CELLs
Partners in Building Energy Security

Guidebook for Local Government Units on the Formulation of the Local Energy Efficiency and Conservation Plan (LEECP)

BOOK 2
REFERENCES

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ICLEI – Local Governments for Sustainability is a global network working with more than 2500 local and regional governments committed to sustainable urban development. Active in 125+ countries, we influence sustainability policy and drive local action for low emission, nature-based, equitable, resilient, and circular development. Our members and team of experts work together through peer exchange, partnerships, and capacity building to create systemic change for urban sustainability.

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List of Acronyms

A/C	Air Conditioner
AFET	Alternative Fuel and Energy Technology
AO	Administrative Order
BLGD	Bureau of Local Government Development
BTU/h	British Thermal Unit per Hour
CDP	Comprehensive Development Plan
CFL	Compact Fluorescent Lamp
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DBM	Department of Budget and Management
DILG	Department of the Interior and Local Government
DOE	Department of Energy
DOF	Department of Finance
DOST	Department of Science and Technology
DOTr	Department of Transportation
DPWH	Department of Public Works and Highways
DTI	Department of Trade and Industry
ECP	Energy Consuming Product
EEC	Energy Efficiency and Conservation
EEC Focal Person	Energy Efficiency and Conservation Focal Person
EEC Officer	Energy Efficiency and Conservation Officer
EECO	Energy Efficiency and Conservation Office
EEF	Energy Efficiency Factor
EER	Energy Efficiency Ratio

EnMS	Energy Management System
EO	Executive Order
EPIRA	Electric Power Industry Reform Act
EPSMD	Energy Efficiency and Conservation Public Sector Management Division
ER	Energy Regulations
EUMB	Energy Utilization Management Bureau
EVOSS	Energy Virtual One-Stop Shop
GB Code	Philippine Green Building Code
GEMP	Government Energy Management Program
GHG	Greenhouse Gas
GWP	Global Warming Potential
GWh	Gigawatt-Hour
h	Hour
hp	Horsepower
IAEECC	Inter-Agency Energy Efficiency and Conservation Committee
IEC	Information, Education, and Communication
IRR	Implementing Rules and Regulations
ISO	International Organization for Standardization
JMC	Joint Memorandum Circular
kt	Kilotonne
kW	Kilowatt
kWh	Kilowatt-Hour
L	Liter
LCCAP	Local Climate Change Action Plan
LDC	Local Development Council
LED	Light-Emitting Diode
LEECP	Local Energy Efficiency and Conservation Plan
LGU	Local Government Unit
MECR	Monthly Electricity Consumption Report
MEPP	Minimum Energy Performance for Products
MFCR	Monthly Fuel Consumption Report
MWh	Megawatt-hour
NCCAP	National Climate Change Action Plan
NDC	Nationally Determined Contribution
NEDA	National Economic and Development Authority
NREP	National Renewable Energy Program
PELP	Philippine Energy Labeling Program
PEP	Philippine Energy Plan
PHP	Philippine Peso
RA	Republic Act
RE	Renewable Energy
SDG	Sustainable Development Goal
SI	International System of Units
t	Tonne
W	Watt

Introduction

Objectives of the Guidebook

Book 2 (References) complements and brings additional value to Book 1 (Procedures) as its objectives are to:

- Provide an overview of EEC fundamentals and relevant government regulations applicable to LGUs;
- Further explains strategies to effectively implement the Local Energy Efficiency and Conservation Plan (LEECP)
- Equip LGUs to prepare for an ISO 50001:2018 Energy Management System (EnMS) Certification; and
- Showcase sample EEC best practices to serve as an inspiration for local authorities.

Target Group

This Guidebook is created, generally, for employees of a Local Government Unit (LGU) and, specifically, its designated Energy Efficiency and Conservation Officer (EEC Officer) in order to be able to successfully formulate and implement the LEECP. Also, this Guidebook can assist external consultants in developing the LEECP for a respective LGU. While the Guidebook is intended primarily for the EEC Officers and employees of LGUs, it can still be flexibly used as reference material for energy managers and energy officers of government institutions and private organizations. Whatever is the case, the learnings and outputs should advance EEC in the country.

Structure of the Guidebook

Book 2 (references, methods, and annexes) is divided into the following six (6) parts.

PART I **PART I. Significance of Energy** Efficiency and Conservation
This explains the fundamentals of EEC as well as the related laws, resolutions, guidelines, and related issuances mandating LGUs' compliance to EEC.

PART II

PART II. Opportunities for an ISO 50001 Energy Management System (EnMS) Certification
While most sections of Book 1, Part I have been adopted based on ISO 50001, this part gives an overview on how the LGUs can gain relevant international certification.

PART III **PART III. Best Practice** EEC Case Studies
This aims to highlight EEC projects and activities which can be replicable and scalable at the local level.

PART IV **PART IV. Organizing and Capacitating the** EEC Management Board
In relation to Phase 2, tasks 1 and 2, the section provides guidance on conducting stakeholders' analysis and equipping the LGUs EEC management board that includes the Local Energy Efficiency and Conservation Office.

PART V **PART V. Strategies in Doing** an Energy Review
This section discusses methods to identify significant energy uses (SEUs), prioritize EEC opportunities, and forecast energy consumption as components of implementing Phase 3 (Conducting an Energy Review) in implementing the LEECP.

PART VI **PART VI. Financing** Modalities and Tools
This section explains some of the internal and external financing modalities and tools that could fund EEC activities, projects, and programs.

PART I. Significance of Energy Efficiency and Conservation

In promoting energy efficiency and conservation (EEC) as a way of life and as a crucial component of sustainable development, it is imperative that local governments and key stakeholders become familiar with its key concepts and relevant national government policies. For Part I of this Guidebook, Section A briefly discusses important EEC concepts and terms that readers will mostly encounter in the other parts and sections, including that in Book 1. It is presented in a manner that is comprehensible regardless of the professional background of the reader. Meanwhile, Section B focuses on the collection of key government issuances mandating conformity of LGUs to EEC.

Section A. Basic Concepts in Energy Efficiency and Conservation

Power and Energy[a]

Power refers to the rate with respect to time at which work is performed. In the International System of Units (SI[b]), the unit of power is watt (W). Most appliances, devices, and equipment are rated in either watt (W) or kilowatt (kW). The prefix kilo- denotes multiplication by one thousand, hence 1 kW equals 1,000 W. Some appliances and equipment are rated in horsepower (hp), such as in the case of some air conditioners. Others are rated in tons of refrigeration or British thermal unit per hour (BTU/h).

The time of use of each appliance, device, or equipment is an important driver in energy conservation. The duration of a switched-on light bulb or a running air conditioner typically depends on the end user's behavior. Therefore, the time of use element is an important consideration in determining the actual energy usage and cost. Some units of time are hour and second.

Energy is the total amount of effort or work it takes to accomplish a task. Put simply, multiplying the power by the time of use results into energy. For instance, a 500 W or 0.5 kW equipment running for 4 hours consumes an energy of 2 kilowatt-hours (kWh). Although the joule is the SI unit of energy, the kWh is also common and widely used, especially when referring to electrical energy. The kWh is mostly used as the billing unit for the energy delivered to consumers by electric utilities.

Different Forms of Energy

There exist many forms of energy. In general, they each fall in one of two basic categories: potential energy and kinetic energy (U.S. Energy Information Administration, 2020).

Potential energy refers to stored energy as a result of its elevation in a gravitational field. One can find potential energy in the water that is behind a dam or in the food that animals eat. Mechanical energy, chemical energy, nuclear energy, and gravitational energy are all considered as having potential energies.

Kinetic energy refers to the energy a system possesses as a result of its motion relative to a reference frame. One can understand kinetic energy through the movement of air which causes the blades of a windmill to rotate, or the flow of water down a slope which causes the turbines of a hydropower plant to turn. Electrical energy, thermal energy or heat, radiant energy including light and solar energy, sound, and motion energy are all possessing kinetic energies.

Energy Efficiency and Energy Conservation

A resource such as the energy is valued for its associated services or the essential benefits derived from it. This can be in terms of lighting, heating, space cooling or air conditioning, ventilation, laundry, cooking, entertainment, refrigeration, etc. Energy efficiency and energy conservation are closely related but with different meanings. For instance, the simple, no-frills tip "switch off lights when not in use" conveys to the end user that switching off a light lessens its operating time—an act of conserving the light bulb's electricity consumption. This, however, denotes that the light bulb will still consume the same amount of electricity when switched on. Replacing the same light bulb with another one at a lower wattage of power, say a light-emitting diode (LED) lamp, will result into lesser electricity consumption for the same length of time it is operated. This latter representation is an example of using electricity more efficiently.

A good definition of efficiency is in engineering where it refers to the ratio between the output and the input, expressed as a percentage. So, the energy efficiency of an appliance, say a washing machine, involves the ratio between the mechanical and thermal energies produced during the entire laundry process and the electrical energy consumed while connected to a power outlet. The higher the percentage calculated, the more efficient the process and the greater the corresponding reduction in the operating expenses. Thus, this results into increased savings. An old washing machine is expected to have a calculated energy efficiency significantly less than a front-loading washing machine with inverter technology. This definition and example, therefore, signify that efficiency is a measure of how much resource is saved in a process. For these reasons, it is important for an LGU to incorporate in its plan and policy the pursuance of appliances and equipment which are highly efficient, as provided in its specifications and through actual measurements, and to avoid or limit the usage of inefficient ones. Old and outdated technologies are usually less efficient than new ones.

[a] Power and energy, as described in this section, relate to their physics and engineering formulas, hence the technical definition.
[b] The International System of Units translates to Système International in French, hence the acronym "SI".

Box 1 highlights the proper definitions of energy efficiency and energy conservation according to the RA No. 11285. For the rest of this Guidebook (including Book 1), the term energy efficiency and conservation will be represented by its acronym, EEC or EEC.

Box 1. Definitions of energy efficiency and energy conservation

ENERGY EFFICIENCY refers to the way of managing or restraining the growth in energy consumption resulting in the delivery of more services for the same energy input or the same services for less energy input. This can be achieved by introducing an appropriate intervention or using better technology as replacement to an inefficient one. Replacing an old and inefficient air conditioner (A/C) with another one having a higher Energy Efficiency Ratio (EER) is an example.

ENERGY CONSERVATION refers to the reduction of losses or wastage in various energy stages from energy production to energy consumption through the adoption of appropriate measures which may, among others, be technologically feasible, economically sound, environmentally-friendly, or socially affordable. Setting an air conditioner's thermostat to 24°C or 25°C instead of lower or colder temperatures is a very practical way of conserving energy.

Table 1 shows a compilation of some examples of replicable measures in energy efficiency and energy conservation.

Table 1. Some examples of replicable measures in energy efficiency and energy conservation

Energy Use	Energy Efficiency	Energy Conservation
Lighting	■ Replace incandescent bulb and compact fluorescent lamp (CFL) with LED light ■ Downsize installed light bulb but observe proper illumination level	■ Maximize the use of natural daylight ■ Manually switch off light to reduce its operating time ■ Install automatic control switches (photo sensor, motion sensor, timer, etc.) in order to reduce a light's operating time
Air Conditioning	■ Replace an old and inefficient A/C with one having a higher EER or better capability such as having inverter technology ■ Practice preventive maintenance on all A/C and cooling units ■ Seal gaps and openings around windows and doors in all air-conditioned areas ■ Provide proper shading and ventilation to an A/C's outdoor condensing unit	■ Set an A/C's thermostat at a moderate temperature (24°C or 25°C) instead of a colder temperature
Refrigeration	■ Replace an old and inefficient refrigerator with one having a higher Energy Efficiency Factor (EEF) or better capability such as having inverter technology ■ Regularly maintain and clean a refrigerator and freezer, including the observance of no ice build-ups	■ Set a refrigerator's thermostat at a not-so-cold but appropriate temperature
Pumps and Motors	■ Use high efficiency water pumps and motors ■ Install a variable frequency drive on motor applications requiring variable speed (e.g., domestic pumps, elevators, escalators, etc.)	■ Reduce the operating time of motors and moving equipment (e.g., blowers, fans, air handling units, elevators, escalators, etc.)
Heating	■ Use solar water heater or heat pump for water heating ■ Sufficiently insulate the hot water storage and its pipelines	■ Use water coming from the cold-water line instead of hot water whenever possible
Consumer Electronics	■ Use LED television units and highly efficient computers and laptops	■ Avoid standby loads by unplugging and switching off laptops and television units when not in use

EEC and Climate Change

It may not be apparent but there is a direct connection between using energy and the environment. The increase in global greenhouse gas (GHG) emissions is a key driver in climate change; and one of the largest contributing factors worldwide is the production and consumption of energy. When one becomes mindful and consumes less energy, the practice cuts down the toxic fumes or emissions released by power plants (especially those that burn coal, crude oil, or other fossil fuels). Likewise, the habit helps preserve the Earth's identity by conserving natural resources and protecting ecosystems from destruction. Taking steps to reduce one's energy intake contributes to a healthier and sustainable world. Examples of GHGs in the atmosphere are carbon dioxide (CO_2), methane, nitrous oxide, and the fluorinated gases (hydrofluorocarbons, chlorofluorocarbons, sulfur hexafluoride, nitrogen trifluoride, etc.). Each of these GHGs has an associated global warming potential (GWP) which refers to its total contribution to global warming relative to a reference GHG. CO_2 has a GWP of 1 while methane has a higher GWP at 28.[c]

[c] Based on the fifth assessment report (AR5) of the Intergovernmental Panel on Climate Change (IPCC)

The GHG emission factor is 0.507 tonne (t) of CO_2 per megawatt-hour (MWh) of electricity for the Luzon and Visayas regional grids. For the Mindanao regional grid, the emission factor is 0.468 t CO_2/MWh.[d] The higher the energy consumed, the higher the GHG emissions. So, if an energy end-user in Luzon, say, a building consumes 200 MWh for a year, then the amount of CO_2 emissions will be as high as: energy consumption × emission factor × GWP = 200 MWh × 0.507 t CO_2/MWh × 1 = 101.40 t CO_2. This is as heavy as 94 Philippine saltwater crocodiles[e] and as polluting as 2,535 passenger jeepneys[f] plying in the streets of the country.

One notable statement between energy efficiency and GHG emissions comes from the Climate Change Commission (CCC) Secretary Emmanuel de Guzman. He said, "According to our review, energy efficiency is the easiest and often cheapest way to reduce the need for expansion of coal power generation. And with the country's energy demand projected to increase by 80 percent between 2017 and 2040, improving energy efficiency in the building sector would be our best course to reduce emissions." (Climate Change Commission, 2019).

Other Important Definitions

Energy Audit: This refers to the evaluation of energy consumption or the analysis of energy flows to determine appropriate intervention techniques for energy conservation and potential efficiency projects in which energy can be judiciously and efficiently used to achieve savings. It determines processes or systems which can reduce the amount of energy input into the system without compromise to the output.

Energy Baseline: This is a quantitative reference that allows an organization to compare the energy performance before and after a change is made to a facility/site or system (i.e., installation or implementation of energy cost savings measures).

Energy Consumption: This refers to the amount of energy used to perform an action, process, etc. The joule and kWh are among its units of measure.

Energy Management System: This refers to the proactive and systematic management of energy consumption in a facility or building. It results into the conservation of energy resources as well as the reduction of operating costs and carbon emissions. An energy management system or EnMS can be about more than the management of energy; it can also support a wider spectrum of sustainable policies.

Energy Performance Indicator: This is the quantitative value of energy performance and energy intensity, as defined by an organization, used to gauge the effectiveness of energy management efforts.

Energy Target: This refers to the detailed and measurable energy performance requirement which emerges from the energy objectives, needing to be set and met.

Energy Use: This is defined as the application of energy. Some examples are lighting, air conditioning or space cooling, heating, refrigeration, etc.

Section B. Compendium of Key Issuances Mandating Conformity of LGUs to EEC

During the infancy of EEC programs, the LGU and its stakeholders should not expect the immediate accomplishment in a single stroke of the vital EEC plans outlined to guide its administration. A poorly thought-out EEC activity is handicapped by an undeveloped plan, not to mention a plan that is not legally and structurally harmonized. The least LGUs can do for a start is to undertake the preliminary steps of long-term planning while complying with appropriate laws, statutes, and codes. This section presents the major issuances, policies, programs, and roadmaps related to EEC that are relevant to LGUs.

Plans, Programs, and Roadmaps

Philippine Energy Plan 2018-2040

The Philippine Energy Plan (PEP) embodies the following clear set of objectives as a response to the Executive Order (EO) No. 5 of 2016 which adopts the government's long-term vision known as the *AmBisyon Natin* 2040. Such an EO requires all plans of the LGUs to be consistent with the said vision.

1. Increase the production of clean and indigenous sources of energy to meet the growing economic development of the country
2. Decrease the wasteful utilization of energy with energy efficiency tools and strategies
3. Ensure the balance between the provision of reliable and reasonably priced energy services, support for economic growth, and protection of the environment

Likewise, the PEP upholds the policies and laws that support the Sustainable Development Goals (SDGs) of the United Nations. The PEP responds to SDG 7 (affordable and clean energy) and SDG 13 (climate action) through the Renewable Energy Act, Energy Efficiency and Conservation Act, and the policy on Resiliency of Energy System and Infrastructure. Energy

[d] Based on the current reference emission factors reported by the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR), https://emb.gov.ph/wp-content/uploads/2019/11/3.-Add-information-for-renewable-systems_Philippines_final.pdf
[e] *Lolong*, the largest Philippine saltwater crocodile ever measured, weighed 1,075 kg
[f] Equivalency is provided by Global Electric Transport (GET) through a news article, https://www.cnbc.com/2015/11/19/the-end-of-the-jeepney-manila-goes-green.html

is considered at the heart of the SDGs for being the golden thread that connects and supports the other goals like addressing poverty, ending hunger, promoting economic growth, making inclusive and resilient cities, and taking action to combat climate change, among others (DOE, 2018). The following eight (8) energy sector strategic directions are envisioned to be implemented progressively during the planning period.

1 ENSURE ENERGY SECURITY	2 EXPAND ENERGY ACCESS	3 PROMOTE A LOW CARBON FUTURE	4 STRENGTHEN COLLABORATION AMONG ALL GOVERNMENT AGENCIES INVOLVED IN ENERGY
5 IMPLEMENT, MONITOR, AND INTEGRATE SECTORAL AND TECHNOLOGICAL ROADMAPS AND ACTION PLANS	6 ADVOCATE THE PASSAGE OF THE DEPARTMENT'S LEGISLATIVE AGENDA	7 STRENGTHEN CONSUMER WELFARE AND PROTECTION	8 FOSTER STRONGER INTERNATIONAL RELATIONS AND PARTNERSHIPS

Figure 1. Strategic Directions of the PEP 2018-2040 (DOE, 2018)

EEC Roadmap 2017-2040

The roadmap provides a framework to direct the country in its national energy efficiency approach. The next figure shows a summary of the strategies and priorities of the government in terms of EEC. From short term to long term strategies, the roadmap covers the different sectors of transport, industrial, residential, commercial, and government.

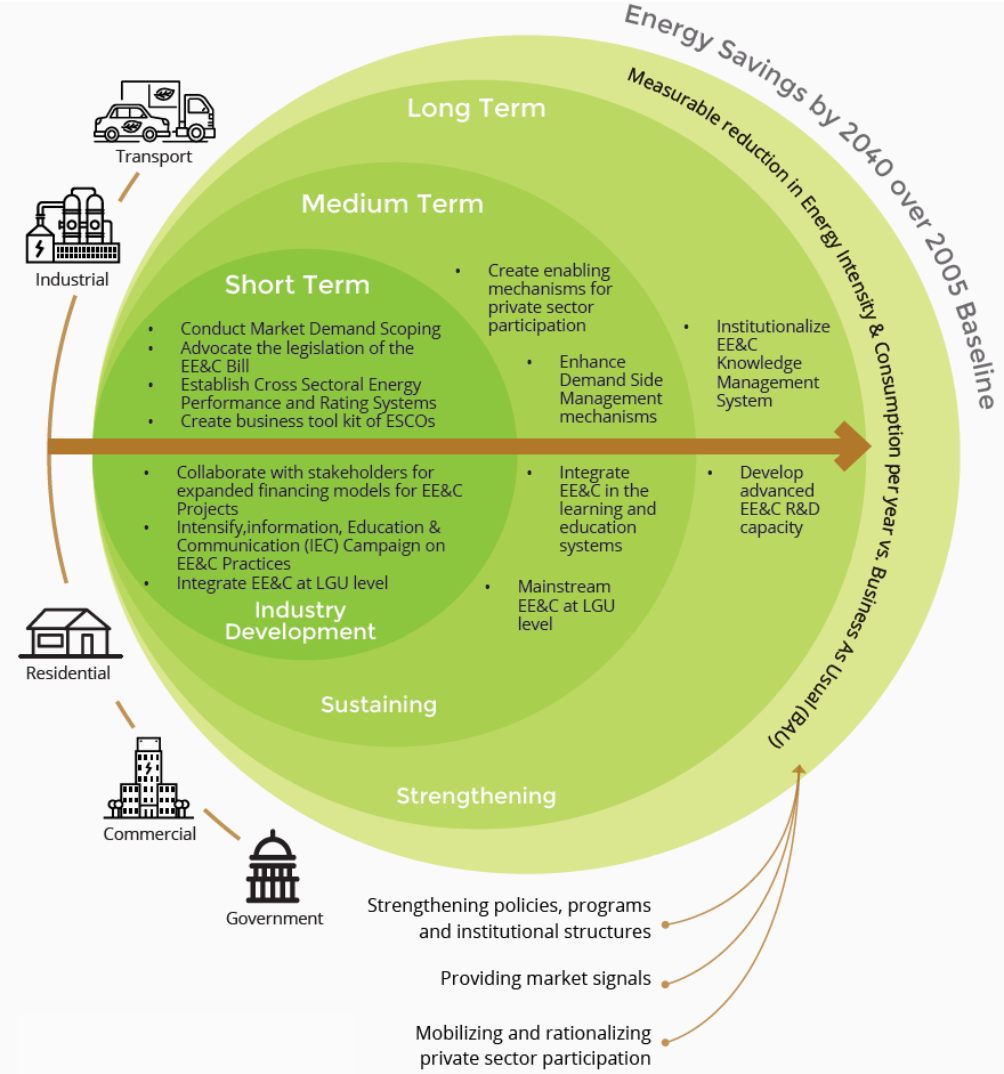

Figure 2. Philippine government strategies and priorities for energy efficiency (EU SWITCH Asia Programme, 2017)

National EEC Program

The National EEC Program is an umbrella program that started in 2004 with a main objective of advancing economic development through EEC, targeting energy consuming sectors while contributing to improved energy security and helping to mitigate climate change. Under this program, activities are geared toward the promotion of efficient and judicious utilization of electricity and fuel. Energy efficient technologies as well as behavioral change through values formation are being promoted and introduced. Its subcomponents include: the GEMP; information, education, and communication (IEC) campaigns; recognition award program; fuel economy run activities; and energy audit services.

Government Energy Management Program (GEMP)

The Government Energy Management Program (GEMP) started in 2004 through Administrative Order (AO) No. 103. It has been updated through AO Nos. 110, 126, 110-A, and 183. Now, the EEC Act and its IRR (Department Circular No. DC2019-11-0014) provide strategic direction in the implementation of the GEMP. GEMP refers to the government-wide program of reducing the monthly consumption of electricity and petroleum products by at least 10%. This is achievable through efficiency and conservation in electricity use as well as fuel use of government vehicles and the employment of renewable energy systems, among others. In 2018, the GEMP initiative was able to save the country about 6.55 GWh[g] of electricity, equivalent to a monetary savings of PHP 52.32 million and reduced emissions of 3,351.4 t CO_2. In 2019, the EEC Act, through Section 43 of its IRR, has extended the scope of the GEMP to all LGUs.

Each LGU shall formulate an EEC program to include energy conservation measures, target savings, motor vehicle inventory, and other strategies consistent with the GEMP. It shall allocate appropriate amount from its approved annual budget for the implementation of its prioritized and planned energy management program. Aside from the target monthly reduction of 10% in the electricity and fuel consumption, LGUs are required to submit the following to the DOE:

1. Monthly Electricity Consumption Report (MECR) (Annex 3)
2. Monthly Fuel Consumption Report (MFCR) (Annex 4)

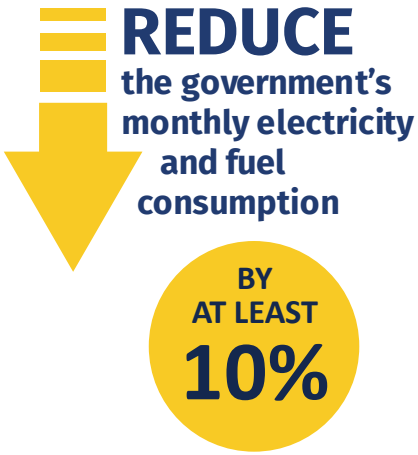

Figure 3. GEMP's overall goal

Box 2. Advantages of regularly submitting the MECR and MFCR forms to the DOE

Aside from complying with the GEMP and the EEC Act, the consumption data (from the MECR and MFCR) allow DOE to conduct evaluation and analysis for the establishment of national energy utilization policies, proper benchmarking, calculating of electricity savings per year, sourcing of awardees for the Energy Consciousness Month every December, and other monitoring activities.

The MECR and MFCR enables an LGU to identify facilities or sites with significant energy consumption—an essential component in an energy management program.

Philippine Energy Labeling Program (PELP)

The government is pushing for a more effective energy labeling system. Through the Philippine Energy Labeling Program (PELP), the DOE spearheads the promotion of a healthy and competitive market for energy efficient products. The guidelines cover the following energy consuming products (ECPs): room air conditioners, refrigeration units, television sets, and lighting products. The PELP is applicable to all importers, manufacturers, distributors, dealers, and retailers of ECPs, equipment, and transport vehicles. In the procurement of these ECPs, their technical specifications must be consistent with the DOE Department Circular No. DC2020-06-0016, "Prescribing the Minimum Energy Performance for Products (MEPP) covered by the PELP for compliance of importers, manufacturers, distributors, dealers, and retailers of ECPs."

Alternative Fuels and Energy Technologies Roadmap 2017-2040

In addressing the increasing demand of the transport sector and the high dependency on imported conventional fuels, alternative fuels and energy technologies (AFETs) remain as important measures and options. Among the benefits of AFETs are in reducing GHG emissions and improving air quality. AFETs strategically help meet the country's Nationally Determined Contributions (NDCs)[h] to the Paris Agreement. LGUs have monumental responsibilities in meeting the NDCs since they are the ones that are directly hit by climate change induced disasters and calamities.

One of the approaches outlined in the roadmap is scaling up the use of AFET through government vehicle re-fleeting using next generation vehicles. Policies such as the EEC Act and the AO No. 14 of 2018 (consolidating and rationalizing the rules

[g] A gigawatt-hour (GWh) is equivalent to 1,000,000 kWh.

[h] NDCs serve as pledges to achieve the goals of the 2016 Paris Agreement, particularly in limiting global warming to well below 2°C above pre-industrial levels or further to 1.5°C. In April 2021, the Philippines made history by approving its first NDC—an ambitious 75% reduction of GHG emissions by 2030 in the name of climate justice (https://www.pna.gov.ph/articles/1137085).

on the acquisition of government motor vehicles) allow all government offices to procure in the most efficient and economic manner, motor vehicles that are cost effective, fuel-efficient, and environmentally friendly.

In terms of infrastructure support for electric vehicles, measures will focus on the: (a) development of dedicated parking lots with installed charging stations in every public and private establishment; (b) installation of public charging stations at gasoline stations, public buildings, and establishments; and (c) provision of green routes where electric vehicles and other alternative modes of transport such as bicycles, e-bikes, and e-scooters will exclusively pass through. LGUs will be mandated, in its local public transport plan, to create or identify the feasible green routes for the convenience of the growing number of residents who consider shifting to bicycles, e-bikes, and e-scooters in going around the town or traveling between home and work. Moreover, both the Biofuels Act and the AFET Roadmap support RA No. 8749 or the Philippine Clean Air Act of 1999.

Energy-Related Laws and Supporting Policies

RA No. 11285: Energy Efficiency and Conservation Act (EEC Act)

The EEC Act is an act institutionalizing energy efficiency and conservation, enhancing the efficient use of energy, and granting incentives to energy efficiency and conservation projects. The Act together with its Implementing Rules and Regulations or IRR (DOE Department Circular No. DC2019-11-0014) took effect in 2019. Its overall goals are to institutionalize energy efficiency and conservation as a national way of life, promote and encourage the use of efficient renewable energy systems, reinforce related laws and other statutory provisions, and ensure a market-driven approach to energy efficiency, conservation, sufficiency, and sustainability in the country. The DILG, through the Memorandum Circular No. 2020-082, provides LGUs with specific guidelines to comply with the Act.

Box 3. Benefits of the EEC Act to LGUs

The EEC Act benefits the LGUs in a variety of ways. One of these is the reduction of the LGUs contribution to the generation of GHGs which are responsible for climate change and extreme weather conditions. Another is in terms of the cost savings and resources arising from related actions and programs which can otherwise be allocated to other sectors, such as public works, health, education, social welfare, agriculture, science and technology, and tourism, among others. The Act aims to provide LGUs an enabling environment to practice and systematize energy management, attracting investors, innovators, sustainability professionals, etc. to fund and/or develop projects that bring positive, multiple impacts. Also, the Act changes people's behaviors toward the efficient use of energy.

Under the law, the roles of the LGUs are to:

1. Develop the Local Energy Efficiency and Conservation Plan (LEECP) and integrate it with the local development plans;
2. Establish an Energy Efficiency and Conservation Office (EECO);
3. Designate an Energy Efficiency and Conservation Officer (EEC Officer);
4. Assist the Department of Energy (DOE) in monitoring the compliance of energy-intensive designated establishments[i] based on a set of guidance and regulations.

Box 4. Benefits of the EECO, EEC Officer, and EEC Focal Person

An EECO, EEC Officer, and EEC Focal Person contribute to the advancement of EE&C programs in the local setting. These serve as the local authority in directing energy management activities which advance local and national development agenda and address regional and global challenges while creating wider impact and remaining relevant.

In issuing building permits for new constructions and retrofitting of existing buildings, the LGUs shall be guided by the DOE-issued Guidelines on Energy Conserving Design of Buildings. They shall implement the minimum requirements as specified from the same.

Aside from the roles of the LGUs, the EEC Act's major provisions include the:

1. Certification for professional competency and accreditation for professional services;
2. Energy performance standards and labeling requirements;
3. Obligations of designated establishments;
4. Functions of the Inter-Agency Energy Efficiency and Conservation Committee (IAEECC);
5. Demand side management (i.e., addressing less restrictive regulatory policies affecting energy consumption rather than energy production); and
6. Incentives.

[i] A designated establishment refers to a private or public entity in the commercial, industrial, transport, power, agriculture, public works, and other sectors identified by the DOE as energy intensive industries based on their annual energy consumption (i.e., 100,000-500,000 kWh for other establishments, 500,000-4,000,000 kWh for Type 1, and more than 4,000,000 kWh for Type 2) in the previous year or an equivalent annual index.

Created pursuant to Section 9 of the EEC Act, the IAEECC was formally organized in January 2020 with the issuance of the DOE Department Order No. DO2020-01-0001 (Organizing the Inter-Agency Energy Efficiency and Conservation Committee). It is tasked to evaluate and approve government energy efficiency projects, as defined under the EEC Act and its IRR, and to provide strategic direction in the implementation of the GEMP.

The IAEECC is chaired by the DOE Secretary and is also composed of the Secretaries of DBM, DOF, DTI, DOTr, DOST, DILG, DPWH, and the Director General of NEDA. Serving as the Committee Secretariat is the Energy Efficiency and Conservation Public Sector Management Division (EPSMD) of the Energy Utilization Management Bureau (EUMB). Since its inception, the following advisory and resolutions applicable to all LGUs have been issued.

RA No. 9513: Renewable Energy Act of 2008

The Renewable Energy (RE) Act is an act establishing the framework for the accelerated development and advancement of RE resources, and the development of a strategic program to increase its utilization. Its overall goals are to: accelerate the exploration and development of RE resources such as, but not limited to, biomass, solar, wind, hydro, geothermal, and ocean energy sources, including hybrid systems, to achieve energy self-reliance; increase the utilization of RE by institutionalizing the development of national and local capabilities; encourage the development and utilization of RE resources as tools to effectively prevent or reduce harmful emissions; and establish the necessary infrastructure and mechanism to carry out its mandates.

The policy framework enshrined in the RE Act is outlined in the National Renewable Energy Program (NREP) which sets out indicative interim targets for the delivery of RE. The NREP is aligned with the thrusts of the government, particularly in increasing the country's energy self-sufficiency, ensuring energy security, and promoting sustainable development. By 2040, the NREP seeks to increase the RE-based installed capacity of the country to at least 20,000 MW, almost quadruple its 2010 level.

RA No. 9367: Biofuels Act of 2006

The Biofuels Act aims to reduce the dependence of the country on imported fuels with due regard to the protection of public health, the environment, and natural ecosystems. Its overall goals are to develop and utilize indigenous renewable and sustainably-sourced clean energy sources to reduce dependence on imported oil, mitigate toxic and GHG emissions, increase rural employment and income, and ensure the availability of clean energy without any detriment to the natural ecosystem.

Advancing the development of biofuels by increasing the blend rates with petroleum (biodiesel for diesel and bioethanol for gasoline) substantially contribute to the reduction of GHG emissions. Currently, the blend rates being maintained in the country are 2% biodiesel blend rate (B2) and 10% bioethanol blend rate (E10). Under the Biofuels Roadmap 2017-2040, the blending requirement as well as the available feedstock will be revisited, and continuous research and development on feedstock sources will be conducted.

RA No. 9136: Electric Power Industry Reform Act (EPIRA) of 2001

The Electric Power Industry Reform Act (EPIRA) provides a framework for the restructuring of the electric power industry, including the privatization of the assets of the National Power Corporation, the transition to the desired competitive structure, and the definition of the responsibilities of the various government agencies and private entities. Among its salient goals are to: ensure and accelerate the total electrification of the country; ensure the quality, reliability, security, and affordability of the supply of electric power; protect public interest; assure socially and environmentally compatible energy sources and infrastructure; promote the utilization of indigenous, new, and renewable energy sources; and encourage the efficient use of energy and other modalities of demand side management.

Under the EPIRA-IRR, Energy Regulations (ER) No. 1-94 is a policy that stipulates host communities, such as LGUs, to be provided with financial benefits by energy generating facilities, including hydro and geothermal, operating within its area. The amount shall be one centavo per kWh (PHP 0.01/kWh) of the total electricity sales. Depending on the classification of the LGU, the total financial benefit shall be allocated and set aside, in certain percentages, as: an electrification fund for projects supporting total electrification; a development and livelihood fund; and a reforestation, watershed management, health, and/or environment enhancement fund.

In relation, RA No. 11234 or the Energy Virtual One-Stop Shop (EVOSS) Act sets the timeframe for government agencies including LGUs (15 days) to decide on applications and cases relative to new power generation, transmission, and distribution projects.

Philippine Green Building Code (GB Code)

The Philippine Green Building Code (GB Code), implemented in 2015, is a referral code of the National Building Code of the Philippines. Inclusion of measures in energy efficiency alongside water efficiency, material sustainability, solid waste management, site sustainability, and indoor environmental quality in the GB Code creates large-scale impact. Its goal is to improve the efficiency of building performance through a framework of acceptable set of standards that will enhance sound environmental and resource management. The section on energy efficiency aims to reduce the energy consumption of the building envelope, mechanical systems, and electrical systems (Table 2). The guidelines are based on the existing Guidelines on Energy Conserving Design of Buildings by the DOE. The section focuses on several technical interventions and recommendations.

Table 2. The energy efficiency section of the Philippine Green Building Code (GB Code)

Building Envelope	Mechanical Systems	Electrical Systems

• Air tightness and moisture protection • Glass properties • Natural ventilation • Building envelope color • Roof insulation	• Air conditioning system • Water heating system • Variable speed drives and high efficiency motors • Enthalpy recovery of exhaust air	• Daylight provision • Daylight controlled lighting system • Lighting power density • Occupancy sensors for lighting control • Elevators and escalators / moving ramps / walkways • Transformer • Overhead or elevated water storage

LGU Energy Code

The LGU Energy Code also known as the Guidelines to Facilitate the Implementation of Energy Projects is an ordinance that an LGU needs to adopt. It is based on the Joint Memorandum Circular (JMC) No. 2020-01 issued by the DILG and DOE. Its purposes are to:

1. Establish, strengthen, and integrate the national energy plans, programs, policies, and mechanisms into the local development plans;
2. Harmonize and fast-track the implementation of the EVOSS Act, Ease of Doing Business Act, EO 30 (Creating the Energy Investment Coordinating Council in Order to Streamline the Regulatory Procedures Affecting Energy Projects), and AO 23 (Eliminating Overregulation to Promote Efficiency of Government Processes);
3. Maximize benefits (e.g., educational and scholarship programs, economic and local development, electrification, and health, safety, and environmental programs) from energy projects to the host communities; and
4. Implement other energy programs and projects to spur total LGU development.

The JMC points to several legal bases including relevant DILG laws, energy-related laws, private sector participation laws, regulatory reform laws/orders issued, and supporting policies issued. Moreover, it covers Provincial Governors and Vice Governors, City and Municipal Mayors and Vice Mayors, Punong Barangays, Members of the Sangguniang Panlalawigan/Panlungsod/Bayan/Barangay, Local Development Councils (LDCs), DILG Regional/Provincial/City Directors, DILG Bangsamoro Autonomous Region in Muslim Mindanao Minister, Cluster Leaders, and the City/Municipal Local Government Operation Officers. Some of JMC salient points include the IAECC resolutions 1-2 outline in Resolutions and Department Orders.

An Energy Sector Committee should be activated by the LGU through its LDC. It will be the one to implement the JMC by way of incorporating energy programs, policies, and projects into the spatial plan (Physical Framework Plan or Comprehensive Land Use Plan).

1. With regards to the spatial plan, the cities and municipalities shall: plot existing upstream and downstream energy facilities with coordinates in accordance with the Philippine Reference System of 1992; coordinate with private sector stakeholders on the expansion of such facilities; submit such data to their respective provinces (for component cities and municipalities), DILG Regional Office (for component cities and municipalities, independent component cities, and highly urbanized cities), the DILG - Bureau of Local Government Development (BLGD), and the DOE - Investment Promotion Office; and coordinate with the Public-Private Partnership Center for investment opportunities and partnerships.
2. With regards to the development plan, the LGUs shall monitor and collect the benefits of energy projects and incorporate these benefits into their Comprehensive Development Plan (CDP). The benefits to host communities for energy projects may include, among others, funds from ER 1-94 and the National Wealth Tax. The CDP of an LGU should include all local energy policies, plans, and programs covering the following themes and then submitted to its respective Regional Development Council for integration into the Regional Development Plan.
    a. Energy safety and best practices
    b. Energy efficiency and conservation
    c. Energy resiliency
3. In terms of energy regulatory reform, the LGU shall streamline the processes in issuing the necessary permits on energy-related projects.
4. The LGUs shall encourage the consumers' participation to ensure energy security.
5. In terms of IEC campaign, the LGUs shall capacitate its stakeholders and constituents on the following topics.
    a. Energy safety practices
    b. Energy efficiency and conservation
    c. Energy resiliency
    d. Energy planning (i.e., energy access and resource development, energy programs and policies, etc.)
    e. Energy investment fora, dialogues, and consultations

Resolutions and Department Orders

Advisory (April 2020)

Enjoining all concerned in the government to realize at least ten percent (10%) cost savings

IAEECC Resolution No. 01 Series 2020

Directing all government agencies, including the LGUs and foreign service posts, to comply with the GEMP, ordering the DOE to conduct energy audits and spot checks and submit proposed improvements to the GEMP

IAEECC Resolution No. 02, s. 2021

Directing all government entities, including the LGUs and foreign service posts, to use energy-efficient LED lamps in government buildings and facilities as a requirement for compliance to the GEMP.

IAEECC Resolution No. 03, s. 2021
Directing all government entities, including the LGUs and foreign service posts, to use inverter type air-conditioning units or similar equivalent technologies in government buildings and facilities as a requirement for compliance to the GEMP.

IAEECC Resolution No. 04 S. 2021
Enjoining The Council of Good Local Governance to Consider, Include and Adopt the Energy Efficiency and Conservation (EEC) As One of The Areas in The Criteria Per Section 7 Of Republic Act No. 11292 – "The Seal of Good Local Governance Act Of 2019". This resolution emphasizes the institutionalization of EE&C to LGU operations through the consideration of EE&C as a criterion to the SGLG which is one of the major indicators of good local government governance in the country.

IAEECC Resolution No. 05 S. 2022
Directing All Government Entities (GEs), including the Local Government Units (LGUs) and Foreign Service Posts to Observe the Approved Government Energy Management Program (GEMP) Guidelines. This resolution enforces the use of the GEMP Guidelines by Government Entities, including LGUs, in energy planning and compliance to the GEMP as part of RA 11285.

Department Circular No. DC2020-06-0016
Prescribing the Minimum Energy Performance for Products (MEPP) Covered by the Philippine Energy Labeling Program (PELP) for compliance of Importers, Manufacturers, Distributors, Dealers and Retailers of Energy-Consuming Products.

Allied Laws

RA No. 7160: Local Government Code of 1991
This was enacted in order to transfer the control and responsibility of delivering basic services to the hands of LGUs. It aimed to enhance provision of services in the grassroots level as well as improve the efficiency in resource allocation. Furthermore, it sought to widen the decision-making space by encouraging the participation of stakeholders, especially in the local level.

RA No. 9729: Climate Change Act of 2009
The Climate Change Act aims to afford full protection and the advancement of the right of people to a healthful ecology in accord with the rhythm and harmony of nature. Among its numerous goals, it aspires to uphold the principle of sustainable development, stabilize GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, build national and local resilience to climate change-related disasters, and to incorporate a gender-sensitive, pro-children, and pro-poor perspective in all climate change and renewable energy efforts.

Under the Climate Change Act, each LGU is mandated to formulate and implement its Local Climate Change and Action Plan (LCCAP) consistent with the provisions of the framework strategy and program on climate change, the Local Government Code, and the National Climate Change Action Plan (NCCAP). The LCCAP should include actionable climate change adaptation and mitigation measures in the local territory, such as public awareness campaigns, renewable energy installations, and energy-saving solutions.

RA No. 9003: Ecological Solid Waste Management Act of 2000
This law provides the necessary policy framework, institutional mechanisms, and mandates to the LGUs to achieve 25% waste reduction through establishing an integrated solid waste management plan. EEC interventions and measures, such as the replacement of outdated and inefficient equipment and vehicles, may result in the generation of waste. Therefore, this law provides guidance on the handling and disposal of such waste.

RA No. 6969: Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990
Under this act, the importation, manufacturing, processing, handling, storage, transportation, sale, distribution, use, and disposal of all unregulated chemical substances and mixtures in the country are regulated.

RA No. 10121: Philippine Disaster Risk Reduction and Management Act of 2010
Though this Act does not explicitly have EEC-related provisions, it is important that the LGUs incorporate the latter's principles and requirements such as in the design of hazard-resistant construction and engineering works, response and rehabilitation operations, etc.

RA No. 10667: Philippine Competition Act
This Act is the country's primary competition law which defines, prohibits, and penalizes anti-competitive practices. It has the aim of enhancing economic efficiency and promoting free and fair competition in trade, industry, and all commercial economic activities

RA No. 10771: Philippine Green Jobs Act of 2016
This law stipulates the need to identify skills, develop training programs, and train and certify workers for jobs in a range of industries that produce goods and render services for the benefit of the environment—conserving natural resources for the future generation and ensuring the sustainable development of the country and its transition into a green economy.

PART II. Opportunities for an ISO 50001 Energy Management System (EnMS) Certification

An official certification gives an LGU and its stakeholders formal recognition that its energy management system (EnMS) has been set up in conformance to a recognized international standard. In Book 1, the phases, tasks, and steps outlined in the formulation of the LEECP adhere closely and intently with the ISO 50001; hence, the outputs and results of such phases, tasks, and steps prove to be useful in the LGU's preparation for an ISO 50001 EnMS Certification. While having a certification is not strictly obligatory for an LGU, it is highly recommended since such achievement results in the accrual of the following benefits. Thus, going through a certification process tends to help ensure and guarantee that the LGU commits itself toward improving energy performance over the years.

- ☐ Reduction in energy consumption
- ☐ Reduction in GHG emissions and carbon footprint
- ☐ Reduction in energy costs
- ☐ Global recognition of the standard
- ☐ Assistance in the compliance with voluntary and/or mandatory EEC targets
- ☐ Improvement in the LGU's image and credibility among its stakeholders and citizenry
- ☐ Increase in energy awareness among the LGU's elected officials and staff members at all levels
- ☐ More effective decision-making processes
- ☐ Improvement in operational efficiencies and maintenance practices

Table 3 shows a summary of the sections, phases, and subphases outlined in Book 1, Part I that have been aligned with the sections of ISO 50001:2018. The output documents prepared by the LGU during each of the following phases/subphases help lay the preparatory work for an EnMS Certification.

Table 3. Alignment of the phases and subphases outlined in Book 1, Part I with ISO 50001:2018

Phases and Subphases Outlined in Book 1, Part I	Corresponding Section/s of the ISO 50001
Section A. Preparatory Compliance in the Formulation of a LEECP	
Phase 1. Assemble an Energy Efficiency and Conservation Team	
Subphases 1.1 – 1.3 Define Management Responsibility and Identify Interested Parties	Sections 4.2, 5.1, 5.3
**Training EEC Officer and Personnel for Competence and Awareness (as part of Subphases 1.1 – 1.3)*	Sections 7.2, 7.3
Phase 2. Establish a Vision Anchored on the Local and National EEC Agenda	
Subphase 2.1. Document the Legal Requirements, Organization, and Context	Sections 4, 4.1, 4.2, 6.1
Subphase 2.2. Develop an Energy Policy	Section 5.2
Section B. Strategic Assessment of the Energy Profile	
Phase 3. Implement an Energy Review	Sections 6.3, 6.6
Subphase 3.1. Collect and Analyze Energy Data	
Subphase 3.2. Determine Significant Energy Uses	
Subphase 3.3. Identify and Prioritize Energy Improvement Opportunities	
Phase 4. Determine the Energy Performance Indicators and Energy Baselines	
Subphase 4.1. Determine the Energy Performance Indicator (EnPI)	Section 6.4
Subphase 4.2. Establish an Energy Baseline (EnB)	Section 6.5
Section C. Planning and Operationalization of the LEECP	
Phase 5. Formulate a Coherent LEECP Blueprint	
Subphase 4.1. Define the Scope and Boundaries of the LEECP	Section 4.3
Subphase 4.2. Set the Objectives and Targets	Section 6.2
Phase 6. Implement the LEECP	
Subphase 6.1. Set Operational Control	Section 8.1
Subphase 6.2. Describe Procedures for Design and Procurement	Sections 8.2, 8.3
Subphase 6.3. Ensure Communication and Documentation of Energy Performance	Sections 7.4, 7.5
Section D. Monitoring, Evaluation, and Improvement of the LEECP	
Phase 7. Monitor and Analyze the Energy Performance	
Subphase 7.1. Perform Monitoring, Measurement, and Analysis	Sections 6.6, 9.1
Subphase 7.2. Execute an Internal Audit of the LEECP	Section 9.2
Phase 8. Modify and Rectify the Plan	
Subphase 8.1. Plan for a Management Review	Section 9.3
Subphase 8.2. Perform Corrective Actions and Continuous Improvement	Sections 10.1, 10.2

Phases and Subphases Outlined in Book 1, Part I	Corresponding Section/s of the ISO 50001
Section A. Preparatory Compliance in the Formulation of a LEECP	
Phase 2. Assemble an Energy Efficiency and Conservation Team	
Subphase 1. Define Management Responsibility and Identify Interested Parties	Sections 4.2, 5.1, 5.3
Subphase 2. Train EEC Officer and Personnel for Competence and Awareness	Sections 7.2, 7.3
Phase 3. Establish a Vision Anchored on the Local and National EE&C Agenda	

Subphase 1. Document the Legal Requirements, Organization, and Context	Sections 4, 4.1, 4.2, 6.1
Subphase 2. Develop an Energy Policy	Section 5.2
Section B. Strategic Assessment of the Energy Profile	
Phase 4. Implement an Energy Review	Sections 6.3, 6.6
Subphase 1. Collect and Analyze Energy Data	
Subphase 2. Determine Significant Energy Uses	
Subphase 3. Identify and Prioritize Energy Improvement Opportunities	
Phase 5. Determine the Energy Performance Indicators and Energy Baselines	
Subphase 1. Determine the Energy Performance Indicator (EnPI)	Section 6.4
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Phase 8. Monitor and Analyze the Energy Performance	
Subphase 1. Perform Monitoring, Measurement, and Analysis	Sections 6.6, 9.1
Subphase 2. Execute an Internal Audit of the LEECP	Section 9.2
Phase 9. Modify and Rectify the Plan	
Subphase 1. Plan for a Management Review	Section 9.3
Subphase 2. Perform Corrective Actions and Continuous Improvement	Sections 10.1, 10.2

The journey of an LGU toward an EnMS Certification is straightforward. An approximate time from commencing system development to the conferring of the certificate could be between six (6) months to one (1) year. It involves the following steps.

1. **Prepare ISO 50001 documents.** It is ideal that the LGU should have already implemented its LEECP and EnMS for a few months (Cosenza, et al., 2019). This means that the LEECP should have already been formulated and tested alongside the output documents and requirements specified in each phase and subphase of Book 1, Part I.
2. **Issue a public bid in order to contract a certification body.** Using the standard procurement procedure of the LGU, the public bid will attract the accredited external certification bodies in the country (e.g., SGS, TÜV, etc.).
3. **Undergo the pre-audit and audit phases of the certification body.** A pre-audit allows the LGU to prepare itself with the requirements of the international standard before an actual audit which ensures and checks its total compliance.
4. **Certification.** Upon successful conformity with the international standard, the certification is conferred to the LGU. The common validity period of the certificate is three years.

PART III. Best Practice EEC Case Studies

City of Mandaluyong

The City of Mandaluyong, a first-class highly urbanized city in the National Capital Region with an area of a little more than 11 km^2 and a population of 425,758 in 2020, is regarded as a city championing energy efficiency and sustainability. As of 2020, the city has an electricity connectivity of 98.68% with power services being provided by Meralco.

In 2014, the city has passed that prescribes the norms of conduct to save energy in all public offices and institutions. Since then, numerous EEC programs and activities followed. Noteworthy completed projects of the city highlight EEC and green building measures such as the use of efficient air conditioning units, LED lighting, occupancy sensors, natural daylighting, solar panels, operable windows, heat reflective glass façade, external shading, permeable pavers, and landscaped areas. Additional features are allied sustainability applications such as the use of efficient water fixtures, rainwater harvesting, and the installation of a materials recovery facility. Combinations of these measures were implemented in some of the LGU's school buildings, barangay halls, and community centers. The city has also instituted LED street lighting along several roads, including the Bonifacio-Pioneer Underpass which also employs solar energy harvesting.

Efficiency in fuel consumption is being demonstrated by the city as well. Electric tricycles or e-trikes and electric transport vehicles such as the e-SAKAY and e-jeeps ply competitively against conventional modes of transportation along several public routes. These alternative modes of sustainable mobility boast being environment-friendly, incorporating energy efficiency per charging, and being safe and comfortable. Such projects were made possible through the city's partnership with the DOE, Asian Development Bank, and Meralco. Moreover, the city promotes sustainability through its anti-smoke belching activities and biodiesel programs.

One of its major projects is the Mandaluyong City Green Building Project. Through this, Ordinance No. 535 was adopted in 2014 to localize the Philippine Green Building Code. And in 2018, a revised version of the city's Green Building Regulations was presented and adopted by Ordinance No. 709. Through the project, a Green Building Team was created to oversee its implementation. The regulations cover energy and water efficiency, material sustainability, solid waste management, site sustainability, indoor environmental quality, renewable energy, and environmental protection. A component of the said statute is the Green Building Certification which is issued to the owners and developers of covered buildings for compliance; the same also stands as a requirement for the granting of a building permit and a certificate of occupancy. To date,[j] the issuance of Green Building Certificates resulted in the annual savings of 50.92 GWh in electricity, 4.73 million L in fuel, and 497.15 million L in water. In layman's terms, these savings are equivalent to the electricity consumption of 120,000 homes, fuel consumption of 6,000 cars, and water consumption of 4,000 homes, respectively. The total cost savings amount to PHP 525 million and the yearly avoided GHG emissions is 27.60 million kg CO_2 which is equivalent to the carbon emissions of 13,000 cars in the streets.

Across the panorama, the city continues to be ambitious as it completes and proposes several EEC and green building projects. These include the executive/legislative building, colosseum and civic complex, city college campus, new city medical center, police station, etc. Thus, through the proper planning of the LGU's team and the service and dedication of its executive leaders, the City of Mandaluyong is headed toward the excellent path of EEC.

A copy of Mandaluyong City resolution on saving energy in public offices and

City of Cauayan

Regarded as the "ideal city of the north," the City of Cauayan is a third-class component city with an area of 343 km^2 in the province of Isabela. It has registered a population of 143,403 in 2020. According to a 2019 study using the National Expert SDG Tool for Energy Planning (NEXSTEP) developed by the United Nations Economic and Social Commission for Asia and the Pacific, the city has an electricity connectivity of 90.40% among its population while 76.70% has access to clean energy. The share of renewable energy in the total fuel energy consumption is 5.30% while its energy efficiency is 4.99 megajoule per USD. Also, its total GHG emissions have been determined at 393 kt CO_2e.

The LGU envisages to be a smart, sustainable city by targeting all the United Nations SDGs, particularly SDG 7 to provide renewable energy in the local context. In order to ensure access to affordable and sustainable energy, the city has installed solar panels in city buildings, positioned solar street lights, and collaborated with the Liter of Light Project to help and encourage its citizens to make use of recycled bottles for lighting. In 2017, smart mobility was rolled out in the city in line with the Smarter City Project which

[j] As presented by Arch. Abraham Raposon, Jr. of the City of Mandaluyong during the EEC Virtual Forum for Local Development in Luzon on October 1, 2020

highlights smarter government, smarter economy, smarter environment, smarter mobility, smarter living, and smarter people. Such a project, in partnership with the Isabela State University, the Department of Science and Technology (DOST), and Ropali, allowed the creation and launching of e-tricycles with solar roof. The same year also saw the launching of the CharM or Charging in Minutes Project for the electric vehicles plying in the roads of the city.

Another admirable example of smart mobility in the city is the Hybrid Electric Road Train which is an off-rail hybrid train developed in partnership with the DOST's Metals Industry Research and Development Center. The train is equipped with four interlinked coaches which can accommodate a maximum of 200 passengers per trip. It has a maximum speed of 50 km/h, is powered by a hybrid engine that runs on either diesel fuel or electric batteries, and traverses a total of 13.5 km daily across 10 stations within the city proper. It offers free rides as the city is still designing a reasonable yet sustainable fare matrix. Unlike conventional railway systems, this train is more energy efficient since there is no need for alternating current running through suspended cables. It also produces less GHG emissions compared with cars, trucks, or buses, thus contributing to a cleaner environment.

The Hybrid Electric Road Train an off-rail hybrid train adopted by Cauayan City and developed in partnership with the DOST's Metals Industry Research and Development Center.
Photo sourced from https://mirdc.dost.gov.ph/

The city also features its waste-to-energy facility, a public-private partnership project with Clean World Sustainable Solutions, Inc., which has the capacity to accommodate waste from the city and its five neighboring LGUs as well. It can treat 22 t of waste in a 24-hour operation. Meanwhile, the most recent initiative for SDG 7 includes an ordinance which was passed to incentivize local businesses utilizing renewable energy in their establishments. Furthermore, the city is also integrating the use of solar energy in the local building code.

In order to push EEC in the city, a local energy audit team has been created. It is composed of city line agencies, business owners, and water and electric companies. The duties of such a team include the provision of technical assistance to minimize energy utilization of households and business establishments, conduct of institutional level energy assessment, and the development of strategies to promote lesser energy generation and consumption.

The city is indeed an excellent example of imbibing and localizing the 17 SDGs of the United Nations. In 2017, its local chief executive provided a state of the city address where the clear steps taken by and future plans of the LGU in SDG localization and institutionalization have been shared. Literally, the city promoted the SDGs in terms of painting and designing its city hall, sports complex, and a park with the 17 colorful goals. Likewise, backpacks distributed to elementary school students were decorated with the goals.

Undeniably, it is impressive how an LGU such as the City of Cauayan can concentrate its efforts in renewable energy, energy efficiency, and energy access for the preservation of the planet, appreciation of cost savings, and, of course, upholding better lives for its citizenry. As of this writing, the city is headed toward an ISO 37122 (Sustainable Cities and Communities) Certification.

City of Mandaue

Located in the heart of the Central Visayas region, the City of Mandaue is a first-class highly urbanized city with an area of 35 km^2 and a population of 364,116 in 2020. It is tagged as a "little rich city" as it hosts about 10,000 industrial and commercial locators. The Visayan Electric Company serves as the distribution utility of the city.

Among the cross-cutting strategies of the city is the development and establishment of policies for its green building and sustainable investment priorities. In 2015, the city promulgated Ordinance No. 13-2015-1047 which is the Green Building Ordinance of Mandaue City, the drafting of which was supported by the International Finance Corporation. The policy promotes the concept of green building in the design, construction, renovation, and operation of all public and private buildings in Planned Unit Development areas in the city. In order to measure the performance of the green buildings in the city, the local government adopted the Building for Ecologically Responsive Design Excellence (BERDE) tool from the Philippine Green Building Council. Further, the policy provides incentives for the green buildings. Also, in support of the policy implementation is the Mandaue City Green Building Board which is a public-private body composed of the city mayor, representatives from the city building officials, engineers, and academics. It has been created to operationalize the Green Building Ordinance successfully.

The Mandaue City Hall.
Photo sourced from sunstar.com

At the 12th Asia-Pacific Economic Cooperation Energy Ministers Meeting in 2015, the City of Mandaue was chosen as the recipient for the Phase 6 of the Low Carbon Model Town Project. It entitled the city to a feasibility study

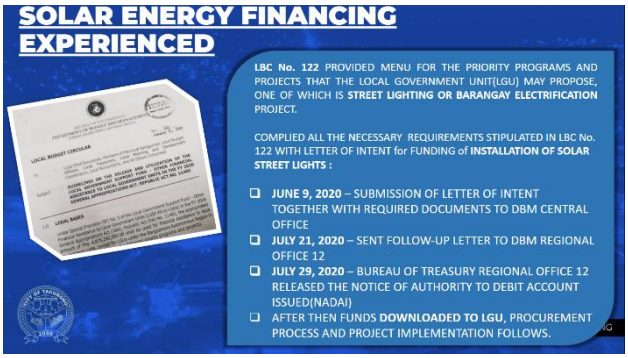
grant that covered green technology opportunities in buildings, urban planning, and the transport sector.

City of Tacurong

Dubbed as the city of goodwill, the City of Tacurong is located in the province of Sultan Kudarat at the center of the Soccsksargen region. It is classified as a fourth-class component city with an area of 153 km^2 and a population of 109,319 based on a 2020 census. Power to the city is being supplied by the Sultan Kudarat Electric Cooperative, Inc.

While little might be known about the City of Tacurong, its initiative and ambition toward EEC are deemed significant; thus, it ranks alongside LGUs in the country with the best EEC practices thanks to the work of its dedicated staff and officials. In 2018, the city spearheaded re-lamping along its roads, including the national highway, with focus on energy efficiency and renewable energy. For this initiative, the city replaced most of its high energy-consuming sodium-vapor lamps (450 units, each with a power requirement of 250 W) with solar-powered LED lights. The combined total cost of installing the zero-carbon, high-efficient lighting system stood at PHP 16 million which was sourced from the local fund. More importantly, the conversion provided the city with an estimated savings of 206,386 kWh in street lighting per year.

Improvements in lighting and cooling efficiency were also seen and experienced in the offices of the LGU. Fluorescent lamps (36 W) were replaced by LED tubular lights (18 W), and non-inverter A/C units were replaced with ones having the inverter technology. The replacements in lighting and air conditioning are currently pegged complete at 50% and 34%, respectively.[k] Also, such measures were estimated to bring annual electricity savings of 6,847 kWh per 100 replaced lamps and 578,208 kWh, respectively. Its newly constructed buildings also employ LED lamps.



Tacurong City's experience on securing financing from the Department of Budget and Management for its street lighting project

The proactivity of the city in EEC is expected to gain traction. In 2020, the local government made a bolder move by mainstreaming the use of solar-powered street lights. The projects, requiring the total amount of PHP 50 million for the installation of 997 units of 150 W solar-powered street lighting in major thoroughfares, have been funded through the Local Government Support Fund-Financial Assistance (LGSF-FA). The city pointed to the Local Budget Circular No. 122 issued by the DBM in 2020 which allowed its staff to propose the solar-powered street lighting projects. In the same year, the funds were downloaded to the LGU, and the procurement process as well as the project implementation followed. Another excellent project of the LGU in the pipeline is the installation of solar panels in its executive and legislative buildings.

During the infancy of implementing EEC measures and projects, the case of the City of Tacurong might also become the case of the other LGUs. Whatever is the case, the integration of EEC in all activities of the local government provides numerous benefits and advantages. Thus, with moving EEC projects, there lies certainty that this city's EEC journey has just begun.

[k] As presented by Ms. Amelia Bochorno of the City of Tacurong during the EE&C Forum: Financing Modalities and Tools to Advance EE&C in Local Planning and Development in Visayas and Mindanao on May 20, 2021

PART IV. Organizing and Capacitating the EEC Management Board

This section further discusses steps in fulfilling the tasks in Phase 2 (Establish a Vision Anchored on the Local and National EEC Agenda). These processes are only prescriptive and is believed to have been done by the LGU in preparing other local development plans. Although they are not required, it is advisable to conduct them as part of the planning process to support effective implementation of the Local Energy Efficiency and Conservation Plan.

Stakeholder analysis

Map stakeholders and determine their interests, needs, and requirements. The goal of this task is to identify the stakeholders that must be involved in the process, along with their interest, needs, and requirements as shown in Figure 4. To develop a stakeholder analysis (Table 4), list down and specify (in the first column) all the parties and stakeholders (individuals or organizations) that, through their programs and activities, may impact and influence the LGU's LEECP and EnMS. Passively, they may be affected by any EEC decision or ruling of the LGU in the future. Start with internal stakeholders first (employees, departments, offices, facilities, etc.) before external stakeholders (LGU customers, regulatory bodies, power provider, suppliers, contractors and subcontractors, service providers, etc.). Next, identify and briefly describe the interests, needs, requirements, and expectations (in the second column) of each of these stakeholders with regards to energy consumption and energy performance. For instance, a public hospital owned by the LGU (listed in the first column) has a requirement (in the second column) of uninterrupted power supply 24/7. Such public hospital may also have a need (in the second column) in the very near future (within two to three years) for an expansion in order to cater for public health. Coinciding with this second step is a consultation workshop and face-to-face meetings (or equivalent) with the stakeholders to discuss in-depth understanding of each of their interests, needs, requirements, and expectations. Document the results of the consultation workshop or minutes of the meetings.

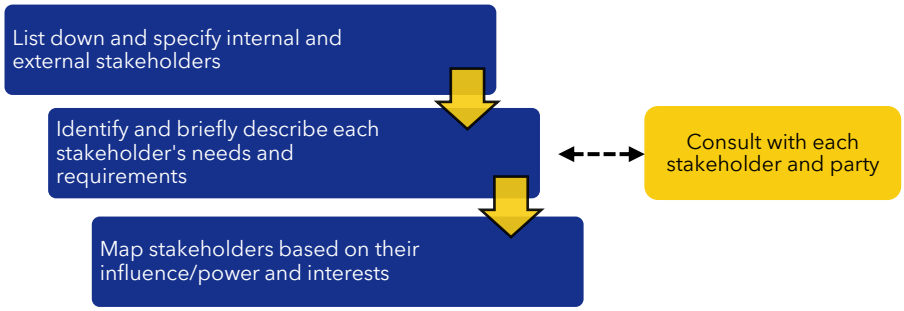


Figure 4. Steps to map stakeholders and determine their needs and requirements

Table 4. Stakeholder analysis

Parties and Stakeholders	Needs, Requirements, Interests, and Expectations Related to Energy Consumption and Energy Performance
(e.g., name of public hospital)	Requirement: uninterrupted, reliable power supply 24/7 Future need: additional power requirement within two years for the construction of the hospital's annex
…	

After identifying the stakeholder and their needs, the final step in this task is to map each one. The formed EEC management board (or jointly with the actual stakeholders) will do the mapping by assessing how much: (1) influence or power and (2) interest a stakeholder have over the decisions and activities relating to the planning for the LEECP and the EnMS, in general. This can be achieved using a power/interest matrix as seen in Table 5 (Johnson, Scholes, & Whittington, 2008). The following is a methodology for assigning which quadrant the stakeholder belongs.

1. **High influence, high interest:** refers to main stakeholders which should be heavily involved and consulted frequently
2. **High influence, low interest:** refers to the stakeholders which can be consulted for unique/specific decisions
3. **Low influence, high interest:** refers to those which must still be present during consultations so that they are kept informed
4. **Low influence, low interest:** refers to those that should be part of the expanded list of participants during consultation.

Table 5. Power/Interest matrix

High Influence		
Low Influence		
	Low Interest	**High Interest**

Capacitating your EECO and EEC management board

Depending on the requirements, specific skills, such as the conduct of energy audit, green procurement, facilities management, etc., might also be needed and come handy for select members of the EEC team. In this case, specialized trainings might be apt for them in the near future. It should be noted that a database or registry containing training attendance and records must be kept and regularly updated to keep track of progress. The following chart shows the procedure of executing this task. It is not a linear but rather an iterative process for upholding continuous improvement.

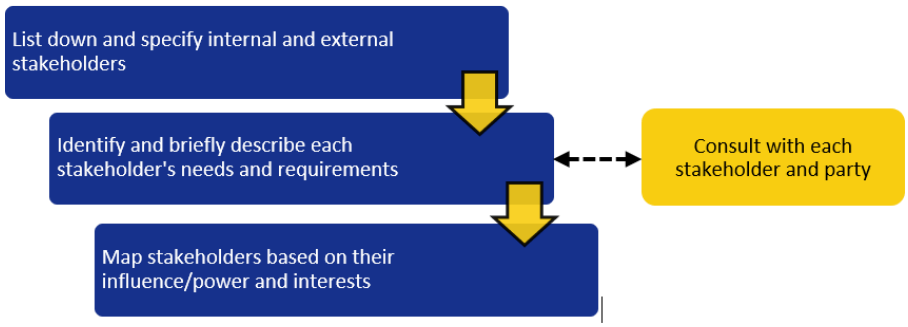


Figure 5. A chart showing how trainings must be conducted for EEC personnel

As indicated previously, the LGU may select its own set of training courses and programs. It just needs to make sure that such assembly of courses and all sorts of awareness-raising campaigns must consider both facilitating and hindering factors to EEC and energy management, in general. In a study, it was presented that the current major barriers in the mass deployment of EEC in LGUs were the absence (or inadequacy) of organized platforms for participated planning, lack of applicable financial instruments, lack of knowledge around existing financial instruments, high upfront investment cost, limited information sharing among stakeholders, and a shortcoming of capacity to monitor and verify energy savings (World Energy Council, 2019). Therefore, the technical components of the trainings must also be complemented with topics relating to or advancing the facilitating factors while reducing the hindering factors in EEC and energy management. For the people working in the EEC team to have the knowledge, skills, and attitudes that are essential to perform their specific and expanded roles and responsibilities, it is strongly prescribed that they must assimilate each of the following competencies (alongside the framework which comes with each). For the most part, the clusters of leadership, core, and functional competencies make up the competency model of an energy efficient LGU (Ateneo School of Government, 2020). Training modules should be aimed at equipping LGU personnel or staff with these competencies. As a reference, EEC Officers may refer to the Indicative Competency Dictionary developed by the Ateneo School of Government. It is a guide to determine the appropriate training program for the energy transition efforts of local governments.

1. **Leadership/Managerial Competency: Energy Leadership**
    a. Strategic and systems thinking in the complexities of the energy systems
    b. Leading change in people's behavior, lifestyle, perspectives, and choices in energy use and access
    c. Building networks, coalitions, and mediating conflicts for energy transitions
    d. Strengthening institutions and creating the enabling environment for energy transitions
2. **Core/Foundational Competency: Energy Planning, Energy Policy**
    a. Knowledge of energy laws, rules, regulations, policies, institutions, and administrative procedures
    b. Analysis of the energy system, its constituent parts and environment
3. **Functional/Technical Competency: Renewable Energy, Energy Audit, Energy Financing**
    a. Renewable energy: adopting and disseminating RE technologies; RE program and project management; community
    mobilizing, organizing, and participation; program monitoring and evaluation of RE program and project
    b. Energy audit: planning the energy audit process; organizing/implementing an energy audit; using innovative techniques and information and communications technology (ICT) tools; communicating the energy audit to stakeholders
    c. Energy access financing: financial analysis and decision in energy transition programs and projects; accounting for financing and other debts for energy transition programs and projects

PART V. Strategies in Doing an Energy Review

This presents tools and steps in data collection and methods to identify significant energy uses (SEUs) and to prioritize EEC opportunities as tasks in Book 1 Phase 3 (energy review). The LGU may opt to select one of the methods prescribe in identifying SEUs and prioritizing EEC opportunities, if no available national directive has yet to be provided. Equally, the methods on selecting EEC opportunities may likewise be used to EE proposals.

Collecting Energy Data

The following energy data collection worksheet (Table 1) helps an LGU to keep track of the energy sources, energy uses, equipment inventory and specifications, energy consumption, and relevant variables among other essential information. It builds on the already available report forms and inventory/survey worksheets from the national government and the ISO recommendations as described in the previous tasks of Phase 3, Subphase 3.1. At the same time, it follows the same course of categorization of the MECR and MFCR forms where all collected energy data are under the umbrella of one facility, building, or department. Thus, an LGU should accomplish one or more worksheet/s depending on its assets. Such a worksheet can be modified accordingly to fit the distinct needs and requirements of a specific facility, building, or a department of the LGU. One of the major values of an accomplished energy data collection worksheet is the determination of significant energy uses (SEUs) which will be discussed in the next subphase. It allows the LGU to prioritize these SEUs and plan for EE&C measures and energy-saving projects with the highest impacts. The guidelines to fill out Table 6 are as follows. The letters (from A to T) represent each of the needed information to accomplish the worksheet.

A. **Facility/Site/Building/Department Name.** Input the name of the facility, site, building, or department in consideration. This will refer to an individual area (e.g., municipal/city/provincial hall, public park, public hospital, etc.) having a separate energy (electricity, fuel, etc.) account.
B. **Description.** Provide the description of the facility, site, building, or department. This may also include additional information such as location.
C. **EEC Officer or EEC Focal Person.** Input the name of the EEC Officer or EEC Focal Person in charge of the facility, site, building, or department.
D. **Gross Area.** Provide the gross area of the facility, site, building, or department as specified in the building plan or blueprint.
E. **Energy Source Number.** Enter a value from one (1) onwards. For instance, if the facility has two energy sources, then this worksheet will have a value of one (1) and the next will have a value of two (2).
F. **Energy Source.** Based on Task 3 of subphase 3.1, select and input the energy source of the facility, site, building, or department. Other energy sources will require separate worksheets.
G. **Total Energy Consumption.** Record the billed energy consumption, such as the billed kWh if the energy source is electricity, from the energy provider. If this is not available, then the person in charge should use a submeter or portable meter to measure the total energy consumption of the facility, site, building, or department.
H. **Unit.** Input the corresponding unit of the total energy consumption. This may be in kWh if the energy source is electricity.
I. **Period in Consideration.** The period in consideration may be per month, quarter, year, etc. Thus, the specific period should be entered here.
J. **Energy Use.** Based on Task 4 subphase 3.1, specify the energy uses of the facility, site, building, or department. Each equipment, appliance, or device to be identified should fall under a certain energy use.
K. **Description of Equipment, Appliance, or Device.** Itemize each of the equipment, machinery, appliance, and device falling under each energy use. It is important to include certain characteristics and specifications of the item/unit. For instance, one can specify here a linear fluorescent lamp with electronic ballast or a split-type A/C unit with inverter technology. One can also consider grouping equipment, appliances, and devices in case of duplicates in characteristics and specifications. However, one must be careful in ensuring that the power rating (column N) and the energy consumption (column P) resemble the group's total power and energy, respectively.
L. **ID Number.** Specify the identification number (if any) of the equipment, appliance, machinery, or device.
M. **Location.** Provide the specific location of the equipment, appliance, or device. One may attach a schematic to properly represent the actual placement of each one.
N. **Power Rating.** Enter the power rating or nameplate rating of each equipment, appliance, or device. This will prove to be useful when no actual measurement of energy consumption (column P) is available and only an estimation can be provided.
O. **Time of Use.** This refers to the operating time (usually in hours) of the equipment, appliance, machinery, or device. This will prove to be useful when no actual measurement of energy consumption (column P) is available and only an estimation can be provided.
P. **Energy Consumption.** Record the actual energy consumption of the equipment, appliance, or device during the specified period in consideration (row I). This can be accomplished by having an actual energy meter, submeter, or portable meter measure or gauge the said equipment. In case this is not possible, an estimation of the energy consumption can be made by simply multiplying the power rating (column N) and the time of use (column O). However, the calculation may not be as simple as this especially for other loads. For instance, the actual power requirement to run a motor is usually, say, 10% less than its power rating or nameplate rating (column N). Additionally, other factors such as the load factor and duty factor must be incorporated into the calculation when necessary. All of this must be taken into consideration when estimating energy consumption of any equipment, appliance, machinery, or device.
Q. **Method of Determining Energy Consumption.** Specify how the energy consumption of the equipment, appliance, or device was obtained. It can be through an actual measurement (installed main meter, submeter, portable meter, etc.), estimated and calculated (as discussed previously), or any other method.

R. **Relevant Variables.** Based on Task 5 of subphase 3.1, list the relevant variables (occupancy, weather, etc.) affecting the energy consumption of the equipment, appliance, or device for easy reference. In case the LGU may find it necessary to insert the data of the individual relevant variables for the period in consideration, then the worksheet may be modified according to such a need.

S. **Persons Influencing Energy Use.** Based on Task 6 of subphase 3.1, list all the people affecting the energy performance of the equipment, appliance, or device in consideration.

T. **% of Total Energy Consumption.** Obtain the percentage contribution of each equipment, appliance, or device toward the total energy consumption (row G) of the facility, site, building, or department. Simply divide the energy consumption (column P) by the total energy consumption (row G); then multiply the result by 100 in order to get the percentage.

It is essential to note that the following energy data collection worksheet can be flexibly used and modified. Since the worksheet will be used in the determination of SEUs, the point of comparison may not only be an equipment against other equipment or an energy use against other energy uses. It can be a metered floor against other metered floors, a metered department/office against other metered departments/offices, or a metered building against other metered buildings. A sample filled out table (Table 7) follows to help readers visualize how the energy data collection worksheet is accomplished properly. After the energy data collection worksheet is filled out, it will also help to visually represent the data through charts and diagrams. A pie chart, bar chart, Sankey diagram, or any other means can be used for the representation.

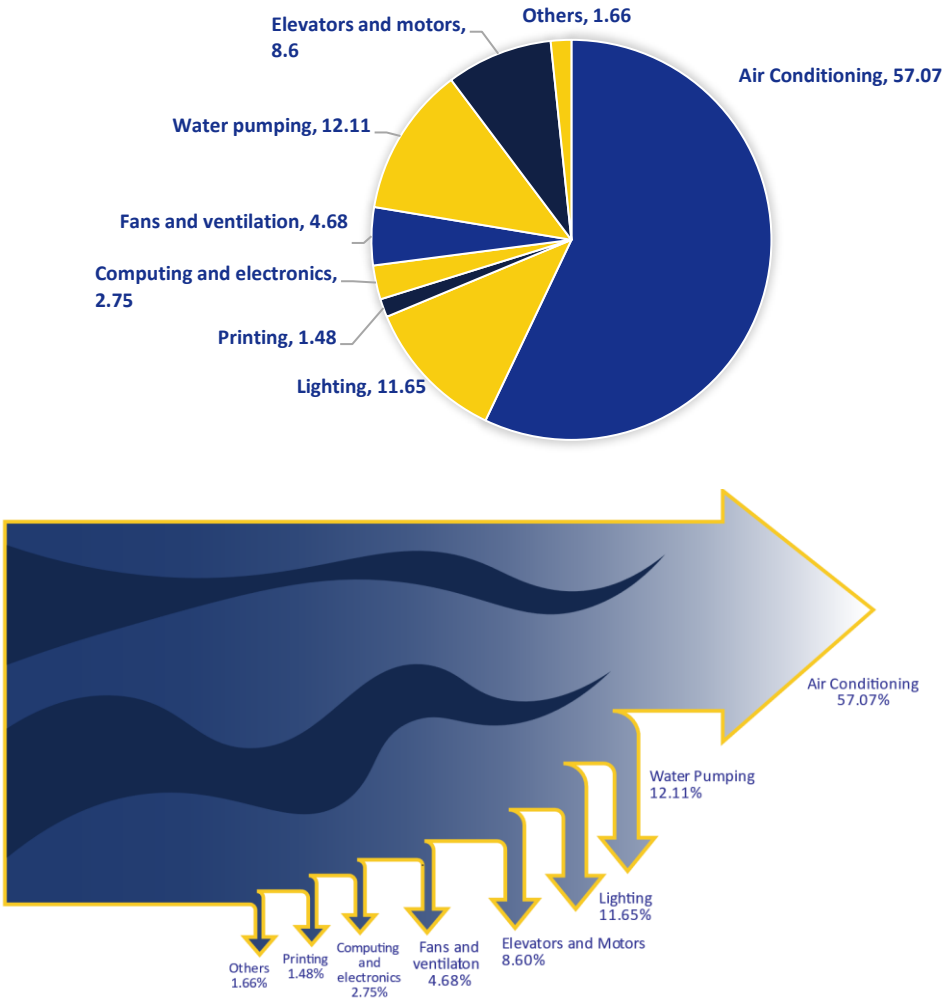


Figure 6. Sample pie chart (above) and Sankey diagram (below)

Table 6. Energy data collection worksheet

Facility/Site/Building/Department Name	A	
Description	B	
EEC Officer or EEC Focal Person	C	
Gross Area	D	
Energy Source Number	E	
Energy Source	F	
Total Energy Consumption	G	
Unit	H	
Period in Consideration	I	

Energy Use	**Description of Equipment, Appliance, or Device**	**ID Number**	**Location**	**Power Rating**	**Time of Use**	**Energy Consumption**	**Method of Determining Energy Consumption**	**Relevant Variables**	**Persons Influencing Energy Use**	**% of Total Energy Consumption**
J	K	L	M	N	O	P	Q	R	S	T

Table 7. Sample filled up energy data collection worksheet

Facility/Site/Building/Department Name	A	City Hall Annex
Description	B	Located at Rizal Avenue and houses different offices of the local government
EEC Officer or EEC Focal Person	C	Juan Santos
Gross Area	D	1,000 m^2
Energy Source Number	E	1
Energy Source	F	Electricity
Total Energy Consumption	G	25,600
Unit	H	kWh
Period in Consideration	I	1 month (22 working days): May 1, 2019 to May 31, 2019

Energy Use	**Description of Equipment, Appliance, or Device**	**ID Number**	**Location**	**Power Rating**	**Time of Use**	**Energy Consumption**	**Method of Determining Energy Consumption**	**Relevant Variables**	**Persons Influencing Energy Use**	**% of Total Energy Consumption**
–	–	–	–	kW	h	kWh/month	–	–	–	%
J	K	L	M	N	O	P	Q	R	S	T
Air Conditioning	Window-type A/C, non-inverter	AC0001	Budget Office	1.12	8	220.35	Portable meter	Occupancy, weather	Employees of Budget Office	0.86%
Air Conditioning	Window-type A/C, non-inverter	AC0002	Budget Office	1.12	8	224.00	Portable meter	Occupancy, weather	Employees of Budget Office	0.88%
Air Conditioning	Window-type A/C, non-inverter	AC0003	Budget Office	1.49	8	336.69	Portable meter	Occupancy, weather	Employees of Budget Office	1.32%
Air Conditioning	Split-type A/C, inverter	AC0010	Treasury Office	1.49	8	201.01	Submeter	Occupancy, weather	Employees of Treasury Office	0.79%
Air Conditioning	Split-type A/C, inverter	AC0011	Treasury Office	1.49	8	199.00	Submeter	Occupancy, weather	Employees of Treasury Office	0.78%
Air Conditioning	Floor type A/C	AC0050	Lobby	5.71	8	703.47	Portable meter	Occupancy, weather	All employees	2.75%
…	…	…	…	…	…	…	…	…	…	…
All Air Conditioning						14,609.92	Added total consumption of individual A/C units			57.07%
Lighting	Fluorescent lamp (20 units @ 40 W each)	FL0001 to FL0020	Budget Office	0.80	8	183.04	Computed: (0.04 kW power rating + 0.012 kW ballast power) × 20 units × 8 h/day × 22 days	Occupancy	Employees of Budget Office	0.72%
Lighting	CFL (60 units @ 14 W each)	FL0021 to FL0080	Building Soffits	0.84	8	147.84	Computed: 0.84 kW × 8 h/day × 22 days	Occupancy	Employees of Budget Office	0.58%

Lighting	Lobby chandelier (with 52 incandescent bulbs @ 65 W each)	CH0002	Lobby	3.38	8	598.00	Portable meter	Occupancy	All employees	2.34%
Lighting	LED light bulbs (50 units @ 7 W each)	LE0051 to LE0100	Hallway	0.35	8	61.60	Computed: 0.007 kW × 50 units × 8 h/day × 22 days	Occupancy	All employees	0.24%
…	…	…	…	…	…	…	…	…	…	…
All Lighting						2,982.40	Added total consumption of all lighting			11.65%
Printing	Desk jet printer	PR0025	Budget Office	0.175	4	15.40	Computed: 0.175 kW × 4 h/day × 22 days	Occupancy	Employees of Budget Office	0.06%
Printing	All-in-one printer	PR0026	Treasury Office	0.250	4	22.00	Computed: 0.250 kW × 4 h/day × 22 days	Occupancy	Employees of Treasury Office	0.09%
…	…	…	…	…	…	…	…	…	…	…
All Printing						378.88	Added total consumption of all printing equipment			1.48%
Computing and Electronics	Laptop	PC0055	Budget Office							
Computing and Electronics	Desktop computer	PC0056	Treasury Office							
…	…	…	…	…	…	…	…	…	…	…
All Computing and Electronics						704.00	Added total consumption of all computing and electronics equipment			2.75%
Fans and Ventilation	Stand fan	FA0080	Budget Office							
Fans and Ventilation	Exhaust fan	FA0081	Ladies' Toilet, 4/F							
…	…	…	…	…	…	…	…	…	…	…
All Fans and Ventilation						1,198.08	Added total consumption of fans and ventilation			4.68%
Water Pumping	Pump 1	PU0001	Basement							
Water Pumping	Pump 2	PU0002	Basement							
…	…	…	…	…	…	…	…	…	…	…
All Water Pumping						3,100.16	Added total consumption of water pumps			12.11%
Elevators and Motors	Elevator	EL0001	Lobby							
…	…	…	…	…	…	…	…	…	…	…
All Elevators and Motors						2,201.60	Added total consumption of all elevators and motors			8.60%
Others	Office equipment (specify)									
…	…	…	…	…	…	…	…	…	…	…
Others						424.96	Added total consumption of remaining office equipment			1.66%

Methods to Determine Significant Energy Uses (SEUs)

Method 1: Ranking System

To accomplish the ranking system, all the energy uses will have to be ranked from the one with the highest energy consumption down to the one with the least consumption. One can group these (such as all air conditioning equipment, all lighting, etc.) or do it individually. Then, the first three or first five energy uses with the highest consumption may be regarded as the SEUs.

Table 8. Representation of the ranking method, with the first five being regarded as SEUs

Rank 1	Energy Use	SEU
Rank 2	Energy Use	SEU
Rank 3	Energy Use	SEU
Rank 4	Energy Use	SEU
Rank 5	Energy Use	SEU
Rank 6	Energy Use	Not SEU
Rank 7	Energy Use	Not SEU
Rank 8	Energy Use	Not SEU

Method 2: 80/20 Rule

Another method using the 80/20 Rule can also be applied. After the rankings are made, the % energy consumptions are successively added until the cumulative value reaches 80%. All energy uses, approximately representing 20% of the total energy uses, qualifying within this value will then be referred to as the SEUs.

Table 9. Representation of the 80/20 Rule

Rank	Energy Use	% Energy Consumption	Cumulative % Consumption	Classification
Rank 1	Energy Use	45%	45%	SEU
Rank 2	Energy Use	15%	60%	SEU
Rank 3	Energy Use	10%	70%	SEU
Rank 4	Energy Use	10%	80%	SEU
Rank 5	Energy Use	8%	88%	Not SEU
Rank 6	Energy Use	6%	94%	Not SEU
Rank 7	Energy Use	4%	98%	Not SEU
Rank 8	Energy Use	2%	100%	Not SEU

These two methods can be understood by referring to the next table. It uses the example from Table 7 (sample data collection worksheet). It can be inferred from Table 10 that Method 1 considers all air conditioning equipment, water pumps, lighting, elevators and motors, and fans and ventilation systems as SEUs while Method 2 only considers all air conditioning equipment, water pumps, and all lighting as SEUs.

Table 10. Application of the ranking (Method 1) and 80/20 Rule (Method 2)

Energy Use	Description of Equipment, Appliance, or Device	...	% of Total Energy Consumption	Cumulative % Consumption	Rank	SEU (Method 1)	SEU (Method 2)
All Air Conditioning		...	57.07%	57.07%	1	SEU	SEU
Air Conditioning	Floor type A/C	...	2.75%				
Air Conditioning	Window-type A/C, non-inverter	...	1.32%				
Air Conditioning	Window-type A/C, non-inverter	...	0.88%				
Air Conditioning	Window-type A/C, non-inverter	...	0.86%				
Air Conditioning	Split-type A/C, inverter	...	0.79%				
Air Conditioning	Split-type A/C, inverter	...	0.78%				
...	...	...	...				
All Water Pumping		...	12.11%	69.18%	2	SEU	SEU
Water Pumping	Pump 1	...					
Water Pumping	Pump 2	...					
...	...	...	...				
All Lighting		...	11.65%	80.83%	3	SEU	SEU
Lighting	Lobby chandelier (with 52 incandescent bulbs @ 65 W each)	...	2.34%				
Lighting	Fluorescent lamp (20 units @ 40 W each)	...	0.72%				
Lighting	CFL (60 units @ 14 W each)	...	0.58%				
Lighting	LED light bulbs (50 units @ 7 W each)	...	0.24%				
...	...	...	...				
All Elevators and Motors		...	8.60%	89.43%	4	SEU	Not SEU
Elevators and Motors	Elevator	...					
...	...	...	...				
All Fans and ventilation		...	4.68%	94.11%	5	SEU	Not SEU
Fans and Ventilation	Stand fan	...					
Fans and Ventilation	Exhaust fan	...					
...	...	...	...				
All Computing and Electronics		...	2.75%	96.86%	6	Not SEU	Not SEU
Computing and Electronics	Laptop	...					
Computing and Electronics	Desktop computer	...					
...	...	...	...				

All Others		...	1.66%	98.52%	7	Not SEU	Not SEU
Others	Office equipment (specify)	...					
...	...	...	...				
All Printing		...	1.48%	100%	8	Not SEU	Not SEU
Printing	Desk jet printer	...	0.06%				
Printing	All-in-one printer	...	0.09%				
...	...	...	...				

Method 3: Point System

Another method that LGUs can employ is using a point system. It combines different criteria and assigns points depending on the predetermined conditions (Table 11). For the sample point system, the highest point an energy use can get is 20 points. Say, for example, that in order to be considered an SEU, the energy use must have at least 60% of the total possible points. This translates to 20 points × 60% = 12. Table 12 shows how the point system method is applied to the previous example (Table 10). It can be inferred from the table that Method 3 considers all air conditioning equipment, water pumps, lighting, and elevators and motors as SEUs.

Table 11. Sample selection criteria using a point system

CRITERIA AND DESCRIPTION	CONDITIONS AND POINTS		
CRITERIA 1: % Energy Consumption What is the percentage energy consumption of an energy use compared with the total energy consumption?	If < 2% **0 Point**	If > 2% & < 10% **5 Points**	If > 10% **10 Points**
CRITERIA 2: Opportunity for Improvement What is the potential percentage reduction in the energy consumption through an energy audit or alternatively estimated from literature data on applicable improvement opportunities?	If < 2% **0 Point**	If > 2% & < 10% **2 Points**	If > 10% **5 Points**
CRITERIA 3: Payback Period What is the investment payback period evaluated through an energy audit or alternatively estimated from literature data on applicable improvement opportunities?	If > 10 years **0 Point**	If > 5 years & < 10 years **2 Points**	If < 5 years **5 Points**

Table 12. Application of the point system (Method 3)

Energy Use	Description of Equipment, Appliance, or Device	...	% of Total Energy Consumption	Criteria 1	Criteria 2	Criteria 3	Total Points	SEU (Method 3)
Air Conditioning	Window-type A/C, non-inverter	...	0.86%					
Air Conditioning	Window-type A/C, non-inverter	...	0.88%					
Air Conditioning	Window-type A/C, non-inverter	...	1.32%					
Air Conditioning	Split-type A/C, inverter	...	0.79%					
Air Conditioning	Split-type A/C, inverter	...	0.78%					
Air Conditioning	Floor type A/C	...	2.75%					
...	...	...	...					
All Air Conditioning		...	57.07%	10	5	5	20	SEU
		...						
Lighting	Fluorescent lamp (20 units @ 40 W each)	...	0.72%					
Lighting	CFL (60 units @ 14 W each)	...	0.58%					
Lighting	Lobby chandelier (with 52 incandescent bulbs @ 65 W each)	...	2.34%					
Lighting	LED light bulbs (50 units @ 7 W each)	...	0.24%					
...	...	...	...					
All Lighting		...	11.65%	10	5	5	20	SEU
		...						
Printing	Desk jet printer	...	0.06%					
Printing	All-in-one printer	...	0.09%					
...	...	...	...					
All Printing		...	1.48%	0	0	0	0	Not SEU
		...						
Computing and Electronics	Laptop	...						
Computing and Electronics	Desktop computer	...						
...	...	...	...					
All Computing and Electronics		...	2.75%	5	0	0	5	Not SEU
		...						
Fans and Ventilation	Stand fan	...						
Fans and Ventilation	Exhaust fan	...						
...	...	...	...					
All Fans and Ventilation		...	4.68%	5	2	2	9	Not SEU
		...						
Water Pumping	Pump 1	...						
Water Pumping	Pump 2	...						
...	...	...	...					
All Water Pumping		...	12.11%	10	5	2	17	SEU
		...						
Elevators and Motors	Elevator	...						
...	...	...	...					
All Elevators and Motors		...	8.60%	5	5	2	12	SEU
		...						
Others	Office equipment (specify)	...						
...	...	...	...					
Others		...	1.66%	0	0	0	0	Not SEU

The following summarizes which energy uses are considered as SEUs (and not SEUs) by each of the described methods. Method 1 is the easiest way to quickly identify SEUs while Method 2 may prove to be helpful when the LGU opts to concentrate on a few key areas and equipment for any EE&C project. However, Method 3 may also be logical and practical to use as the selection criteria is based on very important questions. In the end, it is up to the LGU to choose which method it prefers or to formulate a better one.

Table 13. Comparison of different SEU selection methods

Classification	**Method 1:** Ranking	**Method 2:** 80/20 Rule	**Method 3:** Point System
SEU	Air Conditioning Water Pumping Lighting Elevators and Motors Fans and Ventilation	Air Conditioning Water Pumping Lighting	Air Conditioning Water Pumping Lighting Elevators and Motors
Not SEU	Computing and Electronics Printing Others	Elevators and Motors Fans and Ventilation Computing and Electronics Printing Others	Fans and Ventilation Computing and Electronics Printing Others

Methods to Prioritize EEC Opportunities

As a group, the EEC Officer and its EEC management board together with the stakeholders and parties (particularly those with high influence and/or high interest identified through the stakeholders' analysis conducted). In order to narrow down the prioritization process, an initial screening may be done. For this example, the following methods will be applied only to all options and opportunities related to an SEU (see columns 3 and 4 of Table 15).

As discussed in Book 1, the DOE is also recommending that the following conditions are considered.

- ☐ Environmental hazards
- ☐ Economic and financial factors
- ☐ Safety concerns
- ☐ Use of energy-efficient technology

Method 1: Technical evaluation with ranking of options tool

Method 1: The technical evaluation with ranking of options tool assesses all the screened EEC candidate projects and programs based on several parameters or criteria. A certain number of points is awarded depending on the evaluation of the opportunity per parameter, after which all points are tallied up. The opportunities or options are then ranked based on the total number of points obtained. The highest possible point per parameter is three (3) while the lowest is one (1). The following are the suggested parameters or criteria. The LGU may revise the scoring rules as necessary. Where there is discussion, the group may assign middle scores such as 1.5 (between 1 point and 2 points) and 2.5 (between 2 points and 3 points). The following table (Table 14) appends the selection criteria of this method to the right side of Table 15 so that everyone may see the needed details and information.

1. **Estimated energy or cost savings.** How much energy or pesos will the LGU save?
   - 3 Points: Energy/cost savings is > 10% of the current energy consumption/cost
   - 2 Points: Energy/cost savings ranges from 5% to 10% of the current energy consumption/cost
   - 1 Point: Energy/cost savings is < 5% of the current energy consumption/cost
2. **Cost of implementation.** How much is the estimated installation cost associated with the implementation?
   - 3 Points: Implementation cost is < PHP 100,000
   - 2 Points: Implementation cost ranges from PHP 100,000 to PHP 500,000
   - 1 Point: Implementation cost is > PHP 500,000
3. **Payback period.** How long will the initial cost of investing in the option be repaid through the monthly/annual savings?
   - 3 Points: Payback period is < 5 years
   - 2 Points: Payback period ranges from 5 years to 10 years
   - 1 Point: Payback period is > 10 years
4. **Ease of implementation.** Will the option require lots of resources to implement?
   - 3 Points: The implementation is easy to implement and requires less resources
   - 2 Points: The implementation is moderate to implement and requires moderate resources
   - 1 Point: The implementation is difficult to implement and requires lots of resources
5. **Length of implementation period.** How long will any installation, retro-commissioning, etc. associated with the option last?
   - 3 Points: The installation of equipment, retrofitting, etc. can be implemented in the short-term (1 to 2 years)
   - 2 Points: The installation of equipment, retrofitting, etc. can be implemented in the medium-term (3 to 5 years)
   - 1 Point: The installation of equipment, retrofitting, etc. can be implemented in the long-term (more than 5 years)
6. **Maintenance impact.** How frequent and how heavy will the maintenance of the installed equipment require?
   - 3 Points: The implementation will require infrequent, light maintenance
   - 2 Points: The implementation will require frequent, moderate maintenance
   - 1 Point: The implementation will require very frequent, heavy maintenance
7. **Process or operational impact.** Will the option have an impact to the processes or any operation being done in the facility?
   - 3 Points: There will be low or no impact/disruption to the current operation
   - 2 Points: There will be moderate impact/disruption to the current operation
   - 1 Point: There will be high impact/disruption to the current operation

8. **Safety, health, and environmental impacts.** Will the implementation promote safety, health, and environmental aspects?
   - 3 Points: The implementation will significantly uphold safety, health, and environmental protection
   - 2 Points: The implementation will moderately uphold safety, health, and environmental protection
   - 1 Point: The implementation will have little impact to uphold safety, health, and environmental protection
9. **Urgency of implementation.** Is this action urgent to address current issues and risks?
   - 3 Points: Extremely urgent
   - 2 Points: Urgent
   - 1 Point: Somewhat urgent
10. **Stakeholder acceptability.** Would the stakeholders accept it?
   - 3 Points: Stakeholders representing > 70% of the total will accept it
   - 2 Points: Stakeholders representing between 50% to 70% of the total will accept it
   - 1 Point: Stakeholders representing < 50% of the total will accept it
11. **Mainstreaming potential.** Could it be integrated with existing local government planning and policy development?
   - 3 Points: Easily and fully integrable through many plans and strategies
   - 2 Points: Moderately and partly integrable through many plans and strategies
   - 1 Point: Relatively limited potential
12. **Multi-sectoral and multi-objective impacts.** Would this option address the objectives of other sectors?
   - 3 Points: This will have significant cross over with other sectors and objectives
   - 2 Points: This will have some cross over with other sectors and objectives
   - 1 Point: This will have little cross over with other sectors and objectives

Table 14. Technical evaluation and ranking of options tool (Method 1)

Energy Performance Improvement Opportunity Description	...	SELECTION PARAMETERS OR CRITERIA												TOTAL SCORE	RANK
		1	2	3	4	5	6	7	8	9	10	11	12		
		Energy Savings	Cost of Implementation	Payback Period	Ease of Implementation	Length of Implementation	Maintenance	Operational Impact	Safety, Health, Environment	Urgency of Implementation	Stakeholder Acceptability	Mainstreaming Potential	Multi-Sectoral, Multi-Objective		
OPTION A	...	3	2	3	2	2	3	3	3	3	3	2	2	31	3
OPTION B	...	2	1	3	3	2	2	1	3	3	3	3	1	27	4
OPTION C	...	3	1	2	2	1	2	2	2	1	3	1	1	21	7
OPTION D	...	1	3	2	1	2	1	2	2	3	3	1	1	22	6
OPTION E	...	1	3	1	2	2	1	1	1	3	2	1	1	19	8
OPTION F	...	3	3	3	2	3	2	3	3	2	3	3	3	33	1
OPTION G	...	3	3	3	1	3	3	2	3	3	3	3	2	32	2
OPTION H	...	2	1	3	3	2	2	2	3	1	1	2	1	23	5
OPTION I	...	2	1	3	2	1	1	1	2	1	1	1	2	18	9
OPTION J	...	1	2	1	1	3	2	1	2	1	1	1	1	17	10

Table 15. Energy performance improvement opportunity tracker

Time Frame	Energy Performance Improvement Opportunity Description	SEU Related?	Which SEU?	Responsible Person or Office	Date Identified	Estimated Monthly (or Annual) Savings				Estimated Non-Energy Benefits	Estimated Installation Cost (PHP)
						Electricity (kWh)	Diesel (L)	Gasoline (L)	Others (specify)		
Short-Term Options	1.										
	2.										
	3.										
	...										
Medium-Term Options	1.										
	2.										
	3.										
	...										
Long-Term Options	1.										
	2.										
	3.										
	...										

Method 2: Direct ranking of options

The opportunities or options may also be directly ranked. Everyone in the group can be given, for instance, five (5) times to vote for his/her favorite options. The person may cast all votes in one option or spread it to the other options.

Table 16. Direct ranking of options

Energy Performance Improvement Opportunities	Votes	Rank
OPTION A	𝍸 𝍸 I	10
OPTION B	𝍸 𝍸 𝍸	9
OPTION C	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	2
OPTION D	𝍸 𝍸 𝍸 𝍸 I	8
OPTION E	𝍸 𝍸 𝍸 𝍸 𝍸 III	7
OPTION F	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	6
OPTION G	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 III	5

OPTION H	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 |	1
OPTION I	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 ||	4
OPTION J	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	3

Method 3: The urgency test

The urgency test can be used as advocated in the Rationalized Local Planning System (RPS) by the DILG. The options can be tagged as urgent, essential, necessary, desirable, acceptable, or deferrable (DILG BLGD, 2008).

Table 17. Urgency test (Method 3)

Category	General Criteria
URGENT	☐ Cannot be reasonably postponed ☐ Would remedy conditions dangerous to public health, safety, and welfare ☐ Needed to maintain critical programs ☐ Needed to meet emergency situations
ESSENTIAL	☐ Required to complete or make usable a major public improvement ☐ Required to maintain minimum standards as part of on-going program ☐ Desirable self-liquidating projects ☐ External funding is available
NECESSARY	☐ Should be carried out to meet clearly identified and anticipated needs ☐ Needed to replace obsolete or unsatisfactory facilities ☐ Repair or maintenance projects to prolong life of existing facilities
DESIRABLE	☐ Needed for expansion of current program ☐ Designed to initiate new programs considered appropriate for a progressive community
ACCEPTABLE	☐ Can be postponed without detriment to present operations if budget cuts are necessary
DEFERRABLE	☐ Recommended for postponement or elimination from immediate consideration in the current LDIP ☐ Questionable in terms of overall needs, adequate planning, or proper timing

Method 4: Conflict-compatibility-complementarity

The LGU may also utilize, under the Rationalized Local Planning System, the screening of the options for conflicts, compatibilities, or complementarities.

Table 18. Conflict-compatibility-complementarity matrix (Method 4)

Energy Performance Improvement Opportunities or Options	OPTION A	OPTION B	OPTION C	OPTION D	OPTION E	…
OPTION A						
OPTION B						
OPTION C						
OPTION D						
OPTION E						
…						

INSTRUCTIONS:

1. Indicate the relationships among the proposed projects
   a. If relationship is one of conflict, where the expected benefits of the projects tend to nullify each other or when the implementation of one obstructs the implementation of another, mark the appropriate cell with an "✖"
   b. If relationship is one of complementarity, mark the appropriate cell with an "■"
   c. If relationship is one of compatibility (or if it is neutral), leave the cell blank
2. Projects which conflict with many or most of the other projects should be removed from the initial list
3. Projects which conflict with some but are compatible/complementary with others may be reformulated to resolve the conflict/s

Forecasting Future Energy Uses

The estimation of future energy uses and energy consumption is an important step in energy planning. Projections allow for the LGU to look at the circumstances and factors that could affect consumption and make important decisions about energy projects, technology implementation, etc. Various technical and statistical methods for forecasting of energy consumption exist and with varying results (e.g., end-use model, econometrics model, etc.). The LGU is advised to choose a forecasting model they are already using or familiar with. As an illustrative guide, a simple linear regression can be used by adding a trendline.

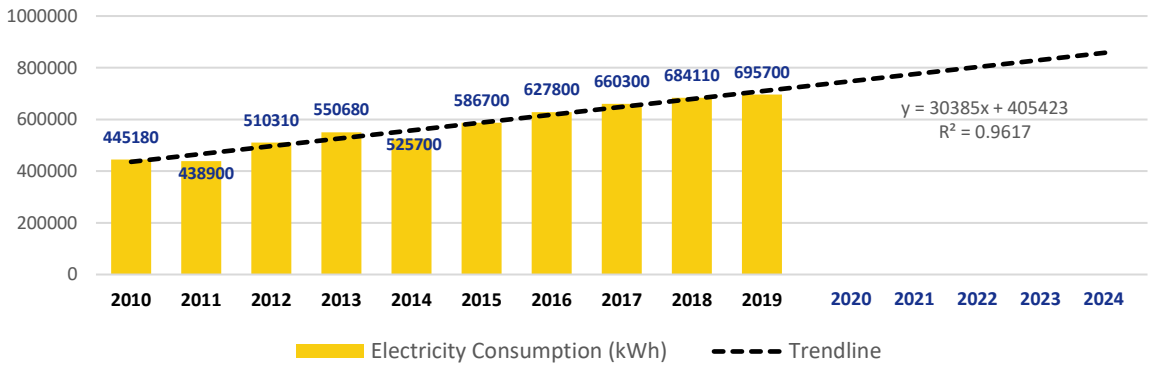


Figure 7. Illustrative forecasting of future energy consumption

A more coherent estimation of future energy consumption can be accomplished by considering various factors. This can include the consideration of anticipated changes in the future such as the acquisition of capital investments and equipment, changes in production levels (if any), changes in energy sources, employment of energy-saving procedures, and a lot of other factors (Office of Energy Efficiency & Renewable Energy, 2021). The next table (Table 19) shows how one can estimate future energy consumption by keying the individual percentage increase or decrease of a certain factor toward the said consumption. Before one can complete Table 19, the percentage increase or decrease of each factor must be determined (as shown in Table 20). For instance, the additions in capital investment such as new construction, additional machines, additional vehicles, etc. tied to a specific energy use, energy source, and/or facility/site must be individually analyzed. The same is true for any energy source replacement or supplement. In case solar energy is used to partially offset the energy source in the future, then this can reflect a negative percentage. Also, future implementations of energy-saving techniques and EE&C measures will generally yield a negative percentage contribution toward the energy consumption. The worksheet can be used to determine the percentage increase or decrease of each of the mentioned factors. Additional worksheets can be used for other factors as deemed necessary. Table 20 shows how the percentage increase or decrease in the energy consumption by different factors are influenced by individual elements. As an example, Factor 1 (capital investment) includes the element of new construction which will require an additional monthly burden of 1,200 kWh. Dividing this 1,200 kWh by the current monthly energy consumption of 3,000 kWh yields a value of +40% as shown in the table.

Table 19. Future energy estimate worksheet

Facility/Site Name			
Energy Source		**Unit**	
Energy Use in Consideration			
Energy Consumption (A)		**Period Covered**	
Future Period in Consideration			
Anticipated Changes		**% Increase/Decrease**	
Capital investments will be completed and change energy consumption by			
Energy source will be replaced/supplemented and change energy consumption by			
Energy saving measures will be instituted and change			
Production levels will change energy consumption by			
Other factors (supplier changes, operational criteria, etc.)			
…			
Sum of expected changes in energy consumption in % (B)			
Expected consumption of the future period in consideration		**Unit**	
$Energy\ consumption\ of\ last\ period \times \left(1 + \frac{\%\ change}{100}\right)$ or $A \times \left(1 + \frac{B}{100}\right)$			

Table 20. Future energy estimate worksheet (individual factors and elements)

Current Energy Consumption	3,000 kWh/month				
Future Period in Consideration	2022 to 2025				
Determination of the % Change in Energy Consumption of Individual Factors					
Factor 1		**Factor 2**		**Factor 3**	
Capital Investment		Energy Source Replacement		Energy-Saving Measures	
Elements	**%**	**Elements**	**%**	**Elements**	**%**
New construction: The energy requirement of which, based on the load schedule, is 1,200 kWh	+40%	Use of solar photovoltaic (PV) panels: Contribution of about 720 kWh per month	–24%	Replacement of 12 old A/C units with ones having higher EER: Reduces 40% (or 600 kWh) of the energy consumption	–20%
…		…		…	
% Change		**% Change**		**% Change**	

PART VI. Financing Modalities and Tools

LGUs and their project partners are encouraged to consider the following financing options. Be guided that not all modalities and tools are presented in this annex; and information may change from time to time. Thus, LGUs may seek further assistance from EEC financial professionals.

A. Context of Public and Commercial Financing of EEC Projects

EEC projects in the government are either publicly-funded, commercially-funded, or a combination of both. Whether the project is intended to be self-financed or debt-financed which requires an equity ratio acceptable to both the lender and borrower, there are many financial mechanisms that LGUs can consider. In the list below, according to the World Bank, the commercial funding of government projects decreases while the share of public funding increases as one goes from the top to the bottom of the presented financing modalities. Commercial financing is closely associated with market maturity.

- ☐ Advanced commercial/project financing (ESCOs)
- ☐ Vendor credit, leasing
- ☐ Commercial financing, bonds
- ☐ Partial risk guarantees
- ☐ Credit line with commercial bank
- ☐ Credit line with municipal/development bank
- ☐ Public ESCOs
- ☐ Energy efficiency revolving funds
- ☐ Utility (on-bill) financing
- ☐ Budget financing with budget capture
- ☐ Budget allocation, grants with co-financing
- ☐ Grants
- ☐

Meanwhile, the DILG, through its Enhanced Guide to CDP Preparation, summarizes the available LGU financing options as follows.

- ☐ Internal Revenue Allotment (IRA)
- ☐ Local revenues through taxes and user fees
- ☐ Official Development Assistance or ODA (bilateral or multilateral technical assistance and loans)
- ☐ Private financing (BOT or bond flotation)
- ☐ Borrowing or credit financing (public or private)

Impact of the Supreme Court decision on the Mandanas-Garcia case: The Supreme Court ruling on the Mandanas-Garcia Case basically modified the just share of LGUs from the national taxes. The decision states that such share is not limited to the national internal revenue taxes collected by the Bureau of Internal Revenue (BIR) but includes the collections (custom duties) of the Bureau of Customs (BOC). Therefore, it is projected that LGUs will have 27.61% increase in the overall Internal Revenue Allotment (IRA) shares in 2022. The additional budget and resources will enhance the capability of LGUs to perform mandated functions under the EEC Act and can be used to fund priority EEC projects.

B. State-Backed Loan Facilities

DBP – Energy Efficiency Savings (E2SAVE) Financing Program: The E2SAVE aims to provide credit assistance based on the electricity savings of energy efficiency projects of LGUs, including ESCOs or energy service providers (ESPs). Eligible projects include the following.

- ☐ Replacement and installation of highly efficient equipment (lighting, HVAC, motors, etc.) and industrial technologies (boilers, kilns, etc.)
- ☐ Recovery/utilization of by-products, industrial process improvement, and system optimization
- ☐ Preparation of energy audit or investment grade audit report for government entities
- ☐ Installation of solar projects and other RE technologies for own-use or net metering

Eligible loan purposes:

- ☐ Short-term: purchase order, energy savings performance contract (ESPC), and/or contract receivable of ESCO/ESP; working capital; import letter of credit for machineries and equipment
- ☐ Long-term: capital expenditure projects; multi-year ESPC and/or contract receivable of ESCO/ESP; energy audit or investment grade audit report for public institutions

Eligible borrowers and loanable amount:

- ☐ Public institutions (LGUs, NGAs, government-owned and controlled corporations or GOCCs, and state universities and colleges or SUCs): 100% of project cost or winning bid price
- ☐ Private companies and ESCOs/ESPs: 80% of project cost

Salient/special program features:

- ☐ Loan tenor is up to 10 years inclusive of up to 1-year grace period on the principal
- ☐ Loan amortization or repayment is based on 80% of monthly energy savings
- ☐ Omnibus Term Loan Facility (OTLF) may be allowed for ESCOs and ESPs covering 2-year pipeline projects

LandBank – Go Green: The Go Green Program for SMEs and public institutions (LGUs, GOCCs, and SUCs) allows financing of the following projects at 90% of the total cost.

- ☐ Solar energy systems
- ☐ Environment-friendly energy systems (e.g., high efficiency equipment and heat insulation system)

Salient/special program features:

- ☐ Energy cost savings can already form part of the amortization
- ☐ Low equity enables the borrowing LGU to shoulder 10% of the project cost
- ☐ Only the object of financing will serve as collateral (chattel mortgage)

LandBank – Omnibus Term Loan Facility (OTLF): The OTLF is provided to LGUs whose infrastructure and socio-economic projects form part of the bank's approved local development plan or AIP. The facility eliminates the inconvenience and associated transaction cost in having to secure loan approval for every single project to be implemented.

LandBank – Bringing Urbanization and Innovations thru LandBank's Diverse Engineering Resources Support (BUILDERS): Under the BUILDERS, contractors licensed by the Philippine Contractors Accreditation Board may loan up to 80% of the cost of government/private sector construction projects (listed are examples below).

- ☐ Power, energy, and RE supply and management projects
- ☐ Mass transit systems networks

DOF Municipal Development Fund Office (MDFO) – Municipal Development Fund Project (MDFP): The MDFP offers concessional financing to LGUs for eligible projects such as the following, provided that the loans should be within their borrowing capacity. Loan repayment is between 15 to 20 years inclusive of up to 3-year grace period on the principal.

- ☐ Public economic enterprise: local electrification (mini-hydro, wind, and solar projects)
- ☐ Social project: water supply system; communal irrigation; and training center
- ☐ Solid waste management: waste-to-energy and wastewater treatment facilities

C. Public-Private Partnership (PPP)

Much of the country's investment in infrastructure is being carried out through public funding and PPP ventures. The PPP Center of the Philippines provides technical assistance to LGUs on projects related to health, tourism, green buildings, waste-to-energy, water and sanitation, solid waste management, and those with climate change mitigation and adaptation features. As of March 2021, a total of 179 PPP projects amounting to PHP 1,289 billion were awarded.

Build-Operate-and-Transfer (BOT): Aimed at developing and supporting a public asset or service, a BOT is a long-term concession agreement under a specific contractual arrangement that is signed between a public entity and a private party. All government infrastructure agencies, including LGUs, are authorized to enter contract with any duly qualified private contractor for the financing, construction, operation, and maintenance of any financially viable infrastructure facility. For guidance, LGUs should refer to their respective local PPP code, if available. Under the PPP umbrella lies different contractual arrangements:

- ☐ Build-and-transfer
- ☐ Build-lease-and-transfer
- ☐ Build-operate-and-transfer
- ☐ Build-own-and-operate
- ☐ Build-transfer-and-operate
- ☐ Contract-add-and-operate
- ☐ Develop-operate-and-transfer
- ☐ Rehabilitate-operate-and-transfer
- ☐ Rehabilitate-own-and-operate
- ☐ Other variations

Joint Venture (JV): A JV is a business agreement between two or more parties that pool their capital, skills, and resources to achieve a specific business activity. Both parties jointly undertake (direct and govern) an infrastructure or development project, with the end view of eventually transferring it to either the private sector or the government. A JV might either be considered a contractual or corporate type. For LGUs, a contractual JV is more common since parties need not incorporate, saving time for faster implementation. For guidance, LGUs should refer to their respective local JV ordinance, if available. Both the waste-to-energy project and the integrated solid waste management facility of the City Governments of Dagupan and Quezon, respectively, are examples of the JV structure.

D. Energy Service Company (ESCO) Financing Modality

ESCOs offer innovative solutions in energy efficiency and can often be funded sustainably through the saved energy expenditure. Generally acting as project developers for a range of tasks, ESCOs are the ones assuming the performance and technical risks associated with a project. The ESCO model works based on the company providing initial capital investments and plans for energy efficiency, with the client reimbursing a portion of the saved energy cost to the ESCO (Asian Development Bank, 2017). In the Philippines, there are 24 accredited ESCOs as of July 2019.[l] Consider, as an example, the annual energy cost of a building before the employment of an energy-efficient technology is at PHP 10 million. When the building owner is assisted by an ESCO to install a solar PV system to partially offset its energy consumption from the grid, the estimated annual energy cost will drop to PHP 7 million. Part of the PHP 3 million savings, say PHP 2 million, will be used by the building owner to pay the ESCO annually for a certain contract period (5 years, 10 years, etc.). So, during the contract period, the building owner enjoys PHP 1 million savings annually; and after the contract period, the building owner enjoys PHP 3 million (or even more) savings annually.[m] Other examples of direct ESCO contract procurement are projects involving LED lighting, the improvement of HVAC efficiency, building energy efficiency, etc.

E. International Financing Institutions and Bilateral Donor Agencies

[l] Data retrieved from DOE's list of accredited ESCOs, https://www.doe.gov.ph/sites/default/files/pdf/energy_efficiency/esco_accredited_companies_july_2019.pdf

[m] The annual savings is projected until the end-of-life of the installed technology. Savings can also escalate due to the rise in the energy tariff as years go by.

World Bank: The World Bank provides developing countries with loans, credits, and grants for projects in a wide range of sectors including clean energy and environmental sustainability projects. In 2016, for instance, the World Bank signed the Access to Sustainable Energy Project grant agreement with the LGU Guarantee Corporation (LGUGC).

International Finance Corporation (IFC): IFC is a member of the World Bank Group and the brainchild behind the Sustainable Energy Finance (SEF) Program—an innovative solution that supports private banks through capacity building, technical evaluation, and product development to help them finance EEC projects which increase shareholder value. Eligible projects include energy efficiency measures in buildings and industrial processes (lighting, space cooling, air compression, building management systems, boiler upgrades, motors, etc.) and RE implementation (biomass, biogas, mini-hydro, wind energy, solar energy, etc.). The SEF Program is implemented locally by private banks such as the BPI and BDO.

Global Environment Facility (GEF): The GEF is an international partnership of institutions, civil society organizations, and the private sector to support a broad range of climate change projects in developing countries, focusing on the areas of RE, EEC, sustainable transport, land use change and management, and forestry. As of 2021, the GEF has participated in 119 projects in the Philippines with an aggregated grant funding of USD 675 million.

Asian Development Bank (ADB): The ADB provides loans, grants, equity investments, and technical assistances to projects that tackle renewable energy, air quality management, climate resilience and green growth, market transformation through energy-efficient electric vehicles, wastewater improvement, sanitation development, solid waste management, recovery of poor municipalities, etc.

Japan International Cooperation Agency (JICA): JICA offers developing countries with technical cooperation, ODA loans and grants, and loan and equity finance to PPP projects. In 2015, JICA financed a mini hydropower plant to help supply electricity to underserved communities and support rice terraces conservation efforts in Ifugao. While in 2017, it funded the energy-efficient street lighting project of the City of Tacloban.

United States Agency for International Development (USAID): USAID's programs aim to advance sustainable, inclusive development by focusing on strengthening economic growth and boosting environmental resilience, among others. The Energy Secure Philippines Project is its latest (2021) engagement which supports a more competitive, secure, and resilient energy sector in the country.

European Union (EU): The EU is one of the largest donors of development aid as well as the biggest contributor of climate finance in the world. Its current support to the country focuses on governance, job creation, renewable energy, and assistance to vulnerable populations. As of 2020, the EU has allotted PHP 3.76 billion in grant funding to the country under the Access to Sustainable Energy Programme (ASEP) to support sustainable recovery efforts, particularly within the energy sector. The ASEP-Clean Energy Living Laboratories (ASEP-CELLs) Project, which considers this Guidebook as one of its key deliverables, supports the DOE in achieving 100% rural electrification through RE, increasing the share of RE in the country's energy mix, and promoting energy efficiency toward sustainable, inclusive growth.

Annexes of Book 1 (Procedures)

Annex 1. EEC Officer Form (sample partially filled out)

GOVERNMENT ENERGY MANAGEMENT PROGRAM
Energy Efficiency and Conservation (EEC) Officer
R.A. No. 11285: Energy Efficiency and Conservation Act

A. GENERAL INFORMATION	
Name of LGU:	Municipality of Santo Niño, Cavite
Income Class:	1st Class Municipality
Head of LGU:	Juan de la Cruz
Position:	Mayor
Address:	
Region:	Region IV-A (CALABARZON)
Province:	Cavite
City/Municipality:	Municipality of Santo Niño
Office Contact No.:	+63 46 888 8888
Office Email Address:	ocm@santonino.gov.ph
B. EEC OFFICER INFORMATION	
Name of EEC Officer:	Mario Santos
Position:	City Engineer/ EEC Officer
Department/Division:	City Engineering Office
Mobile No.:	
Landline No.:	
Fax No.:	
Email Address:	

Please return this form via email at doe.epsmd@gmail.com
***or fax to* 8840-2243**

Annex 2. EEC Focal Person Form

GOVERNMENT ENERGY MANAGEMENT PROGRAM
Energy Efficiency and Conservation (EEC) Focal Person
R.A. No. 11285: Energy Efficiency and Conservation Act

A. GENERAL INFORMATION *(Head Office)*	
Name of LGU:	
Head of LGU:	
Position:	
Address:	
Office Contact No.:	
Office Email Address:	
B. GENERAL INFORMATION *(Facility)*	
Name of Facility:	
Head of Facility:	
Position:	
Contact Details:	
Region:	
Type of Facility: ☐ Facility ☐ Hospital ☐ School ☐ Other	
Address:	
C. EEC FOCAL PERSON INFORMATION	
Name of EEC Focal Person:	
Position:	
Department/Division:	
Mobile No.:	
Landline No.:	
Fax No.:	
Email Address:	

Please return this form via email at doe.epsmd@gmail.com
***or fax to* 8840-2243**

Annex 3. Monthly Electricity Consumption Report Form

DEPARTMENT OF ENERGY
Energy Center, Rizal Drive, Bonifacio Global City, Taguig City
Telefax: (632) 8840-2243, Email: doe.gemp@gmail.com

GOVERNMENT ENERGY MANAGEMENT PROGRAM
Monthly Electricity Consumption Report, _____

LGU: _____ **Tel. Nos.:** _____

Address: _____ **Fax Nos.:** _____

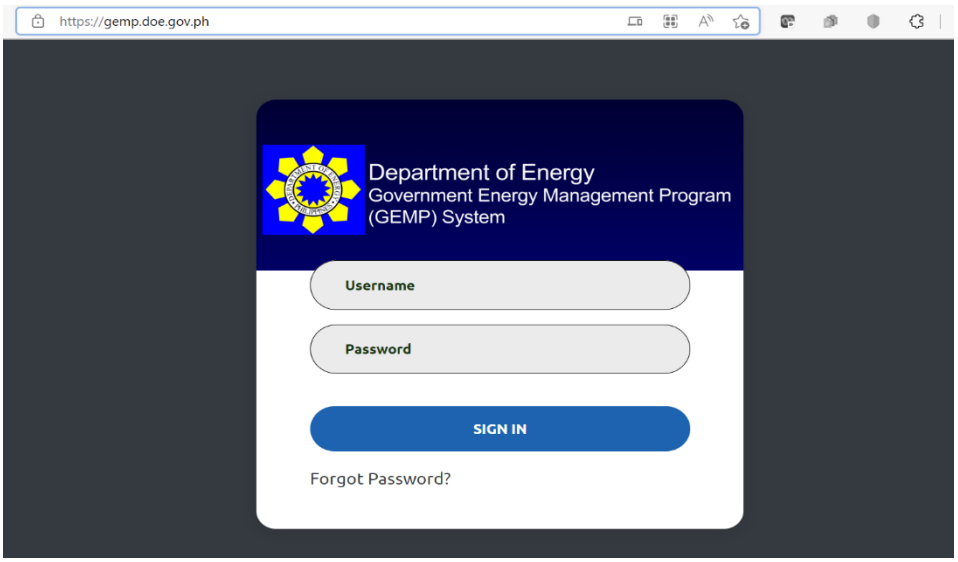
Region: _____

A	B	C	D	E	F	G
Month	**Monthly Consumption Baseline, 2015**	**Building Description**	**Gross Area (square meters)**	**Air-Conditioned Area (square meters)**	**Number of Occupants**	**Monthly Consumption, kWh**
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						
Average						

Prepared by: **Noted by:**

Designation **Designation**

Starting year 2022, please submit and upload your data at the GEMP online system **https://gemp.doe.gov.ph/.**



Annex 4. Monthly Fuel Consumption Report Form

DEPARTMENT OF ENERGY
Energy Center, Rizal Drive, Bonifacio Global City, Taguig City
Telefax: (632) 8840-2243, Email: doe.gemp@gmail.com

GOVERNMENT ENERGY MANAGEMENT PROGRAM
Monthly Fuel Consumption Report, _____

LGU: _____ **Telephone Nos.:** _____

Address: _____ **Fax Nos.:** _____

Region: _____

Month	Monthly Consumption Baseline						Monthly Consumption, 2020					
	GASOLINE			DIESEL			GASOLINE			DIESEL		
	Gasoline liters	Total km Travelled	km/Liter	Diesel liters	Total km Travelled	km/Liter	Gasoline liters	Total km Travelled	km/Liter	Diesel liters	Total km Travelled	km/Liter
January												
February												
March												
April												
May												
June												
July												
August												
September												
October												
November												
December												
Total												

Note: The information contained in this report is for the above-named facility only.

Prepared by: **Noted by:**

_____ _____

Designation **Designation**

Starting year 2022, please submit and upload your data at the GEMP online system ***https://gemp.doe.gov.ph/***

Annex 5. Survey of Government Air-Conditioning Units and Generators

GEMP FORM-1A

Region: ____

GOVERNMENT ENERGY MANAGEMENT PROGRAM (GEMP)

SURVEY OF GOVERNMENT AIR-CONDITIONING UNITS AND GENERATORS

(In compliance with A.O. Nos. 103, 110, 110-A, 126)

Name of Government Agency/Office: _____ Contact No.: _____

Address: _____ Date: _____

AIR-CONDITIONING UNIT

No.	AREA	Type (Window, Split, Package/Floor Type)	Status (Operational, Non-Operational, Stand-by)	Quantity (No. of unit)	Category (Inverter, Non-Inverter Type)	Nameplate Rating			Year of Purchase	Operation	
						Cooling Capacity (KJ/hr)	Capacity Rating (hp or TR)	Energy Efficiency Ratio (EER)		Hours per Day	Days per Week
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											

TOTAL BUILDING GROSS FLOOR AREA (m^2)		TOTAL AIR-CONDITIONED FLOOR AREA (m^2)	

GENERATORS

Brand	Quantity	Capacity (kW)	Status	Remarks

(Please use another sheet if necessary)

Prepared By: (Name and Designation)

Approved By:

_____

_____

Energy Conservation Officer

Annex 6. Survey of Centralized Air-Conditioning Units

GEMP FORM-1B

Region: ____

GOVERNMENT ENERGY MANAGEMENT PROGRAM (GEMP)

SURVEY ON CENTRALIZED AIR-CONDITIONING UNITS

(In compliance with IAEECC Resolution No. 1 s. 2020)

Name of Government Agency/Office: _____ Contact No.: _____

Address: _____ Date: _____

CENTRALIZED AIR-CONDITIONERS

Quantity	Model/Type	Type of System		Cooling Capacity	Blower Capacity	Blower Rating	CWP Capacity	Room Temp. Maintained, °C	Cooling Tower Capacity	Cooling Tower Temperature Difference, °C	Operating Hours/Day	Year of Purchase
		VAR	VCR	TR	m^3/hr	hp	hp		hp			

(Please use another sheet if necessary)

CWP - Circulating Water Pump

TR - Ton of Refrigeration

VAR - Vapor Absorption Refrigeration

VCR - Vapor Compression Refrigeration

hp - Horsepower

Operational Units - Working Condition

Non-Operational Units - Stand-by or Defective

Prepared By: (Name and Designation)

_____

Approved By:

_____

Energy Conservation Officer

Annex 7. Survey on Lighting System

GEMP FORM-2

Region: ____

GOVERNMENT ENERGY MANAGEMENT PROGRAM (GEMP)

SURVEY ON LIGHTING SYSTEM

(In compliance with IAEECC Resolution No. 1 s. 2020)

Name of Government Agency/Office: _____ Contact No.: _____

Address: _____ Date: _____

LIGHTING SYSTEM										
Type of Lamp	**Quantity**	**Type of Fixture**								
		Recessed with reflector	**Surface mounted with reflector**	**Suspended with reflector**	**Recessed with reflector & diffuser**	**Surface mounted with reflector & diffuser**	**Suspended with reflector & diffuser**	**Open**	**Type of Ballast** (Magnetic, Electronic, Rapid-Start)	**Remarks**
Linear Fluorescent Lamps										
1 x 40 Watts										
2 x 40 Watts										
3 x 40 Watts										
1 x 36 Watts										
2 x 36 Watts										
3 x 36 Watts										
1 x 40 Watts										
2 x 40 Watts										
3 x 40 Watts										
1 x 20 Watts										
2 x 20 Watts										
3 x 20 Watts										
1 x 18 Watts										
2 x 18 Watts										
3 x 18 Watts										
Others:										
Please specify type (IB, CFL, LED, etc.) and wattage										

(Please use another sheet if necessary)

Prepared By: (Name and Designation)

_____

Approved By:

_____

Energy Conservation Officer

Annex 8. Survey on Office and Other Equipment

GEMP FORM-2

Region: ____

GOVERNMENT ENERGY MANAGEMENT PROGRAM (GEMP)

SURVEY ON OFFICE AND OTHER EQUIPMENT

(In compliance with IAEECC Resolution No. 1 s. 2020)

Name of Government Agency/Office: _____ Contact No.: _____

Address: _____ Date: _____

OFFICE AND OTHER EQUIPMENT INVENTORY LIST

Location/Office	Equipment	Quantity	Power Rating, Watt	Average Operating Time, hours/day	Average Operating Days per Month

(Please use another sheet if necessary)

Prepared By: (Name and Designation)

Approved By:

_____

_____

Energy Conservation Officer

Annex 9. Vehicle Inventory List

GEMP FORM-2

Region: ____

GOVERNMENT ENERGY MANAGEMENT PROGRAM (GEMP)

VEHICLE INVENTORY LIST

(In compliance with IAEECC Resolution No. 1 s. 2020)

Name of Government Agency/Office: _____ Contact No.: _____

Address: _____ Date: _____

VEHICLE INVENTORY LIST

Brand Name	Quantity	Year Model	Age of Vehicle	Plate Number	STATUS		Fuel Used
					Operational	Non-Operational	

(Please use another sheet if necessary)

Prepared By: (Name and Designation)

_____

Approved By:

_____

Energy Conservation Officer

Annex 10. General Energy Audit Worksheet Guide

A. ENERGY POLICY AND ADMINISTRATION	VERIFICATION METHODS	REMARKS
Establishment of Energy Policy and Target		
An energy project champion or team is assigned to implement energy management in the organization.	Memo or appointment letter of the energy team or champion issued by management	
A thorough energy policy and guidelines are established and documented specifying the organization's commitment to continuous improvement and energy efficiency.	Documented energy policy and guidelines	
Action plan is established and implemented based on the energy policy. Achievements are checked and documented periodically.	Up to date action plan with target and actual achievements (e.g., monthly energy savings report)	
The organization complies with all applicable energy laws and regulations.	Up to date certificates of compliance (or equivalent reports and documents)	
Involvement of Staff, Third Party, Contractors, and Visitors		
All employees receive regular communication about the organization's energy policy and guidelines, the status of action plans, and achievements. In addition, new employees receive orientation on similar topics.	Evidence of communication with employees, minutes of meetings with staff, and/or orientation slides for new employees	
All employees receive periodic training related to the energy policy and guidelines.	Training plans, training/course records and attendance, training certificates, and qualification in relevant discipline/skills	
Energy policies of the establishment are communicated and imposed to third parties and contractors. Energy action performance and achievements are reported in internal and external communication materials.	Purchasing policy which includes communication to third parties, specific criteria for tender, and/or special agreements with suppliers or contractors related to energy policies	
Posters and other dissemination materials related to the organization's energy policies are displayed visibly.	Staff and visitor involvement posters and/or campaign materials targeted on energy awareness	
A feedback mechanism is in place reflecting the suggestions of staff/visitors about the organization's energy programs.	Feedback box and/or website which allows feedback collection, responses to feedbacks with the corrective actions taken	
B. ELECTRICITY AND ENERGY SERVICES	**Verification Methods**	**Remarks**
Consumption Data		
Electricity consumption is measured and monitored.	Records of total electricity consumption together with a copy of official electricity bills for verification	
Electricity Generation		
Renewable energy sources are favored and their share in the total energy supply is monitored and managed (photovoltaic solar panels, biogas, solar thermal, wind, hydroelectric, etc.).	Presence of PV solar panels, biogas, solar thermal for hot water generation, wind turbines, hydroelectric installation, etc.	
Electricity Management		
Sub-metering, smart metering and other monitoring devices are used for measuring and recording of electricity consumption.	Electricity submeters and other monitoring devices and/or records from submeters and other monitoring devices	
Preventive maintenance and monitoring of appliances and equipment are implemented regularly.	Up to date maintenance records of each appliance and equipment	
Peak load management is implemented.	Peak load is determined and intensive tasks are done during off-peak periods	
Air Conditioning		
Gaps and openings are properly sealed in air-conditioned areas.	Seal on gaps (sides of A/C, doors, and windows in air-conditioned rooms)	
Air conditioner (A/C) thermostats are automatically or manually set at moderate temperatures (24°C to 25°C).	Setting of A/C is between 24-25°C	
Heat sources such as cooking devices, hot coffee, and hot water tanks are kept out of A/C rooms or are well insulated	No presence of heating devices or equipment inside cooled spaces	
Preventive maintenance of air conditioning and cooling units is implemented regularly.	Maintenance log of air conditioners and other cooling equipment	
Condenser units of are properly shaded and well ventilated.	Condensing units are shaded and ventilated	
Low wattage fans are installed to distribute cool air evenly in air-conditioned rooms.	Ceiling fans in cooled areas	
Air conditioners with high energy efficiency ratio (EER) and coefficient of performance (COP) are used.	A/C units with inverter technology, high EER, or equipped with the best available technology or BAT (use Philippine Green Building Code or GB Code for reference)	
Lighting		
Light bulbs and tubes are cleaned on a regular period.	Maintenance manual, program of lights, and cleaned lights	
Light switches are properly labelled.	Labels on light switches	
All electric light sources in the building (indoor or outdoor) are of the energy-efficient LED type.	Lighting inventory	
Occupancy/motion sensors are installed in public areas (e.g., hallways, toilets, etc.)	Installed occupancy or motion sensor in areas with variable occupancy such as corridors, storage rooms, and public toilets	
Photosensors or timer are installed for outdoor lights.	Photosensors/timers automatically turn off lights during the day	
Natural day lighting is utilized (e.g., tubular solar lighting devices).	Use of any of the following: light shelf, clerestory, skylight, light monitor, solar tube, air well with natural lighting, etc.	
Refrigeration		
Refrigerators and freezers have enough clearance from the surrounding, and there are no heat sources nearby.	Clearance of at least 4 inches from wall or ceiling, no heat sources (microwave, stove, oven, etc.) near freezers/refrigerators	
Good refrigeration practices are implemented (e.g., no ice build-up, proper temperature setting, etc.).	Visible and appropriate temperature settings, good refrigeration practices are known by staff, and no ice build-up	
Seals and gaskets of refrigerators/freezers are in good condition.	Seals are in good condition with no visible condensation	

Highly efficient refrigerators and freezers are used.	High EEF or listed as BAT (use GB Code as reference)	
Cooking		
Good housekeeping practices are implemented in the kitchen.	Bottom of pots are clean and free of soot, vessels are properly covered while cooking, burners are clean and has blue flame, etc.	
Efficient stoves (induction cookers, biomass stoves, etc.) are used.	Use of induction cooker or biomass stove/gasifier	
Water Heating		
Hot water storage and pipelines are sufficiently insulated.	Surface temperatures of hot water tanks and pipes are near ambient temperature	
Hot water is generated through heat pump, solar water heater, heat recovery from A/C units, or co-generation system (combined heat and power).	Use of heat pump, solar water heater, heat recovery system, or co-generation system	
Washing		
Washing machines are operated at full load and at lowest required temperature.	Washing machines are always operated at full load (loading guide is available)	
Natural (e.g., sun or air) drying of linens is practiced.	Natural (sun or air) drying of linens	
Efficient washing machines and dryers are used.	BAT (front loading, inverter, solar water heater connected, etc.)	
Consumer Electronics		
Individual switches are used for appliances (e.g., TV, DVD player, etc.) to avoid standby energy consumption.	No standby loads	
Efficient TV units, computers, and laptops are used.	Use of LED TV, LED flat screen computers, and laptops	
Ventilation		
Flow resistance in the ventilation system is minimized.	Ducting systems are installed without sharp bends and filters are clean	
Pumps, Motors, and Compressors (PMC)		
Exposed motors and pumps are properly shaded and ventilated.	All motors are shaded and installed in well ventilated areas	
A variable frequency drive (VFD) or inverter technology is installed on motors with variable workloads.	VFDs/inverters are installed on motors and pumps of over 5 kW	
Efficient pumps and motors are used.	All motors have high efficiency (IE3 or above motor classification)	
C. FUEL	**Verification Methods**	**Remarks**
Cooking		
LPG consumption is measured and monitored.	Records of LPG consumption	
Generator		
Diesel/gasoline consumption is measured and managed.	Records of diesel/gasoline consumption	
Proper sequencing of loads as well as synchronization are practiced.	The “largest motor first” rule is observed and synchronization is done automatically or manually	
Generator sets are appropriately sized, well maintained, and running efficiently.	The apparent power rating of the generator is well matched with the power demand and not oversized	
Environmentally friendly fuels, such as biodiesel, are utilized.	Biofuels are used in the generator	
Transportation		
Diesel/gasoline consumption is measured and managed.	Records of diesel/gasoline consumption	
Carpooling is practiced for people and supplies.	Carpooling or bulk buying program	
Bicycles are used by staff and employees.	Bicycles are used as means of daily transport	
Environmentally friendly powered vehicles are used.	Electric, compressed natural gas, and/or biogas vehicles are used	
D. BUILDING INFRASTRUCTURE AND SURROUNDING	**Verification Methods**	**Remarks**
General Building Envelope and Landscaping		
Building materials with low solar radiation absorption rates and reflective surfaces are used.	Building materials and white/light-colored walls (use GB Code as reference)	
Natural heat sinks or materials with high thermal mass are used in order to establish thermal comfort.	Rammed earth wall and/or other elements of high thermal mass	
Measures against heat island effect are implemented (e.g., permeable pavements, use of landscaping that positively affects the microclimate, ponds, etc.).	Landscaping or greenery, permeable pavements, ponds, etc.	
Windows with low heat transmission and devices for shading the same are used.	Double-glazed windows, low emissivity glass windows, use of environmentally friendly tint and coat on windows, and or external shading of windows	
The building as well as its doors and windows are properly oriented (light gain and reduction of heat gain).	The longest side of the building faces north/south, doors and windows are strategically located at the north and south sides of the building, and/or proper window-to-wall ratio (WWR) observance (use GB Code for reference)	
Roofing		
Roof and/or ceiling insulation is/are used.	Insulation on the roof and/or ceiling and/or implementing a double layered roof (use GB Code as reference)	
White or highly reflective paint is used.	Roof surfaces are white color or highly reflective	
Passive Ventilation		
Natural ventilation and cross-ventilation for roof spaces are used.	Roof and/or roof elements (eaves, soffits, etc.) has/have openings and vents for natural ventilation and cross-ventilation	
Natural ventilation and cross-ventilation for regularly occupied building spaces are used.	Flow of air into, around, and out of indoor areas is possible due to strategically located openings	
Hot air is exhausted using passive methods (e.g., clerestories, roof monitors, dormers or solar attic fans, etc.).	Clerestory, roof monitor, roof dormer, or solar attic fans on the roof	
Shading		
Outdoor shading by natural means is used to reduce heat gain of the building.	Any of the natural shading techniques is implemented: roof garden, green wall, natural sunscreen, etc.	
Sun and rain buffers are used by way of technical means.	Any of the technical means is implemented: light shelf, extended awnings, overhangs, etc.	

Annex 11. Example of a Partially Filled-up DOE LEECP template

Sector	Program/Project (Milestone Targets)	Proposed Activities	Period of Implementation	Resources Required
Local Government Buildings, Parks, Streets, and Other Facilities				
1. City Hall	a. Achieve reduction in electricity consumption by 20%	• Replace all old and inefficient A/C units with high EER and inverter types	August 2022 to September 2022	PHP 2,000,000
		• Install variable frequency drives (VFDs) on the water pumps	November 2022	PHP 300,000
		• Set thermostat level of all A/C units at a minimum of 24°C	January 2022	PHP 50,000[14]
		• Enroll under the peak/off-peak (POP) program of the DU	July 2022 to August 2022	PHP 100,000
		• Utilize natural daylight in all applicable hallways and corridors during peak sunshine hours	October 2022 to November 2022	PHP 200,000
		• …	…	…
	b. Comply with the minimum requirements of the Philippine Green Building Code	• Insulate the roofs with polyethylene foam of sufficient thickness to reduce heat transfer to the building	January 2023 to March 2023	PHP 190,000
		• …	…	…
2. City Hall Annex	a. Provide EEC skills competency to EEC Officer and EEC Focal Persons	• Train EEC Officer and EEC Focal Persons on energy efficient lighting system	July 2022	PHP 150,000
		• Train EEC Officer on facilities management	August 2022	PHP 25,000
		• …	…	…
	b. Conduct EEC IEC programs in 20 barangays	• Train barangay officials on implementable EEC measures in government buildings	January 2023 to December 2023	PHP 400,000
		• …	…	…
3. Public Park	a. Achieve reduction in electricity consumption by 80%	• Replace all metal halide lamps with the more energy-efficient LED lights	August 2022	PHP 280,000
		• Install photo sensors on all lamp posts to automatically switch on and off the lights	August 2022	PHP 60,000
		• …	…	…
4. Public Hospital	…	…	…	…
…				
Renewable Energy Installation				
1. Public Elementary School	a. Achieve reduction in electricity consumption by 50%	• Install solar PV panels at the rooftop of the school	February 2023 to March 2023	PHP 1,800,000
		• …	…	…
…				
Transport				
1. LGU Service Vehicle Fleet	a. Achieve reduction in fuel consumption by 10%	• Avoid idling of engine for more than 5 minutes when the vehicles are parked	January 2022	PHP 50,000[15]
		• Regularly maintain all service vehicles to improve fuel mileage, including tuning-up engines and properly inflating tires	January 2022	PHP 100,000
		• …	…	…
2. Public Transport	a. Demonstrate reduction in fuel consumption in public transportation in 2 barangays	• Implement an e-trike pilot project	January 2023 to December 2024	PHP 14,000,000
		• …	…	…
…				

[14] Associated cost in training and awareness
[15] Associated cost in training and awareness

Annex 12. Local Development Investment Program (LDIP) Summary Form

LOCAL DEVELOPMENT INVESTMENT PROGRAM

Summary Form

for Planning Period: **2017-2022**

Years Covered: **2017-2019**

City/Municipality: _____

☐ No Climate Change Expenditure (Please tick box if your LGU does not have any climate change expenditure)

AIP Reference Code (1)	Program/ Project/ Activity Description (2)	Implementing Office/ Department (3)	Scehdule of Implementation		Expected Output	Funding Source (7)	Amount (In Thousand Pesos)				Amount of Climate Change Expenditure (In Thousand Pesos)		
			Start Date (4)	Completion Date (5)			Personal Services (PS) (8)	Maintenance and Other Operating Expenses (MOOE) (9)	Capital Outlay (10)	Total (8+9+10)	Climate Change Adaptation	Climate Change Mitigation	Climate Change Typology Code

Prepared by: Attested by: Certified correct and approved by the LDC:

Local Planning and Development Coordinator | Local Budget Officer | Local Treasurer | City/Municipal Mayor/LDC Chairman

CY _____ Annual Investment Program (AIP)
By Program/Project/Activity by Sector
As of _____

Province/City/Municipality: _____

☐ No Climate Change Expenditure (Please tick the box if your LGU does not have any climate change expenditure)

AIP Reference Code (1)	Program/Project/Activity Description (2)	Implementing Office/ Department (3)	Schedule of Implementation		Expected Outputs (6)	Funding Source (7)	AMOUNT (In Thousand pesos)				AMOUNT of Climate Change expenditure (In Thousand Pesos)		CC Typology Code (14)
			Start Date (4)	Completion Date (5)			Personal Services (PS) (8)	Maintenance and Other Operating Expenses (MOOE) (9)	Capital Outlay (CO) (10)	Total (11) 8+9+10	Climate Change Adaptation (12)	Climate Change Mitigation (13)	
General Services (1000)													
Social Services (3000)													
Economic Services (8000)													
Other Services (9000)													

Prepared by:

Planning Officer
Date: _____

Budget Officer
Date: _____

Attested by

Local Chief Executive
Date: _____

Annex 13. Climate Change Typologies for LGUs

The following are the climate change typology codes categorized under the NCCAP's Strategic Priority 6 of Sustainable Energy (Climate Change Commission, 2015).

Strategic Priority 6- Sustainable Energy			
1 - Energy Efficiency			
FY2016	1 - Policy Development and Governance	FY2016	1 - Policy Development and Governance
A611-04	Mandatory implementation of AO110 and AO126 directing the institutionalization of Government Energy Management Program*	M611-01	Change operational procedures or techniques, or retrofit technologies to reduce GHG emissions in existing operations
		M611-03	Develop/implement ordinances and policies to improve energy efficiency – in buildings, agriculture, industry and city/municipal services (e.g. public building maintenance program to improve energy efficiency; use of more energy efficient street lighting such as LED).
		M611-04	Develop a certification system/incentives for voluntary adoption of energy efficiency labelling, green building rating, and ISO 50001 certification
		M611-05	Develop a local renewable energy program*
Code	2 - Research, Development and Extension	Code	2 - Research, Development and Extension
A612-01	Conduct sustainable and renewable energy resource assessments (e.g. hydro, geothermal, biomass, wind, ocean and solar)*	M612-02	Sector studies, surveys, assessments and information systems on energy efficiency, efficient energy pricing, and promotion of renewable energy
Code	3 - Knowledge Sharing and Capacity Building	Code	3 - Knowledge Sharing and Capacity Building
A613-02	Conduct capacity building of community-based renewable energy organizations on system maintenance, energy efficiency and conservation, organizational development, tariff setting and management systems*	M613-01	Sector reform and capacity building related to energy efficiency in energy sector, promotion of renewable energy and efficient energy pricing
		M613-02	Strengthen regulatory and institutional framework to support expansion of renewable power generation
		M613-03	Strengthening capacity of institutions to plan for low-carbon growth and environmentally sustainable energy supply
Code	4 - Service Delivery	Code	4 - Service Delivery
A614-01	Design and implement system of incentives for renewable energy for host communities and local government units that can be used for sustainable livelihood programs and climate change adaptation measures*	M614-02	Pilot programs on energy efficiency activities

Strategic Priority 6- Sustainable Energy			
2 - Power Generation			
Code	1 - Policy Development and Governance	Code	1 - Policy Development and Governance
		M621-04	Develop RE project-based and service contracts-based portfolios to encourage potential investors in identified sites
Code	2 - Research, Development and Extension	Code	2 - Research, Development and Extension
		M622-02	Conduct survey of RE potential in off-grid areas
Code	3 - Knowledge Sharing and Capacity Building	Code	3 - Knowledge Sharing and Capacity Building
		M623-01	Conduct capacity building of community-based RE organizations on RE system maintenance, EE&C organizational development, tariff setting and management systems

Code	4 - Service Delivery	Code	4 - Service Delivery
A624-02	Flood protection or irrigation from construction of dams or water storage system that manage changes in the water cycle due to CC & CV	M624-06	Development of renewable energy(i.e. Establishment of Solar Panels/Installation of Wind Mill/Bio-Gas)
A624-03	Improve design of wind turbine structures to withstand higher wind speeds as a result of extreme weather events	M624-07	Clean Cities Initiatives or those that promote/increase utilization of alternative/clean fuels for the transport sector (tricycle, jeepney, bus, private and government vehicles)
A624-04	Improve design of solar panels to withstand higher intensity storms resulting from climate change and climate variability		
A624-05	Secure access to water for crops used as bioenergy source		

Strategic Priority 6- Sustainable Energy			
3 - Transportation and Communication			
Code	1 - Policy Development and Governance	Code	1 - Policy Development and Governance
A631-01	Incorporate risks from climate change and climate variability in transportation system planning	M631-01	Improve vehicle emission standards
		M631-02	Improve fuel efficiency standards
		M631-03	Strengthen vehicle inspection systems on emissions and fuel efficiency
		M631-04	Develop ordinances/policies to encourage shift from higher carbon to lower carbon transport modes (i.e. pedestrianization, bicycle lanes, public transport)
FY2016	3 - Knowledge Sharing and Capacity Building	FY2016	3 - Knowledge Sharing and Capacity Building
		M633-01	Capacity building related to energy efficiency in the transport sector
FY2016	4 – Service Delivery	FY2016	4 - Service Delivery
A634-01	Protect transport infrastructure against extreme weather events (especially floods and storms) becoming more frequent and violent due to CC and CV	M634-01	Urban traffic management (e.g. improve traffic flow) to reduce GHG emissions per unit transported
A634-02	Establish emergency services designed to cope with climate change and climate variability related emergencies in the transport sector	M634-02	Improved waterways, port and aviation facilities to reduce the carbon intensity per unit transported
A634-03	Construct new roads, ports, airports and aviation infrastructure to climate resilient design standards	M634-03	New railway lines for electricity based railcars
A634-04	Upgrade existing roads, ports and aviation infrastructure to climate resilient design standards	M634-05	Improve energy efficiency in telecommunications information technologies
A634-05	Development of telecommunications infrastructure for use as part of an emergency response system during extreme weather events		
A634-06	Enhance road maintenance to respond to climate change and climate variability		
A634-07	Enhanced waterway maintenance to respond to climate change and climate variability		

Annex 14. Project Brief for Each PPA

1. **Name and Type of Project**
   - What is the working name of the project? It must be brief and catchy
   - Short description must be added. How would it be described in 2-3 sentences?
   - Project proponent or originator of idea
   - In what category does it fall? Infrastructure & other physical capital? Public and private institutions? Social, local economic development, or environmental management? Other?
   - Where is the proposed location of the project?
   - Are the project's demands on the natural resources assured of being met for the life of the project?
   - Would the project be at any risk from environmental or human-made hazards?
   - Are the project's demands on the natural resources assured of being met for the life of the project?

2. **Activity Components**
   - State indicative duration of each component. What places, activities, and groups in the same area are targeted by the project?
   - List the things that need to be done to produce the desired output. Is a formal feasibility/design study required?
   - Who would manage implementation?
   - What complementary measures are needed to ensure project success or reinforce the intended effects?

3. **Estimated Cost of Resource Inputs** - What amount of implementation funding is required? (Classified into materials, human power, equipment, etc. by activity component, where applicable and in pesos if possible)
   - Materials _____
   - Human resources (labor) _____
   - Equipment _____
   - Others _____
   - Total _____
   - What is the likely funding source? Is the project expected to be financially self-sustaining?

4. **Justification of the Project**
   - Rationale/objective derived from the CLUP/ CDP
   - Indicate the issue being addressed as identified in the plan
   - What indicators of development does the proposed project address?
   - On what other places is the project likely to have an effect, and how?
   - What social and economic activities in what locations are likely to be affected by the project, and how?
   - In what way, if any, is the proposed project related to other planned or on-going area development activities?

5. **Target Beneficiaries**
   - Population sectors or geographical areas
   - Specify how men and women or specific areas will be benefited

6. **Target Outputs or Success Indicators**
   - Quantify if possible and include indicator of success and means of verification
   - What complementary measures are needed to ensure project success or reinforce the intended effects?
   - Will the project lower transaction cost?
   - Will the project reduce barriers to participation?
   - Will the project increase local area employment?
   - Will the project increase income multiplication?
   - What will be the public revenue and expenditure impacts of the project?
   - Is the project meant to improve socio-economic performance in any other ways?

7. **Possible Risks or External Factors that Could Frustrate the Realization of the Project**
   - May be natural, social, economic, etc.

8. **Expected Private Sector Response**
   - Specify desired private sector participation (e.g., investments)
   - What are the expected responses by the private sector and other stakeholders to the changes that will result from the project?

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