification[16].

Natural calamities and disasters

Natural calamities and disasters are the biggest threat to RE development and operation in the province. It ranks 62nd in overall resiliency among the 112 component cities in the country, taking the top spot for its disaster risk reduction plan, annual disaster drill, early warning system, and local risk assessments. However, it ranked lower in terms of having emergency infrastructure and preparedness of utilities[17]. The risk to RE projects will need to be included in its future DRRM plan in. RE can also be used as a strategy for response and enhanced resilience.

4. Case Study: Concepcion

a) Governance/Administrative Challenges and Issues

The Municipality of Concepcion has infrastructure plans for its municipality but were realigned for COVID-19 response. These projects are the rehabilitation/Improvement of Public Markets/Concreting of Parking Spaces and Construction/Rehabilitation of Farm to Market Roads in Prioritized Barangays.

Concepcion also allocated its Counterpart to TSKI & NHA Resettlement Projects for the Multi-Purpose Hall, Road Access, Street Light and Potable Water Supply, and others. It also has its LGU Counterpart for KALAHI-CIDSS: National Community Driven Development Project (KC: NCDDP) but was realigned for COVID-19 Expenses. The municipality also allocated funds for the Community Development Assistance Projects with specific project to be identified based on 20% IRA Utilization Guidelines & project proposal submitted by the barangays. The budget for the priority projects of 25 barangay at P100,000 each as Aids to Barangays/Support with specific projects were realigned for COVID-19 expenses including the Installation of Solar Street Lighting Projects and Rural Electrification Projects in Prioritized Barangays.

[15] Based on 2015 census
[16] NEA. Reference for the Preparation of the Total Electrification Masterplan – 2015 Census (without growth rates) Region 6. https://www.nea.gov.ph/ao39/downloads/category/184-reference-for-the-preparation-of-the-total-electrification-masterplan-2015-census-without-growth-rates
[17] DTI. *Cities and* Municipalities. https://cmci.dti.gov.ph/lgu-profile.php?lgu=Passi

Other infrastructure project of Concepcion includes construction/improvement/rehabilitation of LGU Potable Water System, completion of Multi-Purpose Center (Municipal Auditorium), Construction/Rehabilitation/De-clogging of Drainage Canal with Sidewalk in Poblacion. Concepcion funds its Coastal Resource Management and Bantay Dagat Operation for its municipality.

There are opportunities for waste-to-energy projects with the improvement of Eco-Park/Materials Recovery Facilities (MRF) and the Ecological Solid Waste Management (ESWM) Program/Garbage Collection & Disposal of the municipality.

b) Physical Challenges

RE Project Development

There are 11 island barangays out of the 25 barangays in Concepcion with a population of 43,159 in 10,202 households with an annual growth rate of 1.64% according to the 2015 census. Concepcion is host to the 270MW Palm Concepcion Coal-Fired Power Plant that is currently operating a 137MW and will expand to 270MW in 2021. The funds for Concepcion and ILECO III as host to the power plant under ER1-94 was realigned for Covid-19 response. RE initiatives such as installation of solar streetlight was done by the municipality. An 80kWp solar rooftop system will be installed on various building in Concepcion from the UNDP DREAMS project in coordination with the Iloilo Provincial Government.

There are still opportunities of developing solar projects in the island communities of Concepcion for rural electrification as well as hybrid mini grids with existing diesel gensets for power and potable water supply. The use of renewable energy for productive use such as ice making, cold storage, and fish drying are still to be identified for development, funding, and implementation.

Low Household-level electrification rate

The 25 barangays of Concepcion are all supplied with electricity by ILECO III at 100% electrification. Of the potential 10,000 connections based on the 2015 census, 6,458 connections were achieved in 2018 with an electric cooperative membership of 5,061. This is a low electrification rate of 64.58% by ILECO III compared to the average of 80.22% for its whole franchise area. This is brought about by the difficulty and cost of electrification of the 11 island communities of Concepcion. The generating capacities required by the islands are small and does not meet the minimum requirement of NPC SPUG to generate power at a subsidized price. Diesel gensets operating in island communities of Concepcion are subsidized by ILECO III and the LGU.

Natural calamities and disasters

Concepcion is one of the badly hit municipalities in northeastern Iloilo by typhoon Yolanda. There were several strong typhoons that hit the area and stronger storms are expected to come. These disasters need to be considered in the design of infrastructure and renewable energy projects. Covid-19 also created a negative impact in the development of the municipality that has become a priority to be addressed.

D. Challenges for the Power Distribution and Transmission Providers

1. Electric Cooperatives

The main challenges confronting the ECs insofar as RE development is concerned are summarized below:

Governance Aspects	Physical Aspects

• Lack of readiness of ECs in terms of technical capacities
• Limited promotion of net-metering program
• Lack of readiness of ECs in implementing the Green Energy Option Program (GEOP) and in complying with the Renewable Portfolio Standards (RPS)
• Private companies may develop RE faster than host ECs
• Lack of consumer services and management
	• Meeting growing electricity demand
	  ○ Power supply issues that may be attributed to the congestion of the transmission network
	  ○ Distribution network requires upgrading to connect more embedded generation
	• Limited access to funding sources for RE projects
	• Long process for land conversion and Environmental compliance requirements
	• Low electrification rate in some sitios
	• Negative COVID-19 impact on funding/electricity demand (?)
	• Calamities

a) Governance/Administrative Challenges and Issues

The electric cooperatives appreciate and understand their role under the new power sector environment, in fact since the EPIRA law was passed in 2001 followed by the RE Act in 2008 and then the NEA Reform Act in 2013. These laws allow them to fulfill new roles on top of their main function, that is, to distribute electricity and provide electrification. An emerging concern will be the ability of the ECs to comply to the new on-grid and off-grid Renewable Portfolio Standards (RPS). The RPS requires ECs to source a portion of their electricity sales from RE. They may source their RE supply by contracting them out through a Competitive Selection Process (CSP) or developing their own RE projects. The ECs in the Province of Iloilo together with the ECs in Panay Island have plans to source out the growing energy need of their customers and RPS requirement from generating companies through a cluster CSP.

ECs may develop on-grid RE projects to supply their captive market to up to 50% of the electricity sales. However, the current regulation still requires ECs to undertake a CSP, where they (or their subsidiary) can take part in, when they want to develop a RE site for power supply. For off-grid areas, ECs can operate mini-grids supplied by RE or RE-diesel hybrids.

One of their main concerns has been their technical capacities to develop RE generation projects, specifically for off-grid electrification. ECs perceive that private companies are more capable and thus crowding them out in the development of RE projects. To be sure, the ECs have undergone capacity building activities since these laws had been issued. For example, personnel of ILECO III are supported with capacity building workshops and training including "Seminar on Simplified Tool for Development for Renewable Energy – Diesel Hybrid System and Design of Utility Scale Solar PV" conducted by NEA. This was intended to assist ILECO III in hybridizing their diesel systems in island communities. Given that the

private sector may have the upper hand in relation to RE project development, there are opportunities for ECs to partner and collaborate with private sector generators and this scheme has not been explored yet.

The challenges in off-grid electrification go beyond capabilities to develop power generation projects but also include other market-based issues. One primary issue is the lower electricity demand in off-grid areas to rationalize the cost of putting up RE-hybrid mini-grids. This is where LGUs can support in developing anchor loads such as cold storage facilities, telecommunication sites, or other economic activities that will establish electricity demand to increase the viability of putting up RE power infrastructure. Its benefits will go beyond energy access but also create employment and livelihood opportunities.

Managing the needs of widely dispersed and remotely located consumers, particularly in off-grid islands, present challenges to the electric cooperatives. But some solutions have been put in place. To address the needs of ILECO III consumers over the long stretch on the eastern coast of Iloilo, there are area offices in Sara, Barotac Viejo, and Balasan where the consumers can go. A total of 369 Barangay Power Associations (BAPA) were also organized in the 13 municipalities to assist the EC in the management of consumers in remote areas.

Other issues related to on-grid operations include ECs' need to facilitate consumer-based RE programs, such as net-metering and the GEOP. The net-metering program is already implemented in the three ECs' franchise areas. Increasing the public's awareness on RE and the implementation of I-PREP may see a rise in net-metering eligible participants, as well as GEOP customers. The ECs need to understand the grid's limits in terms of embedded variable renewable energy and enhance their capability to manage its growth.

b) Physical Challenges

Meeting demand

The primary function of electric cooperatives is to meet growing electricity demand and to make electricity services available when consumers need them. The RE Act has also imposed new obligations to the ECs with respect to the share of renewable energy in meeting this demand.

To meet their growing energy demand and RPS requirement, the grid infrastructure must be ready to accommodate higher penetration of embedded variable RE generation. ECs may use net-metering systems, GEOP, and its RE supply contracts to comply to the RPS. These will require that the grid has the capacity to accept more embedded generation.

RE Project Development

Although ILECO III attended the workshop in designing hybrid systems for their diesel gensets, NPC-SPUG has taken the lead with plans in hybridizing their diesel generators with solar for Gigantes island as an opportunity to utilize RE in supplying power in off-grid areas. There are other private initiatives in developing renewable energy projects on solar, wind, and hydro in the franchise area of ILECO III that are either off-grid, large capacity for connection with the transmission line, or embedded in their distribution system.

But the ECs also think there is a dearth of funding available for RE projects, while their internal resources have been prioritized towards network investments. They also raised the issue of land conversion and environmental compliance that to their mind hinder the development of RE projects.

Low Household-level electrification rate

Although on average, the whole province is reported to have relatively high electrification rate at more than 90%, 547 sitios remain unenergized as of September 2019 and close to 44,000 potential connections, which are practically all households, based on 2015 Census remain unserved. This brings down the actual electrification level to 85% based on 2015 Census. Most of these unserved households are in the franchise areas of ILECO II and ILECO III.

On-grid data for ILECO III has 74.37% electrification with 81,750 households energized out of 109,919 in 309 barangays. Its off-grid data shows a 13.30% electrification with 1,685 households energized out of 12,669.

Use of renewable energy systems such as solar, wind, and hydro can provide off-grid electricity in unelectrified communities in the islands and uplands. A sustainable business model can be adapted by ILECO III to avoid dependence on grants in meeting their electrification targets. ILECO III had been using solar home systems in serving its off-grid consumers both in the island and upland communities that are not economically viable for grid extension.

The financial requirements to address Covid-19 realigned the electrification funds from the ER1-94 that delayed the electrification plan of the ECs.

Natural calamities and disasters

The ECs agree with the local governments that more frequent and fiercer calamities threaten infrastructures, properties and livelihood, not to mention human lives, in the province. For example, the coverage areas of ILECO III in 13 municipalities in the northeastern part of Iloilo is frequently hit by strong typhoons. Infrastructure and renewable energy project development should climate proof the technical design against extreme weather conditions, man-made disasters, and calamities.

2. NGCP and NPC-SPUG

The primary transmission-related issue in Province of Iloilo is the congestion of the transmission grid. The current capacity of the grid is fully used by existing power generation plants. No new power plants, either RE or fossil fuel-based, can be connected to the transmission network until it is upgraded. The National Grid Corporation of the Philippines is scheduled to complete the upgrading of the Cebu – Negros – Panay 230kV backbone by December 2022 (part of the Transmission Development Plan).

NGCP cited difficulties in acquiring right-of-way rights that contribute to the causes of delays in its projects. It must be noted that this a common issue for NGCP across the country and not only in Province of Iloilo.

The NPC-SPUG provides power generation (and distribution services in some islands) services in missionary areas or off-grid sites. It owns and operates the 0.926kW diesel generator in Carles while the electricity distribution services are provided by ILECO III. It is planning to provide power generation and

distribution services in Tagubanhan Island in Ajuy, in the municipality of Concepcion. They are coordinating with ILECO II to complete this project.

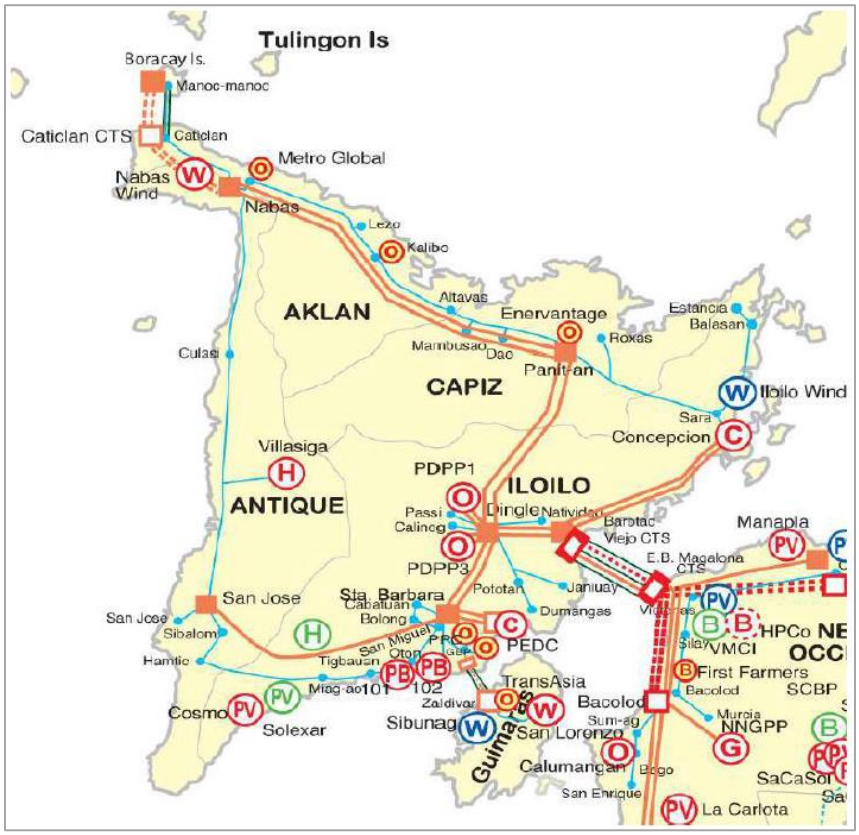
NPC-SPUG must now incorporate renewable energy in its supply of power in Carles, Tagubanhan island, and in its other sites across the country as part of the new off-grid RPS rules. It has already allocated budget for the solar PV hybridization of the Carles site.

Both the NGCP and NPC-SPUG consider calamities and disasters as the primary threats to their operations. Strong typhoons can topple NGCP's transmission networks and damage generation facilities in NPC-SPUG areas. Both have already established disaster risk response systems. Since off-grid sites can be more challenging to manage during calamities, NPC-SPUG coordinates and works closely with barangays to help them restore electricity services and reduce downtime.

E. Readiness assessment of the Panay Grid

The development and utilization of renewable energy sources of Iloilo will require the transmission lines to convey RE generation electricity from resource specific locations to the load centers. The transmission line of Iloilo is part of the Panay grid and interconnected with the Cebu-Negros-Panay transmission backbone. Panay Island including the province of Iloilo is primarily supplied by two large coal power plants. These are the 317.4MW PEDC in Iloilo City and the 135MW PCPC in Concepcion. Panay Island has become self-reliant and less dependent on power import from Negros via the 138 kV Negros–Panay Interconnection System.

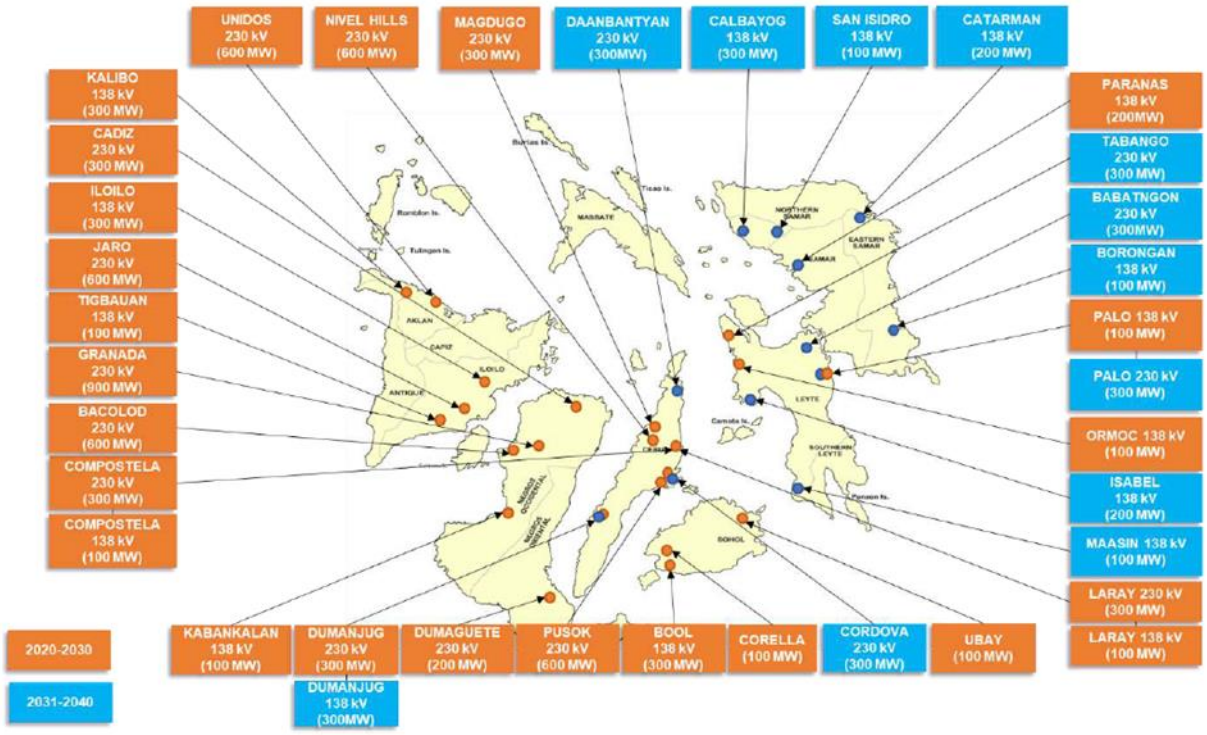
Figure 30. Panay Island Transmission Network (NGCP TDP 2020-2040)



NGCP has included in their TDP the Solexar solar plant, the Igbaras hydro plant in southern Iloilo, and the wind farm in northeastern Iloilo. The Igbulo (Bais) Hydro with a capacity of 5.1MW in Igbaras, Iloilo will be connected along the Sta. Barbara–Miagao 69 kV line. This line will also support the 34.3MW Tigbauan Solar in Brgy. Cordova Norte and Bantud, Tigbauan, Iloilo. The Iloilo 1 Wind Power Project with a capacity of 213MW in Batad and San Dionisio, the Iloilo 2 Wind Power Project with 500MW capacity in Concepcion, and the 17.5MW GPPPI Biomass Power Plant Project in Mina are also included in the TDP.

A map is provided in the TDP with the connection points and their capacities for the Visayan grid. The tapping points recommended by NGCP for power plants in Iloilo are the 138kV Iloilo line rated at 300MW, the 230kV Jaro line with 600MW, and the 138kV Tigbauan line with 100MW capacity.

Figure 31. Recommended Power Plant Connection Points in the Visayas (NGCP TDP 2020-2040)



Development of embedded RE generation in the distribution network will not require transmission development but requires proper coordination with the EC's. NGCP has sited embedded power generation projects that do not require grid reinforcement. This is important in the development of the growing solar rooftop market and also for the anticipated modular waste-to-energy projects that may be developed with the LGUs to address the solid waste problem. Other resources such as micro hydro and small wind can be utilized with interconnection plans laid out where the resources are to be developed.

The use of Battery Energy Storage Systems (BESS) to stabilize the grid and accommodate more variable RE is also considered by NGCP and the ECs, particularly ILECO I with their existing large solar installations and anticipated additional hydro and solar installations to embedded in their network.

Philippine Competitive Renewable Energy Zones (CREZ)

The abundant indigenous RE resources in Iloilo could significantly contribute to the Government's vision of ensuring sustainable, secure, sufficient, and affordable energy for the country. Developing these indigenous RE resources, however, are currently limited both by significant transmission constraints and by regulatory barriers to financial investment by the private sector developers. The initiative on the work of the Philippine CREZ process aims to encourage the transmission upgrades and expansion towards the optimal utilization of the country's indigenous RE resources.

The Philippine Department of Energy together with the United States Agency for International Development (USAID) National Renewable Energy Laboratory (NREL) partnership lead the group of power sector decision makers in the conduct of CREZ process which will be integrated in the TDP process.

The CREZ process was adopted from the Texas model that was successfully implemented in the Unites States of America (USA). The lessons learned from the grid failure in Texas during the February 2021 storm will be considered in the CREZ process as the Philippines face multiple threats on the power system both from natural calamities and man-made disasters.

V. RE Strategy and Action Plan

The main objectives of the I-PREP are to localize the national RE policies and programs and promote local RE development towards reaping the benefits of RE deployment and applications at local levels and support the "greening" of local economic development.

The I-PREP elaborates and implements the Renewable Energy Program under *Strategic Theme 2: Healthy living environment through environmental protection and rehabilitation* of the province's Eight strategic themes. It specifically underscores the Executive Agenda on Environment and Natural Resources Services. The I-PREP is therefore and must be consistent with the Vision and Mission of the Province as well as anchored on the Provincial Development Framework (see Box).

Box 1. Provincial Development Framework

I. VISION "*A progressive, peaceful, ecologically-balanced, resilient, environmentally safe and vibrant Province of Iloilo with sustainable agri-aqua, manufacturing, forest-based and tourism enterprises having adequate access to information, education, technology and other entrepreneurial opportunities, where men and women equitably share the benefits of development*"
II. MISSION "*Create an environment conducive to the development and transformation of the Province of Iloilo into a socially, culturally, economically, and spiritually vibrant community with a body politic that is strong and unassailable*"
III. Overall Guiding Principles ❖ A committed and transparent bureaucracy ❖ A bureaucracy that values efficiency and effectiveness in the delivery of public services ❖ An engaged partnership with the Sanggunian Panlalawigan and the Local Government Officials ❖ A government that works closely with the private sector, NGAs, NGOs, faith-based and the Peoples Organizations ❖ Efficient and judicious use of financial resources ❖ Programs and projects that directly address the needs, priorities and aspirations of the People of the Province of Iloilo.

In addition, the strategies and action plans in the I-PREP take advantage of external opportunities that enhance local RE development on one hand and addresses challenges, issues and gaps that hinder local promotion of RE on the other hand.

A. Key RE Opportunities for the Province of Iloilo

The key (external) opportunities identified that encourage the development of renewable energy in the Province of Iloilo are as follows:

1. Enabling national policy environment

This opportunity refers to the presence of all relevant national laws, policies and regulations that encourage renewable energy development, including at local levels, and provide the mandates and define the roles of local governments. Foremost among these is the Renewable Energy Act of 2008, which includes among other policy instruments consumer-oriented policy instruments, including net metering that encourages consumers to be renewable energy producers (or to become prosumers) and Green Energy Option that promotes consumer choice or empowers consumers to choose their preferred renewable energy supply. The NREP 2020-2040 that is under development at this writing promotes the development of RE at the local levels and for the use of rural-based sectors and in the delivery of social and economic services, which are the main mandate of local governments.

The other relevant national laws, policies and regulations include (in descending chronological order of their issuance):

- Nationally Determined Contribution (NDC, 2021)
- LGU Energy Code (2020)
- National Energy Efficiency and Conservation Act 2019
- EVOSS Law (2018)
- NEA Reform Act (2013)
- Philippine Disaster Risk Reduction and Management Act 2010
- Climate Change Act 2009
- Biofuels Act 2006
- Electric Power Industry Reform Act (EPIRA) 2001
- Ecological Solid Waste Management Act 2000

These national level policies also promote RE development at the local levels in different ways. For example, the LGU Energy Code, which is the DOE and DILG Joint Memorandum Circular 2020-01 entitled *"Guidelines for LGUs to Facilitate the Implementation of Energy Projects",* aims to: "(a) establish, strengthen and integrate the national energy plans, programs, policies and mechanisms into the local development plans; (b) harmonize and fast-track the implementation of EVOSS (Energy Virtual One Stop Shop) Act, EODB (Ease of Doing Business) Act, EO (Executive Order) 30[18] and AO (Administrative Order) 23[19] with the establishment of a unified and streamlined permitting process; (c) maximize benefits from energy projects to host communities; and (d) implement other necessary energy programs and projects to spur the total development of the LGUs."[20]

[18] "Creating the Energy Investment Coordinating Council in order to Streamline the Regulatory Procedures Affecting Energy Projects"
[19] "Eliminating Overregulation to Promote Efficiency of Government Processes"
[20] DOE 2020, *Philippine Energy Plan 2018-2040,* p. xxviii.

A strong connection is also made between RE and climate change. Indeed, energy is a major source of GHG emissions not only at the national level but also at the sub-national levels (province, city and municipal levels). In order to reduce GHG emissions, climate actions include increased adoption and deployment of RE technologies. Local governments can influence as policy maker and regulator and directly contribute as end-user to reduced use of fossil-based electricity end-uses in the residential and commercial sector by switching to RE-based electricity sources. Local governments can also initiate the development of RE-based technologies and their realization in partnership with the private sector. Foremost among these clean technologies are WTE technologies, which more than an energy solution should be integrated to the solid waste management strategy of local governments.

The National Climate Change Act of 2009 is implemented at local levels through the Local Climate Change Action Plan (LCCAP). In many if not most cases climate strategies at local levels have prioritized adaptation actions and so there is an opportunity to expand climate change response and strategies to include mitigation actions.

2. Favorable international trends

In addition to the national enabling policy environment, economic and sectoral trends at international level provide opportunities for the development of indigenous RE resources and accelerated uptake of RE technologies (RETs) in different applications or economic sectors. These international trends favorable to RE development include:

- International agreements and collaborative actions. Foremost among these international agreements are the Paris Agreement and the Global Sustainable Development Goals (SGDs). The Paris Agreement commits countries to actions that would limit global warming to below 1.5°C while the SDGs commit countries to 17 development goals that ultimately (and ambitiously) aim the elimination of poverty.

  The Philippines has ratified the Paris Agreement that has been endorsed practically by all countries. In 2021, the country issued its Nationally Determined Contribution (NDC), committing to 75% GHG emissions reduction and avoidance from business-as-usual (BAU) levels in 2020-2030, of which 2.71% is unconditional (using national resources) and 72.29% is conditional (with international support through the Paris Agreement).

  The SDGs include SDG7 that aims to ensure access to affordable, reliable, sustainable, and modern energy for all. Specifically, it targets all by 2030 to:

  (1) ensure universal access to affordable, reliable, and modern energy services,

  (2) increase substantially the share of renewable energy in the global energy mix and

  (3) double the global rate of improvement in energy efficiency.

  Achieving the Paris Agreement and the SDGs has generated international cooperation and collaborative actions, especially to assist developing and less-developed economies towards the attainment of these goals. These have mobilized funds for increasing capacity and awareness of all stakeholders at national and sub-national levels, strengthening institutions and organizations, and increasing investments in sustainable infrastructures and technologies.

- *Decreasing costs of RETs.* Overtime, particularly during the last two decades, the financial costs of RETs particularly variable renewable energies (VREs) have gone down substantially and made them competitive with fossil-based technologies. Factoring and quantifying their benefits to the environment certainly adds to the attractiveness of the RETs to end-users and investors.
- *Increasing appreciation of the multiple and co-benefits of RE*. Besides its environment benefits, RE brings other economics and social benefits, including reduced impacts of energy utilization on health, powering productive uses of energy and small-scale enterprises, and creating jobs directly during construction and operation and maintenance of these technologies and indirectly through economic linkages in the RE value chain.

B. Gap Analysis and Recommended Actions

The specific challenges identified in the preceding chapter are translated into key issues and concerns. Using the standard Gap Analysis, these issues and concerns (gaps) are dissected with respect to appropriate target indicators and relevant policy, general actions to address the gap, time frame, and specific recommended programs, projects and other activities.

ISSUES/ CONCERNS	DESCRIPTION OF THE GAP	INDICATORS	RELEVANT APPLICABLE POLICY	SUGGESTED ACTIONS TO BRIDGE THE GAP	Time frame[21]	RECOMMENDED PROJECTS, PROGRAMS and ACTIVITIES	RESPONSIBLE PARTY
1. Lack of capacity of the LGU to incorporate Renewable Energy in their development plans	The LGUs do not have the resources and technical capability to incorporate RE in their CLUP (spatial plan) and in their development plans (LCCAP, SWMP, LEECP). The LGUs lack the capability and tools to identify areas with sufficient RE resources.	RE is integrated in the: 1) Comprehensive Development Plan (CDP) 2) Local Climate Change Action Plan (LCCAP) 3) Annual Investment Plan (AIP) 4) Provincial Development and Physical Framework Plan (PDPFP) 5) Comprehensive Development Plan-Executive and Legislative Agenda (CDP-ELA) 6) Provincial Development Investment Program 7) Annual Investment Program	LGU Energy Code RE Law	Capacity building of LGU personnel	Short-term	LGU personnel to undergo training on Renewable Energy technologies and project development. Build capacity on available RE resource assessment tools and databases Incorporate potential RE resources in GIS maps	IPG and LGUs

[21] Short-term: up to 2025; medium-term: up to 2030; long-term: up to 2030.

ISSUES/ CONCERNS	DESCRIPTION OF THE GAP	INDICATORS	RELEVANT APPLICABLE POLICY	SUGGESTED ACTIONS TO BRIDGE THE GAP	Time frame[21]	RECOMMENDED PROJECTS, PROGRAMS and ACTIVITIES	RESPONSIBLE PARTY
2. No specific office that handles RE development	No SP resolution on creation of office to handle RE. This office can facilitate the development of RE projects by the private sector and by the LGU.	A separate Local RE Office established or Special RE Task Force or TWG created	Local Ordinance Sanggunian Resolution	Creation of separate RE office or Special RE Task Force or TWG	Short-term	Appropriation of fund for recruitment and hiring Establish dedicated team from current personnel	LGU
3. Lack of awareness & appreciation on RE development	Stakeholders are not aware of alternative power sources which could be developed and utilized in the locality with potential to bring positive effects in the long term. This may result to opposition against RE projects being developed.	• RE is integrated in the IEC programs of the LGUs • Number of IEC activities	RE Law NREP	Create awareness among people on RE development which could be useful and applicable in the locality	Short- to medium-term	1) Conduct IEC on RE among barangays 2) Social media campaign on RE 3) Special courses/seminars on RE among universities	IPG, and LGUs, Academe
4. Lack of technical expertise to identify and develop RE projects, particularly in the agriculture and fisheries sector	The LGU/IPG may not have the technical expertise to develop and implement RE projects that can benefit the agriculture, fisheries, and other sectors (buildings, tourism).	Members of the Local RE office or Special RE Task Force or TWG trained in RE policy, planning, technology, and project development	NREP 2020-2040 REP-AFS	Capacity building on identification and prioritization of different RE technologies based on agriculture and fisheries resources; how to do financial	Short- to long-term (continuing activity)	1) PURE project development and implementation workshops 2) Technology transfer workshops on Renewable Energy 3) Training (webinars)	IPG, LGU, Academe, DOST, DOE

ISSUES/ CONCERNS	DESCRIPTION OF THE GAP	INDICATORS	RELEVANT APPLICABLE POLICY	SUGGESTED ACTIONS TO BRIDGE THE GAP	Time frame[21]	RECOMMENDED PROJECTS, PROGRAMS and ACTIVITIES	RESPONSIBLE PARTY
	They may not be able to identify opportunities where PURE can be used to provide social services.			analysis; community organization			
5. Inadequate investments on Renewable Energy	Limited number of project developers that initiate the development of RE projects and current difficulty in accessing financing for RE projects.	Number and value of RE investments in the province	RE Law NREP 2020-2040	• Identification of investment opportunities on RE project development and implementation • Investment Promotion • Create an enabling business environment for Renewable energy investments	Medium- to long-term	1) Investment promotion for renewable energy projects 2) Identify specific RE projects 3) Possible local tax incentives for RE projects 4) Improve the local permitting process – participation in EVOSS 5) Consider RE sites in the CLUP to reduce need for land use conversions 6) Explore PPP projects	Provincial & Municipal Investment Promotion Office Legislative Body
6. Lack of or limited budget for small-scale RE projects	The LGU/IPG may not have allocated budget to implement small-scale RE projects.	• Budget allocation for small-scale RE projects • Total costs of small-scale RE projects	Annual Investment Plan	Explore potential sources of financing	Medium- to long-term	1) Allocate budget on the next planning period 2) Explore financing from the national government such as REP-AFS program of the DOE and DA	IPG, LGUs

ISSUES/ CONCERNS	DESCRIPTION OF THE GAP	INDICATORS	RELEVANT APPLICABLE POLICY	SUGGESTED ACTIONS TO BRIDGE THE GAP	Time frame[21]	RECOMMENDED PROJECTS, PROGRAMS and ACTIVITIES	RESPONSIBLE PARTY
						3) Explore financing from DOE and DA's development projects such as DREAMS	
7. Supply chain issues on RE components and parts	There are no reliable supply chain for RE components and parts that will ensure reliable O&M of RE plants. No company / logistics facility to tap	• Availability of RE parts, components, and suppliers are integrated in RE contracts • Number of enterprises engaged in RE supply chain located in the province		• RE investment promotion to attract RE companies into the province • Tapping into private logistics company for transportation of materials for RE development	Long-term	Include investments in RE supply chain in investments promotion and incentives	IPG and LGUs
8. Transmission and distribution networks are not ready for additional variable renewable energy capacities	The Panay transmission grid is congested and does not have the capacity to connect new power plants. The distribution grid may not be ready to manage high penetration of variable renewable energy. This will make it hard for the ECs to comply with their RPS requirement.	Number of new VRE projects connected to the Panay Grid	RE Law NREP DOE Circular on Storage (DC 2019-08-0012) DOE Circular on Smart Grid (DC 2020-02-003)	Uprate and improve transmission and distribution grid infrastructure	Medium- to long-term	1) Include grid improvements in the Transmission Development Plan with consideration of the CREZ areas 2) Include distribution line and infra improvements in the Distribution Development Plan 3) Installation of BESS 4) Development of DRE projects at customer/end-use level 5) Implement smart grid	NGCP ECs

ISSUES/ CONCERNS	DESCRIPTION OF THE GAP	INDICATORS	RELEVANT APPLICABLE POLICY	SUGGESTED ACTIONS TO BRIDGE THE GAP	Time frame[21]	RECOMMENDED PROJECTS, PROGRAMS and ACTIVITIES	RESPONSIBLE PARTY
9. Tedious process of Land Conversion for potential RE locations		Number of utility-scale RE projects	EVOSS Law	Incorporate RE zones (e.g. CREZ) in CLUP	Medium- to long-term	CLUPs are updated to incorporate RE zones	
10. Calamities, Hazards, and disasters	No climate proof RE Systems and other power infrastructure. Potential power outages due to damages caused by calamities	Number of climate resiliency plans, climate proofing projects	Memorandum Circular No. 2014-135 on the guidelines for the formulation of the LCCAP DRRM Plans DOE Circular on Resilience (DC 2018-01-0001)	Develop and construct resilient power infrastructure (power plants and grid networks) Enhance resilience of existing infrastructure Disaster Risk Reduction and Response strategies and schemes	Medium- to long-term	Enhance access of project developers to information on disaster- and climate-proofing of power projects Include disaster-proofing improvements to the distribution network in the DDP Develop and implement disaster risk reduction and management plans among power players Develop and implement climate resiliency plans	Project developers, academe ECs ECs and power generators
11. Power supply issues (brownouts) 12. High cost of electricity, especially for commercial end-users	Power shortage issues because of increasing demand for electricity. Limitations in existing power generation and capability of the grid to connect additional power generators. Businesses are not exploring RE opportunities to reduce their	System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) Electricity tariffs	RE Law Magna Carta for Electricity Consumers	• Identification of investment opportunities on RE project development and implementation • Promotion of consumer based market mechanisms with ILECO II (GEOP and net-metering)	Medium- to long-term	Encourage businessmen/investors to develop RE projects – Promotion of RE investment opportunities ECs may conduct their own promotion activity or create a separate program for net-metering. Rooftop solar for hospitals and other public buildings	IPG and LGUs Investment Promotion Office ECs PHMO, Engineering Offices P/MENROs NGCP and ECs

ISSUES/ CONCERNS	DESCRIPTION OF THE GAP	INDICATORS	RELEVANT APPLICABLE POLICY	SUGGESTED ACTIONS TO BRIDGE THE GAP	Time frame[21]	RECOMMENDED PROJECTS, PROGRAMS and ACTIVITIES	RESPONSIBLE PARTY
	electricity bill. This may stem from lack of awareness on consumer based RE systems.			• Enhance the grid infrastructure		Explore WTE projects if they are technically and economically feasible. Enhance the transmission and distribution grid	
13. Low electrification of some areas.	Some sitios remain to be unelectrified. There are many actors developing projects with no cohesive action plan	Electrification rates at connection or household level	100% electrification target of the country Off-grid omnibus Total Electrification Program (TEP)	Electrification program or strategies	Medium- to long-term	Unified or integrated strategies towards 100% electrification may include: Stand-alone RE systems (e.g. SHS) may be deployed at the HH level Offer the site to private sector that may be willing to serve the area Improved coordination among actors	ECs/City government/ IPG City & private sector
14. Possible change in political leadership after 2022 elections	Stakeholders are concerned that policies would change when political leadership changes after 2022 elections	Party affiliations of elected officials	Relevant Local Ordinances that would be formulated and passed as a result of I-PREP	Integration of renewable energy in local development plans	Short- to medium-term	RE-integrated local development plans	PGI, LGUs
15. Environmental compliance	ECs find it difficult to comply with environmental permitting	Appropriate environmental permits prepared (IEE checklist, IEE report, EIS)	Environmental Laws and DENR Regulations	Dedicated unit within EC to address environmental compliance	Medium- to long-term	Re-organization Training in environmental	Project proponents

ISSUES/ CONCERNS	DESCRIPTION OF THE GAP	INDICATORS	RELEVANT APPLICABLE POLICY	SUGGESTED ACTIONS TO BRIDGE THE GAP	Time frame[21]	RECOMMENDED PROJECTS, PROGRAMS and ACTIVITIES	RESPONSIBLE PARTY
	requirements of energy projects					requirements and other permits	

C. Key Strategies and Action Plan

The following are the recommended strategies to address the challenges discussed in the previous chapter, and the major issues and concerns enumerated in the previous section.

1) Institutionalization and integration of RE in local policy and plans
2) Institutionalization of local RE capacity
3) Promotion of Local RE investments and project development
4) Climate resilience strategy

The key action plans to implement these strategies are shown below:

General Strategies	Key Actions
Institutionalization and integration of RE in local policy, plans, and action	- Institutionalize the I-PREP through a Sangguniang Pambayan Resolution - Localize implementation of LGU Energy Code through a local ordinance - Create a RE office or a RE task force within the LGU that will spearhead RE-related activities and address RE-related issues - Integrate RE opportunities in the provincial development and investment plans (PDPFP, CDP-ELA, LCCAP, PDIP, AIP) - Develop and implement RE projects for rural development (social services, agri-fisheries, tourism, etc) - Develop and implement RE projects that may be integrated with government owned-assets (such as rooftop solar PV installations, etc,) - Create a RE task force within the municipal LGU that will spearhead RE-related activities and coordinate with IPG RE office/task force - Incorporate RE, including Waste-to-Energy, in LCCAP, CDP, CLUP, AIP, 10-Yr SWMP
Institutionalization of Local RE Capacity	- Increase knowledge and capacity in energy integrated local planning, - Capacity building for RE competency (technologies, resource assessment, business models, etc) - Strengthen research and development; partnerships with local universities and other stakeholders - Integration of RE in the academic programs of the education sector - Increase knowledge in RE and climate actions (mitigation and adaptation) and capacity in identifying climate actions, including RE projects - Capacity building for ECs on RE resource assessment, technologies, and project development, and environmental compliance and other permitting requirements

Promotion of Local RE Investments and development	- Incorporate RE in the Provincial Investments and Incentives Code
	- Undertake specific resource assessments to see which RE sources can be fully utilized in the province
	  o Undertake assessment of rice hulls and other agricultural by-product and residues as RE resources and appropriate RE technology and applications potential
	  o Undertake province-wide hydro resource assessment and develop appropriate hydropower projects and technologies
	  o Undertake assessment province-wide for WTE opportunities, including resource potential and appropriate technologies and development of WTE close to existing sanitary landfills, building on the experience with WTE project in Cabatuan
	- Build capability to maintain provincial RE database and provide inputs to the DOE for the national RE databases
	- RE Investment Promotion/Event for on-grid and off-grid RE projects
	- Launch province-wide RE awareness (IEC) campaign for the general public and specific sectors (agriculture and fisheries, commercial and buildings, households).
	- Explore and promote RE opportunities and applications in economic growth sectors (agriculture and fisheries, tourism, commercial sector)
	- Exploit opportunities for rooftop solar PV and net metering
	- Take advantage of presence of RE technology providers
	- Explore PPP on RE projects
	- Participate in the EVOSS to streamline the permitting process
	- Explore PPP on RE projects
	- Form an RE Business Development Unit within the EC, to explore among other tasks funding opportunities for RE projects
	- Improve the distribution infrastructure to make it ready for RE interconnection
	- Explore partnerships with private sector towards development of DRE systems (e.g. AIEC/ILAW JV)
	- Continue RE hybridization of diesel gensets
	- Study feasibility of interconnecting micro-hydro projects/mini-grid to the main grid
	- Cooperation with RE project developers and government agencies (DOE, NEA, NPC-SPUG)

Climate Resilience Strategy	- Increase awareness on climate risks at community level and opportunities for climate actions (mitigation and adaptation) - Incorporate community-based climate actions in the LCCAP - Incorporate resilience to climate hazards in local disaster risk reduction and management plans - Climate proofing of RE projects and other infrastructure projects. - Implement distribution system upgrades to improve supply reliability and increase resilience against climate impacts - Strengthen climate resilience plan to “harden” power generation, distribution, and transmission infrastructures - Development of resilient embedded RE hybrid systems

D. Initial Projects Identified

The SWOT and Gap analyses conducted with inputs from stakeholders resulted in an initial list of typologies of and specific projects. These projects, on one hand, aim to take advantage of the opportunities discussed earlier and, on the other hand, address the major issues and concerns as regards localization of national renewable energy policy and promotion of local RE development.

Following the SWOT Analysis, the projects are also divided into those that address governance issues and those that focus on RE project development and other physical aspects of RE development. Logically, the first set of projects are also called 'soft' projects, while the other set are also called 'hard' or infrastructure projects.[22]

Governance

1. Training on Renewable Energy
2. Provincial RE Resource Assessment
3. Establishment of Local RE Office
4. IEC Campaign on RE
5. Integration of RE in University Curriculum
6. Investment Forum on RE
7. Capacity Building on DRE and Smart Grid for ECs
8. Capacity Building on Preparing Climate Resiliency Plans
9. Training on Environmental Compliance

Physical Aspects

1. Implementation of Smart Grid
    a. Adoption of Advanced Metering Infrastructures (including smart and pre-paid meters) among the three ECs
2. Waste-to-Energy Projects
    a. Explore potential for LFGE (landfill gas to energy)[23]
    b. Explore potential of other WTE technologies (including anaerobic digestion, pyrolysis, gasification)[24]
3. Identified and proposed rooftop Solar PV projects for the City of Passi
    a. Municipal hall building 40 kW (3 phase system)
    b. Motor pool building 15 kW (Single phase system)
    c. Passi Health Center 40 kW (3 phase System)
    d. Phase1 - Market 40 kW (3 phase System)
    e. Phase2 - Market 15 kW (Single phase system)
    f. Old municipal Building 15kW (Single phase system)
    g. Health and Nutrition Center 5kW (Single phase System)
    h. Bus Terminal 5kW (Single phase System)
4. RE Projects in the Agriculture Sector
    a. Livestock Waste Management systems using biogas
    b. RE applications in milking machine

[22] The identification of a long list of specific projects and prioritization of a short list of projects will be among the subject of the next stakeholders' consultations.
[23] The Payatas WTE project is an example of LFGE.
[24] Naga City in Cebu's WTE project is an example of AD, while the WTE project being developed in Tagum City is an example of pyrolysis. Gasification is also a common technology in converting solid agriculture or crop residues to energy sources.

c. Small-scale irrigation systems powered by solar PV pumps
d. Rooftop solar PV applications in other agriculture and fisheries facilities and buildings

5. RE Projects in the Tourism Sector
6. Rural Electrification Projects
7. Grid Enhancement Projects

The next chapters will be part of the second draft of the I-PREP.

VI. RE Investment Plan

VII. Capacity Building Plan

VIII. M&E Plan

IX. Risks and Risk Management Plan

X. Communications Plan

XI. Local Ordinances

XII. List of References

XIII. Appendices

1 Calculating Biomass Energy Potential from Crop Production Data
2 SWOT Analysis Tables

Appendix 1. Calculating Biomass Energy Potential from Crop Production Data

The theoretical biomass potential refers to potential energy output (J) of the biomass resource. It is often calculated based on its intrinsic heating value (J/g). Each type of biomass has its own heating value.

1) Calculate the available biomass resource
   Estimate the amount (Kg) of recoverable by-product or agricultural waste from the crop production data. Calculations will be more accurate if actual agricultural waste surveys are conducted. The table below shows the crop to residue ratios/residue factors for corn, sugarcane, and rice.

Harvested Crop	Crop By-product/ Biomass	Residue Factor (for every Kg of Crop)
Rice	Husk[a]	0.2 Kg Husk
Sugarcane	Bagasse[b]	0.25 Kg bagasse
Corn	Corn stover[c]	0.70 Kg corn stover

[a]Source: GIZ. 2015. *Use of Biomass as Renewable Energy Source in Panay*. http://faspselib.denr.gov.ph/sites/default/files/Publication%20Files/Bioenergy%20final%20report.pdf
[b]Source: Mena, A. *The Utilization of Sugar Cane By-Products as Substitutes for Cereal in Animal Feed*. *http://www.fao.org/3/X6930E/X6930E07.htm*
[c]Source: Go, A.W., et al. 2019. Potentials of agricultural and agro-industrial crop residues for the displacement of fossil fuels: A Philippine Context. *Energy Strategy Reviews*. 23 (2019) 100 – 113. Elsevier
Corn Stover refers to leaves or straw, stalks, husks, and some cobs that are left in the field and discarded when harvesting the corn.

   The calculated weight of by-products is then multiplied by the recoverability factor. This is the percentage of the biomass that can be collected and used for energy generation. In most cases, researchers use 50% as a conservative estimate. For bagasse, 85-90% can be a good estimate since bagasse is collected from the sugar mill.

$$Weight\ of\ Biomass\ Resource\ (Kg) = Weight\ of\ Crop\ (Kg)\ x\ Residue\ Factor\ x\ Recoverability\ Factor$$

2) Calculate the potential energy output of the biomass resource
   The potential energy output from the biomass can be calculated by multiplying the weigh of the biomass with its heating value. The heating values for rice husk, bagasse, and corn stover are listed in the table below. These values are for dry weights of the biomass.

Biomass	Heating Value
Rice Husk[a]	15.84 MJ/Kg
Bagasse[b]	18.2 MJ/Kg
Corn Stover	18.57 MJ/Kg

[a]Ame-Oko. A et al. 2018. *Analytical Method to determine the potential of using rice husk for off grid electricity and heat generation*. African Journals Online. Vol 37 No 1. https://www.ajol.info/index.php/njt/article/view/165131

[b] Alves. M. 2015. *Surplus Electricity production in sugarcane mills using residual bagasse and straw as fuel*. Elsevier. Volume 91. 2015. p 751-757

[c] Morisette, R. et al. Combustion of Cor Stover Bales in a Small 146-kW Boiler. 2011. Energies

$$Energy\ Output\ (MJ) = dry\ weight\ of\ Biomass\ (Kg)\ x\ Heating\ Value\ (\frac{MJ}{Kg})$$

3) Estimating the electricity output

The electricity output can be calculated using the conversion factor:

1GJ = 278kWh , 1GJ = 1000MJ

$$Electricity\ Output\ (kWh) = Energy\ Output\ (MJ)\ x\ 278\frac{kWh}{GJ}\ \ x\ \frac{1\ GJ}{1000\ MJ}$$

The potential capacity of the biomass plant can be calculated by dividing the electricity output by the number of projected hours of operation. In the calculations for the I-PREP, 8000 hours25 was used.

$$Potential\ Capacity\ (kW) = \frac{Electricity\ Output\ (kWh)}{operating\ hours\ (h)}$$

[25] GIZ. 2015. *Use of Biomass as Renewable Energy Source in Panay*. http://faspselib.denr.gov.ph/sites/default/files/Publication%20Files/Bioenergy%20final%20report.pdf

Appendix 2. SWOT Analyses

ILOILO PROVINCE	
STRENGTHS *Resources or capabilities that help the IPG accomplish its objectives. Strengths may be competitive advantages or specific skills/expertise.*	**WEAKNESSES** *Deficiencies in resources and capabilities that hinder IPG's ability to accomplish the objectives.*
Political/Governance • Commitment of the LCE to pursue RE investments in the Province • Presence of Provincial Investment Promotion Office • Willingness of the Provincial Government to commit in the development of RE in Iloilo • Presence of Iloilo Investment Facilitation Network (IIFN) to help RE investors in licensing and registration requirements • Presence of e-BOSS • Incorporation of RE in programs in the AIP (CCA-tagged) • Trained hospital personnel in terms of Building and Equipment Maintenance • RE is included / forecasted in the District Hospitals' Business Plan and AIP	*Political/Governance* • IPG personnel has no technical capability to evaluate RE resources, technologies and investments • Tedious process of Land Conversion for potential RE locations (from Agricultural to Industrial) **(weakness of LGUs, threat to the Province)** • No local plan specifically for RE • No personnel has participated in energy/power systems training • Lack of IEC programs and initiatives
Economic/ (market demand) • Growing demand for RE in health (public hospitals) and agriculture projects (private and public) in Iloilo Province • Supply of rice hulls and livestock waste for biomass • Favorable economic climate of Iloilo Province • Available financing thru banks • Some of PGI Buildings e.g. hospitals are ready and suitable for RE systems installation • Hospitals' locations are suitable for RE such as solar power (13 hospitals are strategically located across Iloilo Province) • Business/enterprises adopting climate-change mitigation practices in Iloilo Province	*Economic/ (market demand)* • Municipal and Agricultural Waste produced and segregated is not sufficient to meet RE technology requirements
Social	*Social*

• Potential partnerships with NGOs and International Organizations that advocate and provide funding for RE Programs and Projects	• RE is less prioritized
Technological • Presence of TIPED technology for waste-to-energy projects • Availability of GIS (for RE resource mapping)	*Technological* •
Environmental (physical) •	*Environmental (physical)* • Calamities • Lack of advocacy on Climate Change initiative on the community level
Legal • Inclusion of RE in the 10-year Solid Waste Management Plan **(for validation with PENRO)** • Presence of RE supportive policies (Provincial, Municipal Investment & Incentives Code, 10-year SWM Plan)	*Legal* • Lack of RE investment-enabling policy for the Province
Physical RE infra • Ongoing implementation of Jalaur River Multipurpose Project II – Hydropower • Presence of various RE resources in various stages of development	*Physical RE infra* • Frequent brownouts in Iloilo Province
• *CPU-AREC: LGUs made aware of the benefits of RE (4 LGUs under ILECO 3)* • *Solarization of hospitals initiative of HMO (PHP7.5 million proposal)* • *Private sector proposal* • *PGI: existing structures; link with other NGAs (DEPED in far flung areas)* • *Webinar on LGU Energy Code by RDC*	• *No in-depth knowledge at LGU level what system is beneficial with them* • *Commercial interest over LGU benefit* • *Improper assessment*
OPPORTUNITIES *Outside factors or situations that can affect IPG in a favorable way.*	**THREATS** *Outside factors or situations that can affect the IPG in a negative way.*
Political/Governance •	*Political/Governance* • Upcoming elections which may affect the direction of the Province on RE investments
Economic/ (market demand)	*Economic/ (market demand)*

• Growing sectors outside Iloilo City (e.g BPOs) with significant power requirements (I would say this is one economic strength of the province, rather than an external opportunity)	• Rising cost of fuel and electricity
Social •	*Social* • Unstable Peace and Order situation in upland Off-Grid areas
Technological •	*Technological* • Limited availability of appropriate/suitable RE supply replacement
Environmental (physical) •	*Environmental (physical)* •
Legal • Mandatory Climate Change Initiatives required by the National Government • Presence of RE and Climate-change related policies	*Legal* • Tedious process of Land Conversion for potential RE locations (from Agricultural to Industrial) **(weakness of LGUs, threat to the Province)**
Physical RE infra 1.	*Physical RE infra* 2.
• *2022 elections: keep initiatives of incumbent local governments* • *Expand solar rooftop installations in hospitals (this is more of a strength—big potential market for rooftop solar installations)* • *for RE Development RDC resolutions* • *RE promotion in agro and fisheries sector* • *Existing microhydro projects connection to the grid* • *EE&C* • *Other RE and EE opportunities* • *leasing* • *PPP* • *Provincial officials believe in benefits of RE*	• *2022 elections: discontinued with new local governments* • *Pandemic: disrupted (RE) projects* • *Oversizing of rooftop solar installations* • *Inappropriate technology*

ILOILO PROVINCE	STRENGTHS	WEAKNESSES
OPPORTUNITIES	**SO Strategies (Aggressive)** Using IPG's internal strengths to take advantage of external opportunities.	**WO Strategies (Turnaround)** Improving internal weaknesses by taking advantage of external opportunities
National enabling policy environment *3.* Mandatory Climate Change Initiatives required by the National Government 4. Presence of RE and Climate-change related policies 5. LGU Energy Code	1. Incorporate RE in LCCAP, CDP, CLUP, AIP, and province development and investment plans (PDPFP, CDP-ELA, PDIP, AIP) 2. Integration of actions identified in the LCCAP with other local development plans, including at the province level 3. Localize implementation of LGU Energy Code through a local ordinance 4. Promote RE applications in the agriculture and fisheries sector 5. Study feasibility of interconnecting micro-hydro projects/mini-grid to the main grid 6. Incorporate WTE in 10-year solid waste management plans, LCCAP, etc.	1. Increase knowledge in RE and climate actions (mitigation and adaptation) and capacity in identifying climate actions, including RE projects 2. Increase knowledge and capacity in energy integrated local planning 3. Launch province wide RE awareness (IEC) campaign, for both the general public and specific sectors (agriculture and fisheries, commercial and buildings, households) 4. Increase knowledge and capacity in WTE technologies and project development 5. Incorporate community-based climate actions in the LCCAP 6. Incorporate RE in the Provincial Investments and Incentives Code 7. Consider solar PV plus BESS (microgrid) for hospitals and other critical facilities and infrastructure 8. Integrate RE zones in CLUP as a response to tedious land conversion process
THREATS	**ST Strategies (Diversification)** Using IPG's strengths to avoid or reduce the impact of external threats.	**WT Strategies (Defensive)** Defensive actions directed at reducing IPG's internal weakness and avoiding external threats.
2022 elections could bring about change in leadership	Notes: 6. As RE is considered more resilient technology than fossil-based technologies (e.g. RE mitigates risk of fossil fuel supply disruption during calamaties), above-mentioned strategies also respond to the threat of climate hazards.	Notes: 1. Above-mentioned strategies are deemed to respond to the threat of change in political leadership as a result of upcoming national and local elections.

	7. Above-mentioned strategies also respond to the threat of political leadership change as a result of upcoming national and local elections as well as rising cost of fuels and electricity. 8. Installation of RE to increase electricity access will hopefully improve the peace and order situation in off-grid areas.	
Tedious process of Land Conversion for potential RE locations (from Agricultural to Industrial)		
Climate hazards		Incorporate resilience to climate hazards in local disaster risk reduction and management plans
Limited availability of appropriate/suitable RE supply replacement		Develop local value chain for RE supply

CONCEPCION	
STRENGTHS *Resources or capabilities that help CONCEPCION accomplish its objectives. Strengths may be competitive advantages or specific skills/expertise.*	**WEAKNESSES** *Deficiencies in resources and capabilities that hinder CONCEPCION's ability to accomplish the objectives.*
Political/Governance • Commitment of the LGU officials in the use of RE in providing social services (electricity, water, livelihood) • RE spaces/areas integrated in the CLUP updating	*Political/Governance* • No municipal RE plan • RE development is not a priority because of the absence of the roll out of the RE Act • Needed capacity of LGU for developing RE projects • Limited budget on RE programs and projects
Economic/ (market demand) • Increasing tourism development (resorts, restaurants and hotels), which are potential owners of RE systems	*Economic/ (market demand)* •
Social • High RE awareness and acceptability of the communities, especially in island barangays assisted by NGOs (ICODE, Concern Worldwide, Christian Aide, etc)	*Social* • Low awareness on RE in other barangays of the municipality not assisted by NGOs
Technological • Active RE project implementation, such as solar streetlights, in island communities by NGOs and government agencies (Kalahi CIDDS) • Approved SF4RE Project (Rooftop Solar Project) amounting to PhP7M	*Technological* •
Environmental (physical) • Available RE resources such as solar, wind and hydro (plus some biomass in other municipalities) • Small islands and communities where RE projects can be developed	*Environmental (physical)* • Difficult geographical locations (islands and mountains) for project development and monitoring
Legal •	*Legal* • Lack of local RE policies at LGU level (resolutions and ordinances)
OPPORTUNITIES	**THREATS**

Outside factors or situations that can affect CONCEPCION in a favorable way.	*Outside factors or situations that can affect CONCEPCION in a negative way.*
Political/Governance • Strong support of the provincial government • Staff are available and willing to be trained on RE	*Political/Governance* • RE is not a top priority by some LGUs • Pandemic, disasters, and calamities will alter the development direction of the LGUs in terms of budgeting and fund utilization which may not favor RE
Social • Strong support of NGOs and national government agencies (DOE, DSWD, DILG) • Presence of RE champions (Green Forum Panay, CPU ANEC, One RE, etc) • Strong support of ILECO III	*Social* •
Environmental (physical) •	*Environmental (physical)* • 5th district municipalities are prone to all types of hazards especially typhoon, storm surges, floods, and landslides
Physical RE infra • Access to ER1-94 for local development (50%), ILECO III electrification (50%) • Potential reduction of electricity bills from use of RE	*Physical RE infra* 9.

PASSI CITY	
STRENGTHS *Resources or capabilities that help PASSI CITY achieve its objectives. Strengths may be competitive advantages or specific skills/expertise*	**WEAKNESSES** *Deficiencies in resources and capabilities that hinder PASSI CITY's ability to accomplish the objectives*
Political Governance: • Dynamic and committed local officials from the Chief Executive down to Vice Mayor and sanggunian to the barangay officials. • Presence of our different local development plan such as CLUP , CDP, LDIP, LCCAP, SWMP, Environment Plan, LDRRMP, Investment Plan and etc. • Strong support and participation of people on RE Development. • Active participation of the private sector (DVPSMH, CASA, and BEST) and business establishments. • Participation of academe sector. • Full support of ILECO II for Passi City RE Development. • Support of socio civic organization	*Political Governance:* • CLUP and CDP to be updated. • There is no specific department tasked to handle RE development. • Absence of Passi City RE plan. • Non existence of administrative and technical personnel for RE development (note: this is similar to item 2) • Absence of coordination with private groups and companies engaged in Renewable Energy
Economic (market demand) • Presence of big business entreprises such as; Central Azucarera de San Antonio, CITYMALL, JOLLIBEE, GAISANO. • Presence of Financing Institutions such as; Banks, micro finance and cooperatives. • Favorable strategic location for commerce, trade, industry and tourism. • Presence of sanitary landfill that can produce RE. • Presence of construction materials and quarries (mountain and river source) • Presence of small irrigation facilities • Business or entreprises adapting climate change mitigation practices. • Experience in RE; own use biomass plant (CASA using Bagasse) exporting to ILECO II.	*Economic (market demand)* • Agricultural wastes produced and segregated is not sufficient to meet RE technology requirements • Non existence of CENTRAL PANAY ECONOMIC DISTRICT for required land area to locate heavy industries • No existing plan to upgrade the sanitary landfill for RE project development • Absence of logistics company • Absence of would be buyers of the manufactured products especially from industries • Difficulty in tapping investment from banking institutions

• Solar streetlights and installations in different brgys. (Imbang Grande, Agdayao, Sto. Tomas, Alimono, Aglalana, Sarapan, Sablogon, Talongonan, Buenavista)	
Social • Potential partnerships with NGOs and International Organizations that advocate and provide funding for RE Programs and Projects • Presence of CSOs, NGOs, POs,Homeowners Associations, Hotels and Restaurants and cooperatives. • Public Awareness on Renewable Energy developments.	*Social* • Lack of IEC on need for RE development • Lack of awareness and appreciation on RE development • No social entrepreneurship (Big and Small) • Lack of advocacy on Climate Change Initiative at the community level
Technological • Availability of GIS (for RE resource mapping) • Availability of technical personnel	*Technological* • Lack of trainings on RE development • Lack of access to RE technology • Insufficient knowledge *on RE technology*
Environmental (physical) • Availability and sustainability of renewable resources (solar, hydro and biofuel/biomass)	*Environmental (physical)* • Topographic condition of Passi City • Landlock location
Legal • Inclusion of RE in the 10-year Solid Waste Management Plan (for validation with PENRO) • Presence of RE supportive policies Comprehensive Land Use Plan, Comprehensive Development Plan,LCCAP, LDRRMP, 10-year SWM Plan and etc. • Presence of Environment Code for RE development • Establishment and operation of TWG on I-PREP.	*Legal* • There is no legal framework on RE development • Lack of local ordinances supporting RE development
Physical RE Infra • On-going implementation of Jalaur River Multi-Purpose Project II - Hydropower • Presence of various RE resources in various stages of development • On going of construction of sanitary landfill. • Existing solar streetlights and rooftop solar on several establishments and households.	Physical RE Infra • High cost of electricity • Inadequate power supply especially for industrial establishments

• Existence of Reservoir on CASA(Central Azucarera de San Antonio) • Use of rice hulls for palay dryers from different ricemills.	
OPPORTUNITIES *Outside factors or situations that can affect PASSI CITY in a favorable way*	**THREATHS** *Outside factors or situations that can affect in a negative way*
Political Governance: • Identified as one of the possible successful pilot area for the RE development • Development of plans and programs on RE development. • Rapid economic growth • Excellent services for passinhon • Climate change *adaption and mitigation*	*Political Governance:* •
Social • Livelihood and employment • Appreciation *of RE by the people of Passi City*	*Social* • Negative *attitude and non-acceptance of RE development*
Technological • Availability of knowledge and skills to utilize resources for RE development	*Technological* • *Scarcity of technological* knowledge *on RE development*
Environmental • Attainment of our vision on Ecological Balance and Environmental Protection • Lower the carbon emmission to mitigate effects of greenhouse gases	*Environmental* • calamities, hazards and disasters

MIAG - AO	
STRENGTHS *Resources or capabilities that help MIAG-AO achieve its objectives. Strengths may be competitive advantages or specific skills/expertise*	**WEAKNESSES** *Deficiencies in resources and capabilities that hinder MIAG-AO abillity*
Political Governance: • Commitment of the LCE to pursue RE investments in Miag-ao • Presence of Municipal Investment Promotion Office • Willingness of the Municipal Government to commit in the development of RE	*Political Governance:* • No technical capability to evaluate RE resources, technologies and investments • Tedious process of land conversion for potential RE locations (from agricultural to industrial) • No local plan specifically for RE • No personnel has participated in energy/power systems training • Lack of IEC programs and initiatives • Absence of Investment Facilitation Network to help RE investors in licensing and registration requirements
Economic (market demand) • Growing demand for RE in agri-aqua projects (private and public) • Favorable economic climate • Availability of financing through banks • Business/enterprises adopting climate change mitigation practices	*Economic (market demand)* • RE is less prioritized • low awareness of RE in the community
Social • Potential partnerships with NGOs and international organizations that advocate and provide funding for RE programs and projects • Presence of academe – ISATUV, UPV • Acceptability of the project by the general public	*Social* • RE is less prioritized • Low awareness of RE in the community
Technological • Availability of GIS and other technical instruments (for RE Resource mapping) • Research capability due to the presence of academic institution (UPV and ISAT-U) • Potential and stable energy	*Technological* • Lack of skills, knowledge and technical expertise, manpower brought about by the RE projects
Environmental (physical) • Potential for hydropower plant (presence of hydro resources – water falls) • Potential for wind energy • River systems (Tumagboc, Naulid, Bacauan, and Oyungan)	*Environmental (physical)* • Risks due to natural calamities and environmental disasters • Lack of advocacy on climate change initiative on the community level • Need for viability assessment

	• High initial investment cost
Legal • Inclusion of RE in the 10-year Solid Waste Management Plan and other local plans	*Legal* • Lack of RE investment enabling-policy
Physical RE Infra • Presence of various RE resources in various stages of development (solar farm at Brgy. Narat-an) • Proposed another solar power plant at Barangay Potrido – Damilisan and Tabunacan	*Physical RE Infra* • Frequent brownouts • Lack of infrastructure development (RE)
OPPORTUNITIES *Outside factors or situations that can affect PASSI CITY in a favorable way*	**THREATHS** *Outside factors or situations that can affect in a negative way*
Political Governance: • Availability of government support fund for the development • Anticipated demand for the RE project • Potential waste to energy project in the proposed sanitary landfill	*Political Governance:* • Upcoming 2022 May election that may affect the continuity of the project • Lack of technical expertise in RE • Difficulty to secure permits and other requirements in DENR
Economic • Presence of the Philippine Army Camp at Camp Monteclaro • Increased tourism (Miag-ao Church, other tourist sites) • Establishment of Cosmo and Viz Solis Solar Power Plant • Availability of support fund from the national, provincial for social, economic, and environmental development	*Economic* • Excessive conversion of potential agricultural land to other uses like solar energy projects • Global economic recession • Presence of private lending groups operating on high interest rates without necessary permits. • Rising cost of fuel and electricity
Social • Presence of two universities • Increasing awareness on climate change	*Social* • Threat of local insurgency
Technological • Anticipated demand for RE in areas of development • Presence of Cosmo Solar Power Plant • Electrification programs	*Technological* •
Environmental • Intensive greening program of the national government • Fast-growing sector •	*Environmental* • Potential ecological impact associated with RE development • Potential ecological impacts associated with R&D • Population pressure, converting land from agriculture to industrial

Legal • Availability of Local Development Plan and financial support for programs and projects	*Legal* • Government imposed regulations • Lack of polices on RE

MIAG-AO	**STRENGTHS**	**WEAKNESSES**
OPPORTUNITIES	**SO Strategies (Aggressive)** Using Miag-ao's internal strengths to take advantage of external opportunities.	**WO Strategies (Turnaround)** Improving internal weaknesses by taking advantage of external opportunities
	1. Enhance personnel capabilities through trainings and seminars on RE. 2. Establish effective linkages with international entities for possible funding support for programs and projects.	1. Strengthen the Joint undertaking with Provincial Government for the formulation of I PREP Project. 2. Access the DOE and other government agencies for assistance for Renewable Energy. Make representation with the ILECO I regarding the problem on frequent Brown outs.
THREATS	**ST Strategies (Diversification)** Using Miag-ao's strengths to avoid or reduce the impact of external threats.	**WT Strategies (Defensive)** Defensive actions directed at reducing IPG's internal weakness and avoiding external threats.
	1. Enforce strong political will on reform agenda focusing on the four areas of concern: economic, social, environmental and government administration 2. Organize Peoples Organization for Renewable Energy development.	1. Expand RE Development by providing alternative source on streetlighting, irrigation system and other infrastructure development. 2. Improve campaign on promotion of Renewable Energy its importance and contribution to socio-economic services on the people and community.

ILECO I AND ILECO II	
STRENGTHS *Resources or capabilities that help accomplish the I-PREP objectives.*	**WEAKNESSES** *Deficiencies in resources and capabilities that hinder the accomplishment of I-PREP objectives.*
• Iloilo has abundant supply of agri waste (rice hull, hay, bagasse) for biomas power – presence of self generating power plant for sugar millers e.g. CASA sells directly to the grid • (CASA ad URC and a lot of rice mills) • Presence of potential sources of hydro (all throughout Iloilo) e.g. igbaras • Availability of RE technology providers • Presence of by-products or wastes; and landfill sites that will eventually collect methane (ILECO II) - Sanitary landfill of Passi city is a private/public partnership , MOAs have been secured for supply of wastes • Presence of WTE technology for a 10MW plant in Cabatuan, to be tapped to 59kV of NGCP	• Lack of funding sources for RE projects (ILECO as developer) • Investments for solar (consumer perspective) • Lack of readiness of the coop in terms of technical capacities •
OPPORTUNITIES *Outside factors or situations that can affect the implementation of I-PREP in a favorable way*	**THREATS** *Outside factors or situations that can affect the implementation of I-PREP in a negative way*
• Investment in solar home systems to address brownouts (consumer perspective) ; • RE technologies for hospital needs (At this point in technology application and current economies, rooftop solar PV are aimed at saving on electricity bills. They are not a solution to brownouts. They could be if developed or designed with BESS, which currently generally not affordable at household or customer level.) • Availability of NEA/DOE Smart grid roadmap • Limited ancillary power on part of NGCP • NEA is encouraging ECs to put up RE power sources minimum 1 MW per year (e.g. Jalaur project of NIA – Ecs be given priority in developing hydro prower) • RPS, GEOP and other legal mandates to promote Res • On-going Jalaur project • NEA has a new RE office	• Environmental compliance requirements (I think this is a weakness rather than a threat.) - Land conversion • Frequent brownouts (consumer perspective) examples in hospitals (will take the perspective of the ECs, and this would be a weakness than a threat; but what are the causes of these frequent brownouts) • Rice hulls are currently being used already for their own purposes; availability of rice hiulls may be an issue • Private companies may develop RE faster than host ECs. • Calamities (extreme weather conditions)

• Compliance to RA 9003	

ILECO I AND ILECO II	**STRENGTHS**	**WEAKNESSES**
OPPORTUNITIES	**SO Strategies (Aggressive)** Using internal strengths to take advantage of external opportunities.	**WO Strategies (Turnaround)** Improving internal weaknesses by taking advantage of external opportunities
RE development at the local levels	1. Undertake assessment of rice hulls and other agricultural by-product and residues as RE resources and appropriate RE technology and applications potential 2. Explore partnerships with private sector towards development of DRE systems (e.g. AIEC/ILAW JV) 3. Undertake province-wide hydro resource assessment and develop appropriate hydropower projects and technologies 4. Undertake assessment province-wide for WTE opportunities, including resource potential and appropriate technologies; build on the experience with WTE project in Cabatuan 5. Take advantage of presence of RE technology providers 6. Consider WTE among LGUs with approved 10-year SWMP	
Institutionalize local RE capacity		1. Form an RE Business Development Unit within the EC, to explore among other tasks funding opportunities for RE projects 2. Capacity building for ECs on RE resource assessment, technologies, and project development, and environmental compliance and other permitting requirements

THREATS	**ST Strategies (Diversification)** Using internal strengths to avoid or reduce the impact of external threats.	**WT Strategies (Defensive)** Defensive actions directed at reducing internal weakness and avoiding external threats.
Climate hazards		• Design or implement distribution system "hardening" program to increase resilience against climate impacts
RE variability		• Explore or consider opportunities for investing in BESS to address intermittency (in response to absence or instability of ancillary services)
Frequent brownouts		• Hasten or fast-track implementation of rehabilitation programs to increase reliability of distribution systems

NGCP and NPC-SPUG	
STRENGTHS *Resources or capabilities that help accomplish the I-PREP objectives.*	**WEAKNESSES** *Deficiencies in resources and capabilities that hinder the accomplishment of I-PREP objectives.*
• There is a separate group handling ASPA applications to support safe operation of the grid. There are applications – mostly conventional plants (there are hydro applications) (ASPA per LVM sub-grid) • There is a group handling system impact study application at the national level. HQ advises provincial office to conduct the assessment/evaluation. – Presence of local capability to assist in the conduct of the SIS. The expertise is in the HQ (final evaluation). • Cebu – Negros – Panay upgrade to 230kV backbone by Dec 2022 • Trained personnel in modelling and simulations on the CREZ process • CREZ incorporated in the Transmission Development Plan already • Upgraded tower designs to improve resiliency • Integrated Disaster Action Plan to respond to damages caused by typhoons/ and other causes – minimizes the downtime • Sufficient funding for upgrades, once ERC approves • NPC-SPUG can restore damages plants with aid of contractors and barangays • SPUG – plans for hybridization with BESS, dedicated for funding for hybridization for Gigantes Island. Currently 24/7 service, capacity addition (diesel). 100% electrified Gigantes N&S, land for acquisition in Gigantes. • NPC-SPUG – no problems on bill collection • NPC – SPUG – to develop distribution plan in Concepcion, with funding (under discussion ILECO 3)	• As of now, new power plants cannot connect within the Panay grid
OPPORTUNITIES Outside factors or situations that can affect the implementation of I-PREP in a favorable way	THREATS Outside factors or situations that can affect the implementation of I-PREP in a negative way

• RE can provide reliable supply in off-grid areas to supplement diesel generators	• Strong typhoons can topple transmission towers • Cause of delays – right-of-way acquisition • Some areas are flagged for safety/security • SPUG Peace and order issues in small islands

NGCP and NPC-SPUG	**STRENGTHS**	**WEAKNESSES**
OPPORTUNITIES	**SO Strategies (Aggressive)** Using internal strengths to take advantage of external opportunities.	**WO Strategies (Turnaround)** Improving internal weaknesses by taking advantage of external opportunities
Infrastructure Planning	• Strategic transmission development planning through the CREZ process	
RE Hybridization of Off-grid sites	NPC-SPUG off-grid power generation facilities will be hybridized	
THREATS	**ST Strategies (Diversification)** Using internal strengths to avoid or reduce the impact of external threats.	**WT Strategies (Defensive)** Defensive actions directed at reducing internal weakness and avoiding external threats.
Climate hazards	• NGCP will implement its Integrated Disaster Action Plan during times of disaster • NPC-SPUG has systems and plans in place to respond to disasters	• NPC-SPUG will strengthen its collaboration and relationship with the barangays to be able to work together during times of disaster to reduce downtime.
RE variability	• NGCP has an ASPA group that entertains ASPA applications to ensure that stability of the grid • NGCP performs Transmission Impact Study to understand the impact of new RE plants connecting to the grid	• Strengthen auxiliary services
Frequent brownouts		• Hasten or fast-track implementation of rehabilitation programs to increase reliability of distribution systems