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NET-METERING REFERENCE GUIDE

How to avail solar roof tops and other renewables below 100 KW in the Philippines

www.renewables-made-in-germany.com

NREB National Renewable Energy Board

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Editor
Markus Dietrich
GIZ Consultant, Project Development Program

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Layout Design
F. Mara Mendoza

Contact
GIZ Office Manila
PDCP Bank Centre
9th Floor, V.A. Rufino cor.
L.P. Leviste Sts.
Makati City, Philippines

Postal address
GIZ Office Manila
PDCP Bank Centre
P.O. Box 2218 MCPO
Salcedo Village
Makati City, Philippines

Tel: +63 2 6515100
Fax: +63 2 7531441
pep-southeastasia@giz.de

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Foreword

The Philippines enjoys a sizeable amount of sunshine. In fact, the country can harness the sun's power as its radiation across the country has a power generation potential of 4.5 to 5.5 kWh per square meter per day.

With that, every on grid private household and company can utilize the power of the sun with solar panels on their own roofs. This paves way to the introduction of the Net-Metering scheme. The scheme represents the first step of a paradigm shift from the traditional generation-transmission-distribution scheme towards individual and community based distributed on-site power generation.

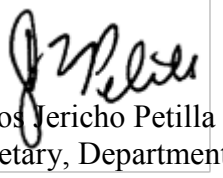
The Net-Metering is the first non-fiscal incentive mechanism fully implemented under the Renewable Energy (RE) Act of 2008. Through the installation of solar photovoltaic (PV) panels up to 100 kW, house owners and commercial establishments can now partly satisfy their electricity demand by themselves.

Excess power generated from the solar PV installation will be delivered to the local distribution grid of the electric distribution utility and will be used to offset the end-user's electricity consumption. In other words, end-users become "prosumers" or producers and consumers of electricity at the same time. In effect, end-users are able to generate savings on their electricity bill and protect themselves against rising electricity prices.

What is even greater to this cause is that end-users can help mitigate the effects of climate change through the use of clean energy technologies. It will also contribute in lessening the country's dependence on costly imported fossil fuels.

Thus, the Department of Energy lauds the different RE stakeholders for coming together and publishing the "Net-Metering Reference Guide: How to avail of solar roof tops and other renewables below 100 KW in the Philippines." Through this informative reference, the energy sector supports the consumers who wish to invest in solar roof tops.

It is with great confidence that this guidebook will help electric consumers make informed decisions over the installation of solar roof top, and take advantage of the benefit of the net-metering scheme. The DOE is optimistic that soon enough thousands of roofs nationwide will be fitted with solar installations and harness the unlimited, free energy from the sun. As we all know, it's more sun in the Philippines.



Carlos Jericho Petilla
Secretary, Department of Energy

Preface and Acknowledgments

GIZ has a long history of promoting solar energy in the Philippines dating back to the 1990s supporting the establishment of the UP Solar Lab and many off grid solar projects, for example with solar water pumps. So the development of this "Net-Metering Reference Guide" fits in well with our past and current activities which are based on the concept of sustainable development.

In the context of "renewables – Made in Germany" GIZ implements its Project Development Program (PEP-SOA) with partners in the Philippines in three pillars: Information exchange, business partnerships and the development of conducive framework conditions for the deployment of renewable energies.

Since the inception of "renewables – Made in Germany" in April 2011, GIZ has organised many activities jointly with the German-Philippine Chamber of Commerce and Industry and the European Chamber of Commerce of the Philippines and enterprises in Germany and in the Philippines, including business trips of solar companies and the organization of the annual German Solar Training Weeks. GIZ also supported the development of the net-metering rules and interconnection standards which were finally approved in July 2013. It is now time to disseminate the opportunity this regulation brings for every grid electricity customer in installing a solar PV and other renewables. To this effect GIZ in cooperation with DOE organized a multi stakeholder effort to publish this guide which is meant to serve as a reference for consumers who wish to participate in net-metering.

We would like to thank Carlos Jericho Petilla, Secretary DOE, Pete Maniego, Chairman NREB and the contributors who have made this guide possible: Mario Marasigan, Director DOE REMB; Aty. Ranulfo Ocampo, President PEPOA, Chairman NREB Sub-Committee on Net-Metering; Anna M. Reodica, Senior Manager Utility Economics, MERALCO; Jessie L. Todoc, Country Manager Philippines, International Copper Association Southeast Asia Ltd.; Dipl.-Ing. (FH) Christian Brennig; Dipl.-Ing. (FH) Tatiana Abarzúa; Dipl.-Ing. (FH) Sebastian Stein; Tetchi Capellan, President PSPA; Silver Navarro, Jr. - Renewable Energy & Financing Consultant; Noel Verdote, IFC SEF Program and Rustico Noli De La Cruz, Assistant Vice President, Development Bank of the Philippines.

We would also like to thank the following companies for sharing information about solar PV installations in the Philippines: MATEC, Solarus Partners Inc, UNI Solar Inc, Greenheat Corporation and CEnAG Solar.

We wish that this reference guide will entice thousands of electricity customers to generate their own electricity with quality installations and to take advantage of the net-metering rules.

Dr. Bernd-Markus Liss
Principal Advisor
PEP-SOA Philippines

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Glossary

BSW	Bundesverband Solarwirtschaft (German Solar Association)
CFEI	Certificate of Final Electrical Inspection
DAS	Distribution Assets Study
DBP	Development Bank of the Philippines
DG	Distributed Generation
DIS	Distribution Impact Study
DMC	Distribution Management Committee
DoE	Department of Energy
DU	Distribution Utilities
EC	Electric Cooperative
EDP	Environmental Development Project
ERC	Energy Regulatory Commission
IFC	International Finance Corporation
kW	Kilowatts
kWh	Kilowatts per hour
kWp	Kilowatt peak
LGU	Local Government Unit
MERALCO	Manila Electric Company
MW	Megawatt
NGCP	National Grid Corporation of the Philippines
NGO	Non-governmental organization
NREB	National Renewable Energy Board
OBO	Office of the Building Official
ODA	Official Development Assistance
PEC	Philippine Electrical Code
PEPOA	Private Electric Power Operators Association
PFI	Participating Financial Institutions
PSPA	Philippine Solar Power Alliance
PV	Photovoltaic
QE	Qualified End Users
QTP	Qualified Third Party
RE	Renewable Energy
ROI	Return on Investment
STC	Standard Test Condition

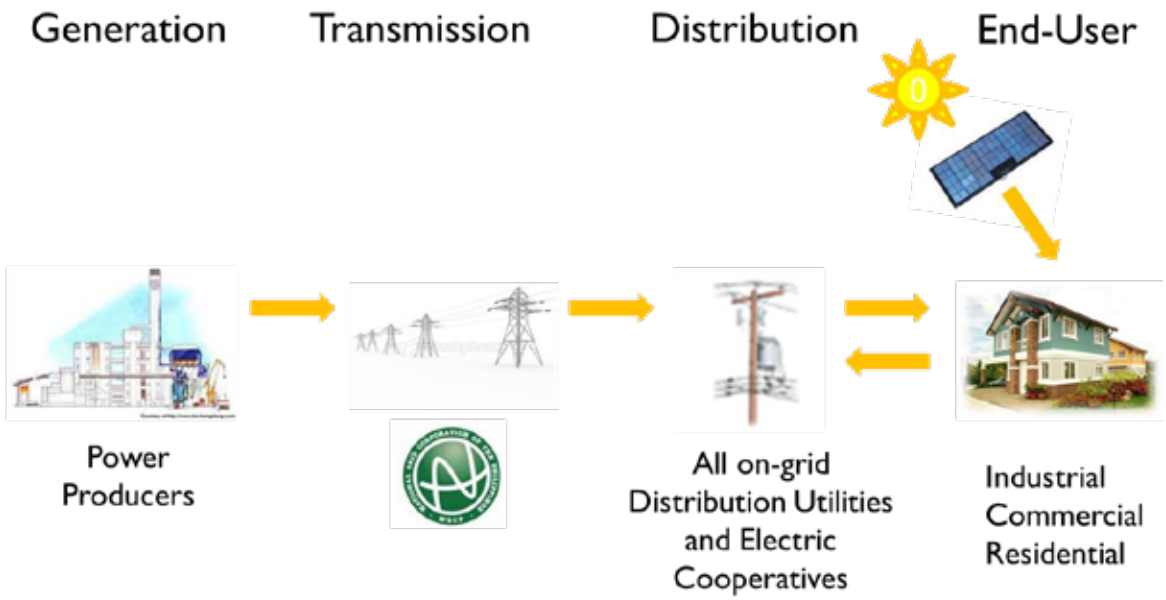
1. How net-metering works: Understanding the basics of policy, regulation and standards

Author: Atty. Ranulfo Ocampo, President PEPOA, Chairman NREB Sub-Committee on Net-Metering

According to Wikipedia "Net metering is an electricity policy for consumers who own renewable energy facilities (such as … solar power) which allows them to use electricity whenever needed while contributing their production to the grid."

In the Philippines, net-metering is the first policy mechanism of the Renewable Energy Act of 2008 which has been fully implemented.

The picture below illustrates the flow of electricity from power generation via high voltage transmission and distribution utilities to the end-user who can now install a renewable energy facility and send not needed electricity back into the distribution grid and earn credit for this export.



This Frequently Asked Questions section of the guide addresses net-metering policy, regulation and standards in the Philippines. Further clarification on the subject of accumulated peso credits, exemption from the imposition of the Universal Charge, Certificate of Compliance (COC) for Renewable Energy (RE) facilities, and the treatment RE facilities with installed capacity greater then 100KW is provided in a letter by the Energy Regulatory Commission dated November 25, 2013 in the annexes.

Q1. What is net-metering?

A1. Net-metering allows customers of Distribution Utilities (DUs) to install an on-site Renewable Energy (RE) facility not exceeding 100 kilowatts (kW) in capacity so they can generate electricity for their own use. Any electricity generated that is not consumed by the customer is automatically exported

to the DU's distribution system. The DU then gives a peso credit for the excess electricity received equivalent to the DU's blended generation cost, excluding other generation adjustments, and deducts the credits earned to the customer's electric bill.

Q2. Is net-metering already available in the Philippines?

A2. On 27 May 2013, the Energy Regulatory Commission adopted ERC Resolution 09, Series of 2013 approving the Rules Enabling the Net-Metering Program for Renewable Energy. This resolution was published on 10 July 2013 in newspapers of general circulation in the country and took effect 15 days thereafter. Thus, the Net-Metering Rules took effect in the Philippines on July 24, 2013.

The Net-Metering Program is available only to On-Grid distribution systems (or DUs connected to the transmission grid).

Q3. What is the legal basis of ERC in approving a net-metering program for renewable energy in the Philippines?

A3. Section 10 of the Renewable Energy Act of 2008 (Republic Act No. 9513) provides that subject to technical considerations and without discrimination and upon request by distribution end-users, DUs shall enter into net-metering agreement with qualified end-users who will be installing the RE system.

The ERC, in consultation with the NREB and the electric power industry participants, shall establish net-metering interconnection standards and pricing methodology and other commercial arrangements necessary to ensure success of the net-metering for renewable energy.

Q4. Why is there a capacity limit of 100 kW placed on RE systems under the net-metering program?

A4. This is because net-metering, as defined under Section 4 (gg) of the RE Law, refers only to a system appropriate for Distributed Generation (DG). DG, as defined under Section 4 (j) of the RE Law, as small generation entities supplying directly to the distribution grid, any one of which shall not exceed one hundred kilowatts (100 kW) in capacity.

Q5. What types of power generating facilities are eligible for net-metering?

A5. RE facilities such as solar, wind, biomass or biogas energy systems, or such other RE Systems not exceeding 100 kW in power generating capacity, capable of being installed within the customer's premises, are eligible to participate in the net-metering program.

Q6. What benefit will I get if go into net-metering?

A6. By generating electricity for own use, you reduce the amount of electricity you buy from your local DU. The rate of savings (or avoided cost) realized on electricity generated for own use is equivalent to the DU's retail rate consisting of charges for generation, transmission, system loss, distribution, subsidies, taxes and other charges.

You also earn peso credits on any excess electricity exported to the DU equivalent to the DU's blended generation cost, excluding other generation adjustments. The peso credits earned is then used to reduce your electric bill/s.

Q7. How will my DU meter my import and export energy?

A7. The DU may opt to install two uni-directional meters – one to meter energy you buy from your local DU, and the other to meter the energy you export to the DU.

The DU may at its option install a single bi-directional meter that can meter both import and export energy if it finds it to be a more economical.

The DU may also install a third meter in proximity to your RE facility to meter its total RE generation. The total RE generation shall earn for the host DU RE Certificates which the DU can use to comply with its Renewable Portfolio Standards (RPS) obligations.

Q8. Who are qualified to participate in the net-metering program?

A8. DU customers who are in good credit standing in the payment of their electric bills to their DU are qualified to participate in the Net-Metering Program for Renewable Energy. These customers are referred to in the Rules as "Qualified End-Users" or QE.

Q9. If I am a contestable customer getting my power supply from a competitive Retail Electricity Supplier (RES), am I qualified to participate in the net-metering program?

A9. No. Only distribution end-users (or captive customers) or contestable customers who opted to remain with their DU are qualified to participate in the net-metering program. This is because the excess electricity received by the DU from the QE can only be distributed to the DU's other customers, and the credit to be given for the excess electricity received by the DU is equivalent to the DU's blended generation costs. Contestable customers getting their power supply from an RES are thus not eligible to join the Net-Metering program.

Q10. If I am a customer directly-connected to the transmission grid, am I qualified to participate in the net-metering program?

A10. No. Customers directly-connected to the transmission grid are not DU customers but are transmission load customers of the National Grid Corporation of the Philippines (NGCP).

Q11. How do I determine the DU's blended generation cost for a particular month?

A11. DUs are required to publish in their websites their monthly generation cost. You only need to access your DU's websites to get the blended generation cost of your DU for a particular month so that you will know how much credit you are entitled to on any excess electricity you export to your DU.

Q12. Please give an example of a DU's blended generation cost, say for the billing month of November 2013?

A12. Using Meralco's generation costs for November 2013 (as downloaded from its website), its blended generation costs, excluding other generation adjustments, for November 2013 is highlighted in yellow (see table).

COMPUTATION OF THE GENERATION CHARGE FOR NOVEMEBER 2013
(Applicable for Customer Not Under Meralco TOU)
Based on October 2013 Generation Costs

Source		(A) GWH (million kWh) Purchased	(B) Energy Share (%)	(C) Basic Generation (Php million)	(D) Other Cost Adjustments (Php million)	(E = C + D) Total GenCost for the Month (Php million)	(F = E / A) Avg GenCost (Oct 2013) (Php/kWh)	(G) Avg. GenCost (Sept 2013) (Php/kWh)	(H = F - G) Incr/(Decr) (Php/kWh)
A. Power Supply Agreements (PSAs)									
1. SEM-Calaca Power Corp. (SCPC)		211.62	7.0%	744.81	(0.21)	744.59	3.5186	3.4755	0.0431
2. Masinloc Power Partners Corp. (MPPC)		175.45	5.8%	780.33		780.33	4.4477	3.5709	0.8768
3. Therma Luzon Inc. (TLI)		160.84	5.4%	633.94	(3.19)	630.76	3.9217	3.9504	(0.0287)
4. San Miguel Energy Corp. (SMEC)		7.21	0.2%	113.85	(1.65)	112.20	15.5527	3.8087	11.7440
5. South Premiere Power Corp. (SPPC)		593.70	19.8%	2,826.16	(2.49)	2,823.66	4.7560	4.7769	(0.0209)
6. Therma Mobile Inc. (TMO)		3.61	0.1%	22.38	0.04	22.41	6.2030		
Subtotal		1,152.43	38.3%	5,121.46	(7.51)	5,113.96	4.4376	4.1674	0.2702
B. Purchase Power Agreements (PPAs/IPPs)	Dispatch								
1. Quezon Power Agreement (PPAs/IPPs)	68.9%	232.41	7.7%	1,147.05	(3.29)	1,143.76	4.9213	4.8803	0.0410
2. First Gas Power Corp. (FGPC) - Sta. Rita	93.8%	694.57	23.1%	3,407.74	(16.27)	3,391.47	4.8828	5.0463	(0.1635)
3. FGP Corp. (FGP) - San Lorenzo	96.0%	181.21	6.0%	900.97	(5.79)	895.18	4.9400	5.0246	(0.0848)
Subtotal	87.6%	1,108.19	36.9%	5,455.76	(25.35)	5,430.41	4.9002	5.0017	(0.1015)
C. Wholesale Electricity Spot Market (WESM)		228.23	7.6%	2,590.15	544.84	3,134.99	13.7359	5.6324	8.1035
D. Renewable Energy									
1. Montalban Methane Power Corp. (MMPC)		1.03	0.03%	4.12	0.01	4.13	3.9932	4.0769	(0.0837)
2. Bacavalley Energy Inc. (BEI)		0.33	0.01%	1.29	0.00	1.29	3.9750	3.9733	0.0017
3. Pangea Green Energy Philippines		0.39	0.01%	1.56	0.00	1.56	3.9866	3.9555	0.0311
4. Others		0.32	0.01%	1.65		1.65	5.1788	5.2465	(0.0677)
Subtotal		2.07	0.1%	8.62	0.02	8.64	4.1719	4.2187	(0.0468)
Total Generation Cost		**2,490.92**	**82.9%**	**13,176.00**	**512.00**	**13,687.99**	**5.4951**	**4.6199**	**0.8752**
Generation Rate Adjustments									
Pilferage Recovery							(0.0184)	(0.0175)	(0.0009)
High Load Factor Rider							0.0021	0.0026	(0.0005)
TOU Differential							0.0313	0.0294	0.0019
NPC GRAM							0.1572	0.0488	0.1084
Generation Charge							**5.6673**	**4.6832**	**0.9841**
					billing month →		*Nov. 2013*	*Oct. 2013*	
Customers with energy not sourced by Meralco		515.11	17.1%						
TOTAL NET SYSTEM INPUT		3,006.04	100.0%						

Q13. Will I incur additional charges if I avail of net-metering?

A13. Yes, DUs shall impose a net-metering charge to all customers who avail of net-metering equivalent to their existing ERC-approved Php/customer/month supply and metering rate based on the exported energy as registered in the export meter. This net-metering charge shall cover the DU's incremental costs related to system enhancement and additional meter reading and other operating costs.

The DUs may also apply before ERC a different schedule of net-metering charges subject to ERC approval after due notice and hearing. Meantime, the net-metering charges cited above shall prevail until a different schedule of net-metering charges is approved by ERC.

Q14. Please give a simulation of how my electric bill would look like if I am a net-metering customer with a 2kW solar-powered facility installed on my roof top?

A14. See assumptions and simulated electric bill below:

Assumptions:

Rated Capacity of Solar Rooftop		2.00	kW
Yield @ 100% Capacity Factor	(2kWx720hrs)	1,440	kWh
Yield @ 16% Capacity Factor	1,440x16%	230	kWh
Own Use @ 60%		138	kWh
Net Export @ 40%		92	kWh

I. Sample Billing Format & Simulation

Table A. DU Charges to Customer

Billing Concept	Base	Price	Amount
Generation Charge	460	5.6673	2,606.96
Prev Mos Adj on Gen Cost	460	0.0314	14.44
Prev Yrs Adjustment	460	0.0000	0.00
SUBTOTAL			**2,621.40**
TRANSMISSION CHARGE (P/kWh)	460	0.9333	**429.32**
Transmission Charge (NONVAT)	429.32	99.4725%	427.06
Transmission Charge (VATABLE)	429.32	0.5264%	2.26
System Loss Charge	460	0.6062	**278.85**

Distribution Charge	460	2.5043	1,151.98
Fixed Metering Chrg	1	5.00	5.00
Metering Chrg per kWh	460	0.4066	187.04
Fixed Supply Charge	1	19.88	19.88
Supply Charge per kWh	460	0.6043	277.98
SUBTOTAL			**1,641.88**
Net-Metering Charge:			
Fixed Metering Chrg	1	5.00	5.00
Metering Chrg per kWh	92	0.4066	37.47
Fixed Supply Charge	1	19.88	19.88
SUBTOTAL			**62.35**
SUBSIDIES			
Lifeline Rate Subsidy	460	0.1173	53.96
Sr Citizen Subsidy (P/kWh)	460	0.0001	0.05
SUBTOTAL			**54.01**
Government Taxes			
Local Franchise Tax	5,087.81	0.750%	38.16
TRAC	460	0.0160	7.36
VALUE ADDED TAX			
Generation Charge	2,606.96	10.9700%	285.98
Prev Mos Adj on Gen Cost	14.44	9.8800%	1.43
Transmission Charge (VATABLE)	2.26	12%	0.27
System Loss Charge	278.85	9.43%	26.30
Distribution Rev & Subs	1,758.24	12%	210.99
SUBTOTAL			**570.48**
Universal Charges:			
Missionary	460	0.1163	53.50
Environmental	460	0.0025	1.15
NPC Stranded Debt			
NPC Stranded Contract Cost	460	0.1938	89.15
Equl'n of Taxes & Royalties			
DU Stranded Contract Cost			
SUBTOTAL			**143.80**
Other Charges			
Annual Bill Deposit Interest			(19.05)
SUBTOTAL			**(19.05)**
TOTAL CURRENT AMOUNT DU TO CUSTOMER			**5,783.05**

Table B. Customer Charges to DU

Billing Concept	Base	Price	Amount
Generation Charge (net export)	92	**5.4951**	506.43
Residual Credit Earned in Prior Mos.	0	**5.4951**	0.00
TOTAL CURRENT AMOUNT CUSTOMER TO DU			**506.43**

Table C. Net Metering Customer's Bill

TOTAL CURRENT AMOUNT DU TO CUSTOMER	**5,783.05**
LESS: TOTAL CURRENT AMOUNT CUSTOMER TO DU	**(506.43)**
LESS: Credit Amount from Previous Month	
Net Bill Amount	**Php5,276.62**

Avoided Cost (Own Use)	138	PHP 12.5718	PHP 1,737.93
Credit earned	92	5.4951	506.43
TOTAL AVOIDED COST			**PHP 2,244.36**
Avg. Savings Rate/kWh		230	PHP 9.76

Q15. Are all customers ideal candidates for net-metering?

A15. Not all DU customers are ideal candidates for net-metering. Customers with demand-related (kW) charges may not be ideal candidates for net-metering because net-metering displaces only energy-related (kWh) charges.

Be that as it may, customers whose peak demand of electricity coincides with the availability of the RE resource may also stand to benefit from net-metering even if he has demand-related (kW) charges. This is because his RE production can potentially reduce his coincident peak demand for electricity.

Q16. Who then would be ideal candidates for net-metering?

A16. Customers with pure energy-related charges will benefit from net-metering.

As mentioned above, customers whose peak demand of electricity coincides with the availability of the RE resource may also stand to benefit from net-metering even if he has demand-related (kW) charges because his RE production can potentially reduce his coincident peak demand for electricity.

Q17. What is the optimum size of an RE facility should I install in my premises?

A17. If you consume all of your RE production, you avoid 100% of the retail rate of your electric bill.

If you export any excess RE to your DU, you only offset the blended generation cost (or weighted average power production cost) of your DU. This is about 40-45% of the retail rate of your electric bill.

So for an RE facility like a solar roof top system, the optimum capacity that you should install in your premises should not exceed your daytime peak demand for electricity so that you can maximize your savings/avoided cost on electricity, and shorten to the extent possible the payback period of your investment in the solar roof top facility.

2. How to apply for net-metering services with your distribution utility

Author: Anna M. Reodica, Senior Manager Utility Economics, MERALCO

2.A Filing of net-metering service application

The customer goes to his Distribution Utility (DU) to request to participate in the Net-Metering Program[1]. Upon receipt of the request, the DU will provide the customer the following list of required documents[2]:

- Net-Metering Application Form
- Identification Document
- Detailed Planning Data
- List of Certified Equipment
- Plant Parameters Form

Once the requirements listed above are in order, the customer files the accomplished Net-Metering Application form with the supporting documents. The DU will then verify the accuracy and completeness of the documents. Within ten (10) business days upon receipt of the application, the DU will issue an acknowledgement receipt with feedback on whether or not the application is complete[3].

2.B Technical evaluation

With the submission of complete documentary requirements, the application proceeds to the technical evaluation phase. The DU will perform an initial assessment to determine if a Distribution Impact Study (DIS) will be needed, in accordance with the DSOAR, and inform the applicant accordingly. The DIS is performed to assess the ability of the Distribution system to safely and reliably accommodate a proposed interconnection of a generation source and if any upgrades may be required. If the conduct of DIS is deemed necessary, the DU informs the applicant and relays the following details on the DIS:

- Scope of the Study
- Estimated Time of DIS Completion
- DIS Fee

Within thirty (30) days[4] from receipt of the details on the DIS, the applicant informs the DU of his decision on whether or not to proceed with the DIS. If the applicant decides to continue with the DIS, the applicant settles the DIS fee with the DU. During the conduct of the DIS, additional information may be requested from the applicant. From receipt of complete information for the DIS, the DU has sixty (60) days[5] to complete the study.

Within five (5) days[6] from completion of the DIS, the DU forwards to the applicant the results of the study and the DU's findings on whether a subsequent stage of a Distribution Assets Study (DAS) is necessary[7]. The

1 Section 5.1, Annex A-1 - Net-Metering Interconnection Standards, ERC Resolution No. 09 Series of 2013
2 Section 5.2, Annex A-1
3 Section 5.4, Annex A-1
4 Section 2.9.3.4, DSOAR
5 Section 2.9.3.7, DSOAR
6 Section 2.9.3.10, DSOAR
7 Section 5.6, Annex A-1

DAS determines all additional distribution assets and costs required to accommodate the proposed generation source of the Net-Metering customer.

If the conduct of a DAS is necessary, the DU issues an offer of DAS service to the applicant. Within fifteen (15) days[8] from receipt of the DAS offer, the applicant informs the DU whether or not to proceed with the DAS. Upon acceptance of the DAS offer and payment of the DAS fee by the applicant, the DU has thirty (30) days to complete the study. Within five (5) days[9] from completion of the DAS, the DU informs the applicant of the results of the study.

2.C Interconnection facilities and project agreement

With the conclusion of the technical evaluation phase, the DU finalizes the design of the interconnection facilities based on the results of the DIS and / or DAS, along with the corresponding project costs, if applicable. This stage includes an inspection of the Service Entrance depending on the meter set-up (2 uni-directional meter or single bi-directional meter). A Certificate of Final Electrical Inspection (CFEI), to be obtained from the city or municipality, may be required on a case-to-case basis.

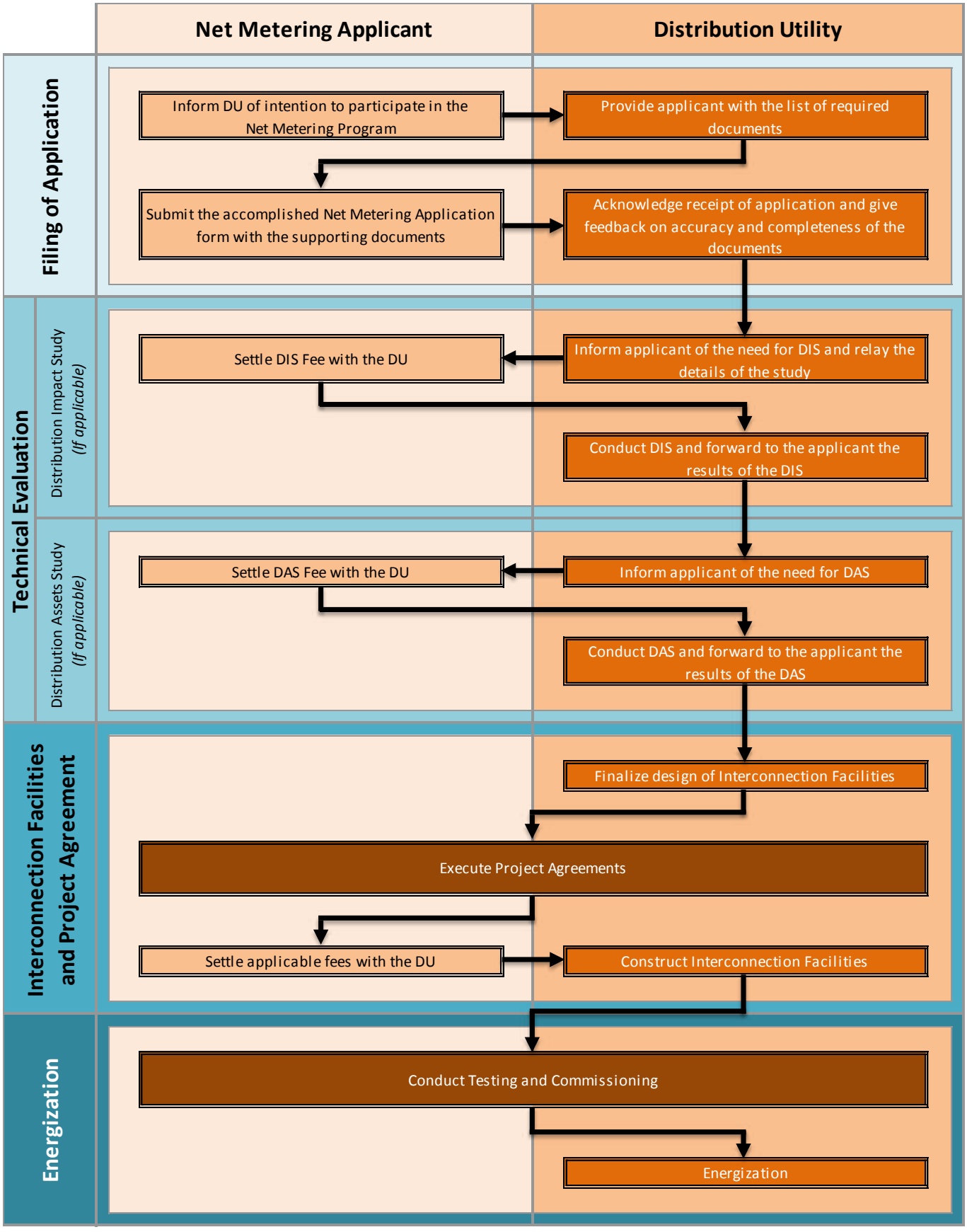
After the completion of the plans for interconnection facilities, project agreements (e.g. Net-Metering Agreement, Fixed Asset Boundary Document) will be executed and the applicable fees will be paid. Construction of the interconnection facilities may then proceed.

2.D Energization

Once the construction is completed, the applicant's installed facilities will undergo testing and commissioning to be witnessed by the DU[10]. Commissioning will include inspection of the system components and functional tests to ensure compliance with the Net-Metering Interconnection Standards[11].

The flow chart on the following page illustrates the application process for net-metering.

8 Section 2.9.4.1, DSOAR
9 Section 2.9.4.8, DSOAR
10 Section 10, Annex A-1
11 Sections 6 and 7, Annex A-1


Net Metering Applicant
Distribution Utility
Filing of Application
Inform DU of intention to participate in the Net Metering Program
Provide applicant with the list of required documents
Submit the accomplished Net Metering Application form with the supporting documents
Acknowledge receipt of application and give feedback on accuracy and completeness of the documents
Technical Evaluation
Distribution Impact Study (If applicable)
Settle DIS Fee with the DU
Inform applicant of the need for DIS and relay the details of the study
Conduct DIS and forward to the applicant the results of the DIS
Distribution Assets Study (If applicable)
Settle DAS Fee with the DU
Inform applicant of the need for DAS
Conduct DAS and forward to the applicant the results of the DAS
Interconnection Facilities and Project Agreement
Finalize design of Interconnection Facilities
Execute Project Agreements
Settle applicable fees with the DU
Construct Interconnection Facilities
Energization
Conduct Testing and Commissioning
Energization

3. How to avail the permits for solar roof tops at your LGU

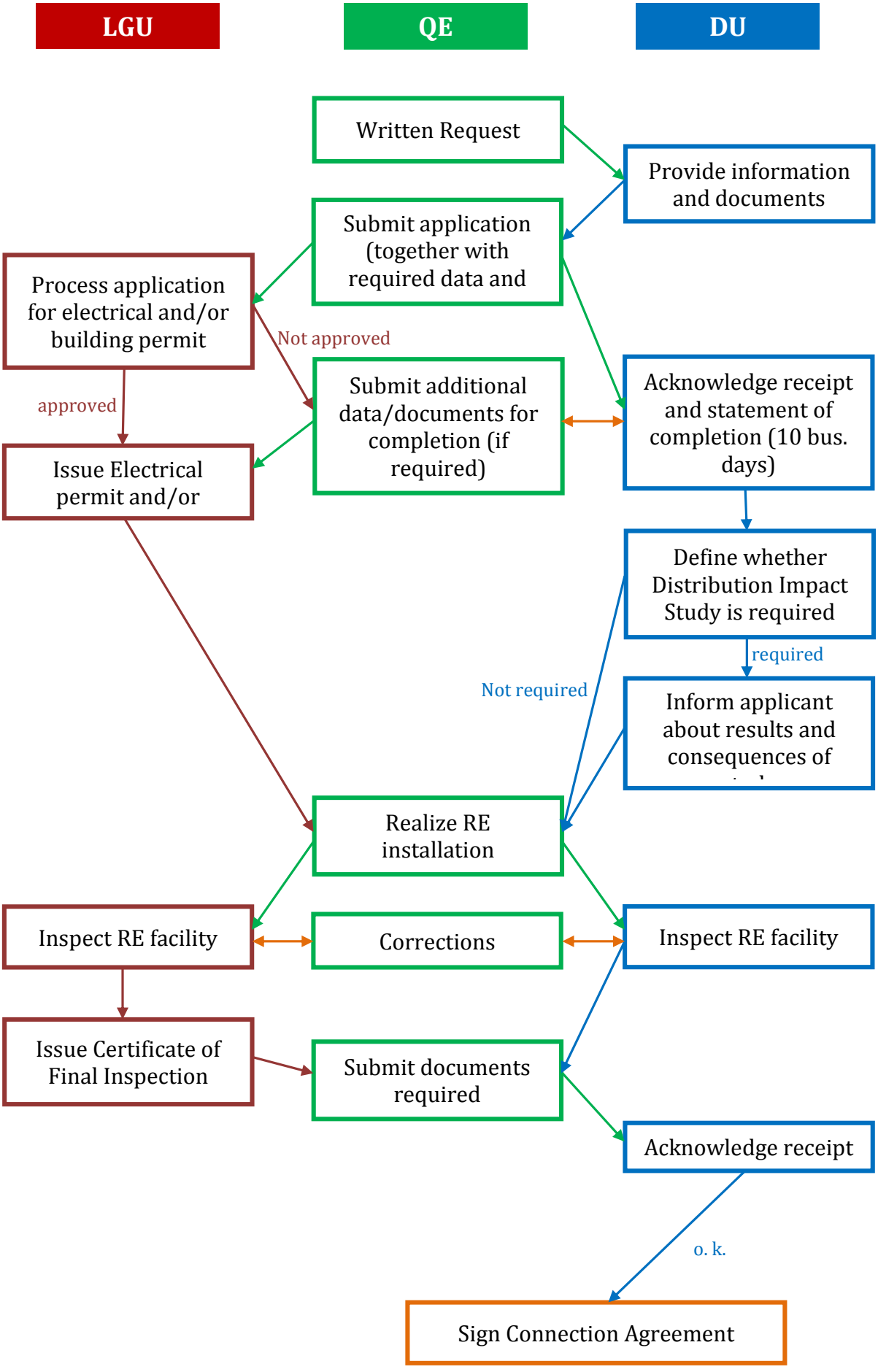
Author: Jessie L. Todoc, Country Manager Philippines, International Copper Association Southeast Asia Ltd.

3.A Overview of procedures

Generally, all Local Government Units (LGUs) include the application for electrical permits to the procedure for application of a Building Permit. The processing of building permits falls under the overall control and supervision of the Office of the Building Official (OBO) of the LGU.

In processing the electrical permits, the Electrical Division of the OBO shall see to it that the applicant complies with the standards and requirements on electrical safety in the Philippine Electrical Code (PEC), the Electrical Engineering Law, and the concerned LGU.

The applicant shall first submit certain administrative and technical requirements as specified by the LGU. The Electrical Division will then assess the completeness and correctness of the submitted documents and forms. If satisfied, the Electrical Division within the indicative period of time and after payment of the required fees by the applicant will then issue the Electrical permit.


LGU
QE
DU
Written Request
Provide information and documents
Submit application (together with required data and
Process application for electrical and/or building permit
Not approved
Submit additional data/documents for completion (if required)
Acknowledge receipt and statement of completion (10 bus. days)
approved
Issue Electrical permit and/or
Define whether Distribution Impact Study is required
required
Not required
Inform applicant about results and consequences of
Realize RE installation
Inspect RE facility
Corrections
Inspect RE facility
Issue Certificate of Final Inspection
Submit documents required
Acknowledge receipt
o. k.
Sign Connection Agreement

When all of the electrical systems have been installed, the applicant submits a request for inspection to the Electrical Division. The Electrical Division then assesses and evaluates the installation at the site for compliance with the National Building Code and the Philippine Electrical Code, based on the plans and specifications of the building that were submitted to the agency. If satisfied, the Electrical Division then issues a Certificate of Final Electrical Inspection.

3.B Requirements

The following are the required documents to be submitted to the electrical division of the concerned LGU:

a. Electrical permit for new building (and installation of roof top solar PV)

Makati	Manila	Pasig	Quezon City
• Land Title/Contract of Lease • Realty Tax Receipt • Affidavit of the owner authorizing to use of the property to separate, reconnect, remodel, relocate the kWh meter and repair of service entrance with duly notarized • Accomplished Application Form ***(DPWH Form No. 96-001-E)*** to be signed by a licensed engineer/master electrician with PTR No. for the current year • Floor lay-out with lighting and power lay-out • Riser Diagram • For a load of 4kW or 20 outlets or more, 5 sets of plans, signed & sealed by a PEE with PTR No. for the current year • Barangay clearance	• Application for electrical permit—white form • Electrical plans and specifications –5 sets	• Duly accomplished Electrical Permit Form ***(DPWH Form No. 96-001-E)***, signed and sealed by Professional Electrical Engineer • 5 sets electrical plan, signed and sealed by Professional Electrical Engineer • 2 sets Bill of Materials/Contract for electrical works • 2 sets Scope of Works • 2 sets Specifications • Xerox copy of PTR and PRC ID of PEE • Authorization letter from owner	• Proof of Ownership • Urban Poor Affairs Office Clearance with Barangay Certificate (if applicable) • Notarized Business Permit Application (if Applicable) • Location Map/Sketch • Affidavit of Undertaking and Commitment • Notarized Authorization Letter (for applicant's representative) • Photocopy of valid ID of applicant • Photocopy of the valid ID of the Lot owner • Electrical Permit Application Form • Clear copies of valid PRC IDs & current PTRs • Electrical Plan

b. Electrical permit for new installation (e.g. rooftop solar PV) in an old or existing building

Makati	Manila	Pasig	Quezon City
• Land Title/Contract of Lease • Realty tax receipt • Affidavit of the owner authorizing to use of the property to separate, reconnect, remodel, relocate the kWh meter and repair of service entrance with duly notarized • Accomplished Application Form ***(DPWH Form No. 96-001-E)*** to be signed by a licensed engineer/master electrician with PTR No. for the current year • Floor lay-out with lighting and power lay-out • Riser Diagram • For a load of 4kW or 20 outlets or more, 5 sets of plans, signed & sealed by a PEE with PTR No. for the current year • Barangay clearance	• Application for electrical permit—pink form • Electrical plans and specifications – 5 sets	• Duly accomplished electrical permit form ***(DPWH Form No. 96-001-E)***, signed and sealed by Professional Electrical Engineer • 5 sets electrical plan, signed and sealed by Professional Electrical Engineer • 2 sets Bill of Materials/Contract for electrical works • 2 sets Scope of Works • 2 sets Specifications • Xerox copy of PTR and PRC ID of PEE • Authorization letter from owner	• Proof of Ownership • Meralco Bill • Previous Annual Inspection Certificate for Electrical • Notarized Business Permit Application (if Applicable) • Location Map/Sketch • Affidavit of Undertaking and Commitment • Notarized Authorization Letter (for applicant's representative) • Photocopy of valid ID of applicant • Photocopy of the valid ID of the Lot owner • Electrical Permit Application Form • Clear copies of valid PRC IDs & current PTRs • Electrical Plan

c. Certificate of final electrical inspection

Makati	Manila	Pasig	Quezon City
• Duly accomplished Request for Inspection • Duly accomplished Certificate of Completion • Copy of Electrical Permit • Copy of Electrical Permit's Official Receipt • Approved Electrical Plans • Revised Electrical Plans (if applicable) • Affidavit of undertaking for change of engineer (if applicable) • Test results (insulation resistance test, load balancing test, high potential test, ground resistance test, etc.) • Others	• Application for electrical inspection	• Request for Inspection • Copy of Electrical Permit • Copy of electrical plan • Copy of Scope of Works • Copy of Specifications • Xerox copy of PTR and PRC ID of PEE • Authorization letter from owner	• Duly accomplished Request for Inspection • Approved Building Permit • Approved Electrical Permit • Approved Electrical Plan • Electrical Permit Form • Clear copies of valid PRC IDs & current PTRs

3.C Timeline

Upon submission of administrative requirements, each LGU has set a timeline for administrative action as follows:

	Makati City	Manila	Pasig City	Quezon City
Approval of Electrical Permit upon submission of documentary requirements	• 1 – 3 working days	• 1 day	• 1 day	• 2 – 5 working days
Schedule of electrical inspection upon submission of request for inspection	• 1 – 3 working days	• 1 day	• 1 day for official inspection. Inspectors roam the area on a regular basis to monitor	• 2 – 3 working days
Issuance of Certificate of Final Electrical Inspection after the final inspection	• 1 – 3 working days	• 1 day	• 1 day	• 2 – 3 working days

3.D Fees

Generally, all LGUs adopt the schedule of fees set by the National Building Code of the Philippines for electrical fees as per NBCDO Memorandum Circular No. 1 series of 2004 issued last November 16, 2004. The following schedule (d.1 through d.6) is used for computing electrical fees in residential, institutional, commercial, and industrial structures for Quezon City, Manila and Makati City. Pasig City, however, has a different schedule of fees that was enacted by the city government through a City Ordinance.

d.1 Total connected load (kVA)

d.1.1. 5 kVA or less	P	200.00		
d.1.2. Over 5 kVA to 50 kVA		200.00	+	20.00/kVA
d.1.3. Over 50 kVA to 300 kVA		1,100.00	+	10.00/kVA
d.1.4. Over 300 kVA to 1,500 kVA		3,600.00	+	5.00/kVA
d.1.5. Over 1,500.00 to 6,000 kVA		9,600.00	+	2.50/kVA
d.1.6. Over 6,000 kVA		20,850.00	+	.25/kVA

Note: Total connected load as shown in the load schedule.

d.2 Total transformer/uninterrupted power supply (UPS)/generator capacity (kVA) (or kW in the case of rooftop solar PV)

d.2.1. 5 kVA or less	P	40.00		
d.2.2. Over 5 kVA to 50 kVA		40.00	+	4.00/kVA
d.2.3. Over 50 kVA to 300 kVA		220.00	+	2.00/kVA
d.2.4. Over 300 kVA to 1,500 kVA		720.00	+	1.00/kVA
d.2.5. Over 1,500.00 to 6,000 kVA		1,920.00	+	0.50/kVA
d.2.6. Over 6,000 kVA		4,170.00	+	0.25/kVA

Note: Total Transformer/UPS/Generator Capacity shall include all transformer, UPS and generators which are owned/installed by the owner/applicant as shown in the electrical plans and specifications.

d.3 Pole/attachment location plan permit

d.3.1. Power Supply Pole Location	P	30.00/pole
d.3.2. Guying Attachment		30.00/attachment

This applies to designs/installations within the premises.

d.4 Miscellaneous fees: Electric meter for union separation, alteration, reconnection or relocation and issuance of wiring permit:

Use or Character of Occupancy	**Electric Meter**	**Wiring Permit Issuance**
Residential	P 15.00	P 15.00
Commercial/Industrial	60.00	36.00
Institutional	30.00	12.00

d.5 Formula for computation of fees

The Total Electrical Fees shall be the sum of d.1 to d.4

d.6 Forfeiture of fees

If the electrical work or installation is found not in conformity with the minimum safety requirements of the Philippine Electrical Codes and the Electrical Engineering Law (RA 7920), and the Owner fails to perform corrective actions within the reasonable time provided by the Building official, the latter and/ or their duly authorized representative shall forthwith cancel the permit and the fees thereon shall be forfeited.

4. How to buy a solar roof top from your installer

Authors: Tetchi Capellan, President PSPA; Dipl.-Ing. (FH) Christian Brennig; Dipl.-Ing. (FH) Tatiana Abarzúa; Dipl.-Ing. (FH) Sebastian Stein (all BSW); Markus Dietrich, GIZ Consultant

Introduction

Producing electricity partly for own consumption, and partly for sale to the distribution utility companies, is now available in the Philippines provided anyone has a roof suitable for solar energy. This guide provides an overview of important points to consider when planning and purchasing a small PV system intended for own consumption.

The guide is directed towards interested parties considering installing a grid-connected photovoltaic roof system up to 100 kW. It attempts to walk the reader through the different stages beginning from the day the idea to buy a PV system is conceived, up to the realization of the PV project. What this consumer manual intends is to assure quality and reliable installations. The system can be either a residential PV installation of a household or a larger commercial PV roof top system.

4.A Selecting components for solar roof top

4.A.1 What modules to buy

There are different types of modules in the market. Crystalline silicon modules (c-Si) have the largest market share. As a newer technology, these so called hybrid cells combine the material advantages of crystalline cells with the fabrication features of thin-film technology. They contain monocrystalline cells which are coated with amorphous silicon. Therefore the modules with hybrid cells are produced cheaper but with a higher efficiency and also a better performance.

When buying a module, it is important to check if the module passed the design qualification and type approval (see below the section “test specifications”).

☼ Manufactured for maximum energy yield per m². ☼ Mostly with aluminium profile frame which protects glass edges, facilitates mounting, improves statics of modules and can be used for fixation on mounting structures. ☼ Most frames are produced with mounting holes and holes for water discharge.	**modules**

☼ Modules with cadmium (CdTe) and amorphous silicon solar cells (a-Si) are most widely used. ☼ Other cell types contain copper (as CIS/ CIGS modules). ☼ As less semi-conductor material is needed, the production of thin-film solar modules becomes cheaper and the selling price drops significantly. ☼ Reminder: Thin-film modules have a lower efficiency than c-Si modules. Therefore larger area is needed for the PV installation. ☼ Often used in façades or, as they weigh less and can be produced in flexible forms, integrated in different building forms.	**thin-film modules**

☼ Crystalline silicon modules: choose the modules with standard IEC 61215 which comprises the examination of all parameters linked to ageing of PV modules and describes various qualification tests based on the artificial load of the materials (radiation, thermal and mechanical testing). ☼ Thin-film modules: choose the modules with standard IEC 61646, where additional test procedures are done to adapt to special properties of thin-film technologies. ☼ Check the safety qualification according to IEC 61730, as these are used in conjunction with above mentioned standards. Focus on fundamental construction requirements for PV modules such as the prevention of electrical shocks, fire hazards and personal injury.	**Test specifications**

☼ Many module manufacturers offer a product warranty of two or three years. Some offer a product warranty of 10 years. ☼ Most manufacturers guarantee a 25-year limited warranty on the power output, usually 90 % of the minimum output power rating of the modules during the first 10 years of operation, and 80 % during the following 15 years. Sometimes, manufacturer provides a warranty stating guaranteed power output of 97 % of the minimum output power rating during the first year of operation and a guaranteed maximum linear degradation of 0.7 % p.a. until the 25th year. ☼ Reminder: Examination of European PV systems done by research and testing institutes indicate that the actual degradation is far lower than the module power guarantee offers.	**Module warranty**

Useful Tips:

- ☼ **Check compliance of module type with IEC standards and type of warranty.**
- ☼ **Buy modules with measurement record and serial numbers as reference.**
- ☼ **Secure technical data sheet and choose modules with low tolerance ranges of nominal output or positive sorting of power output categories.**
- ☼ **If modules with high tolerance values (> 5%) are used by your installer, ask how they will be pre-sorted so connection of modules with a similar maximum power current within one string reduces losses caused by mismatch.**
- ☼ **Modules with different power output categories (e.g. 215/220/225 W_p), should be stringed with modules from the same performance class**

4.A.2 Choosing inverters

The inverter represents the connection between the photovoltaic system and the public distribution grid. It converts the direct current generated by the PV system into alternate current. Therefore, the inverters have to adapt to the grid frequency (60 Hz) and the voltage level, typically 230 V.

There are Inverters for grid-connected systems and for stand-alone systems. As the name suggests, grid-connected inverters are directly linked to the public electricity grid through the in-house electrical network.

Most inverters have a 10-year limited warranty.

place of installation

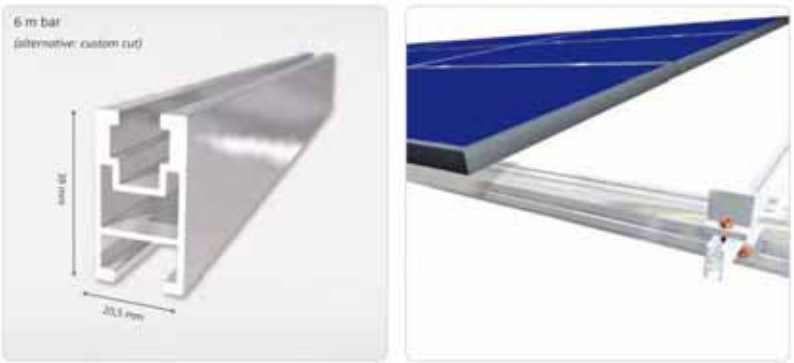
- As much as possible, the inverter should be installed near the house meter. Shorter DC cabling cuts system loss of solar power.
- Inverters get slightly warm during their operations. To achieve higher performance, there should be adequate ventilation.
- Always comply with the external conditions demanded by the manufacturer, particularly permissible humidity and ambient temperature.

Useful Tips:

- **Ensure adequate ventilation**
- **Consider range of permissible ambient temperature for inverter (avoid power limitation due to high temperatures)**
- **If an inverter is mounted outdoors it has to be protected against rain and insolation.**
- **Pay attention to local high tide levels**

4.A.3 Selecting mounting systems and warranty

Unlike in the past, manufacturers now offer easy to install mounting systems for flat roofs. For large roofs on industrial and commercial buildings, frames are now generally lightweight, aerodynamic, self-supporting, and without roof penetration challenges. These features are ideally suited for roofs with membrane or bitumen surfaces as they represent a slight additional load to the roof.



When installing the modules, no holes should be drilled into the frame! Call your module manufacturer before you drill further holes, as warranty commitment may be invalidated.

Fixing of modules

- When fixing or clamping the solar panels on the rails of the chosen mounting system the appropriate points have to be considered.
- The weight of the modules is approx. 20 kg per module. Always check the kind of roof surface.
- In case no information is provided by the manufacturer, the module attachment should be along the longer side of the module, at around ¼ of the module length. The pre-drilled module holes are mostly in this part of the frame.

Useful Tips:

- **Choose a corrosion-resistant and statically tested mounting system.**
- **Check if chosen mounting system complies with the requirements of module manufacturer.**
- **Consider maximum local wind loads.**

4.B Sizing of the PV system

4.B.1 Do I need a small PV systems

The electrical power of a PV system is measured in kilowatt peak (kWp) and refers to the maximum power under standard test conditions (STC). For the installation of a 1 kWp power plant, you will only need an area of about 8 m². If you have a small roof area, you may want to choose solar modules with higher efficiency.

Remember that only a portion of your household electricity demand will be covered by the PV system. It is therefore important to get a rough estimate of the overall power of the PV system obtained - based on the space allowed on your roof – and match the PV energy output with your consumption.

Solar allows you to reduce your consumption during the daytime. It is essential to improve the demand profile of your home by utilizing washing machines, dryers and other loads whenever the PV system delivers a lot of electricity and reaches peak capacity. Managing your load this way will reduce the peak demand for electricity. Under the net-metering regime, consuming self-generated solar power makes more economic sense than selling excess power to the public grid. Of course, storing energy is an option. As the prices for battery decreases in the near future, a purchase can be considered in order to use all electricity provided by the PV system.

4.B.2 Can I install large PV systems up to 100 kWp

The installation of a PV system is a good investment, which can provide higher returns than a savings deposit with only an average interest rate of .25% - 1.25% per annum.

Larger PV systems for commercial use will therefore make sense if you can arrange loads to coincide with high solar generated electricity. Sometimes this is realized applying remote controlled relays or sockets to switch on additional selected loads. More recently load management components are offered that also consider weather forecasts and thereby set time frames corresponding to the projected electricity generation.

In the case that the owner of the building is the operator of the PV system, it can be considered to include the solar roof top in the property insurance. The insurance coverage should already be provided during the construction phase.

Questions to ask for home installation

- Is the quality of the roofing suitable for the mounting of a solar system?
- Is the chosen area for the PV installation free of any shading caused by neighbouring buildings, antennas or trees?
- Is an alternative roof more adequate for a PV installation, like the roof of a garage?
- Are expansion gaps between modules considered (approx. 10 mm)?
- Will fire compartments not be overbuilt and are sufficient distances to fireproof walls taken into account (1.25 m)?
- Are switches for demand response considered (control of loads)?

Roof space requirements

Solar cell material	Module efficiency	Required surface area for 1 kW_p
High performance silicon (rear contacts, HIT)	17 - 20 %	5-6 m²
Monocrystalline silicon	11 - 16 %	6 - 9 m²
Polycrystalline silicon	10 - 15 %	7 - 10 m²
Thin-film:		
Copper-Indium-Selenide	6 -11 %	9 - 17 m²
Cadmium-Telluride	6 -11 %	9 - 17 m²
Micromorphous silicon	7 - 12 %	8,5 - 15 m²
Amorphous silicon	4 - 7 %	15 - 26 m²

Useful Tips:

- **Choose roof area free of shading, as shaded modules significantly reduce the PV output**
- **If your roof is orientated towards south you will have the highest yield with a module inclination of 8°**
- **Inclination between 0° and 20° is appropriate too.**
- **Inclining the modules provides a washing effect by rain.**
- **If it is possible for you to realize a building integrated PV system you could save money for roof tiles and other roofing material.**
- **Flat roofs: Consider sufficient distance between module rows to avoid shading.**
- **Consider what portion of your present electricity demand you would like the PV system to meet. The ideal is to plan for system lower than peak demand.**

Questions to ask in Large Scale Installation

- Is the quality of the roofing of your building suitable for the mounting of a solar system?
- Is the chosen area for the PV installation free of any shading?
- How is the relation between nominal power of the PV generator to nominal power of the inverter (described as DC/AC ratio)?
- Can loads be easily switched on and off (demand response)?
- Large on-roof PV systems: Is the PV plant divided in different arrays with intermediary spaces (for maintenance and safety reasons)?
- Has an insurance policy been concluded?

Recommendations

- **Check your electricity demand and consider which degree of self consumption you would like to achieve with the PV system**
- **Consider if you can re-arrange some loads to peak capacity time in order to maximize the use of the solar generated electricity**
- **Check with your LGU for Electrical and Building Permit**
- **Large roofs: consider modules with lower efficiency at a more competitive price**
- **A relation between nominal power of PV generator and inverter of 1:1 is preferable (DC/AC ratio 100%) because a lower ratio would lead to losses**
- **Consider an intermediary space of 1 m and a maximum width of 40 m as protective measure for the event of a fire in the building (thus fire fighters can maintain safety distance for fire-fighting purposes at electrical installations).**
- **Check with your property insurance firm about insuring the PV Installation**

4.C How do I recognize a good offer?

The first question to ask is: Where will I find a good PV installation company? System installation can be found by advertisements in printed media and internet search. There is a solar association in the country and you can search the website for companies that can provide installation services.

Sometimes, component providers and its local distributors frequently offer lists of authorised installers of their components. Always ask for references of already realized PV systems.

When choosing an installer, the most obvious way is to get their track record. Don't forget to ask the host of the PV system if they are satisfied with the recorded PV yields and the overall installation process.

Did the installer comply with agreed deadlines? What are the impression about the installer's know-how and diligence? How is the visual aspect of the PV installation?

Payments for the provision of services are made through instalments (partial payments). For instance a payment is made after signing of contract. Then, another payment is remitted to the installer as soon as the delivery of material to construction site is done. Then, the final payment is completed when the installation of components and connection of modules to the inverter, or after grid connection.

☼ Is the installer able to explain the working of the PV system in simple words and a comprehensible way? ☼ Does the installer provide electrical plans and other documents required for LGU Electrical and Building Permits? ☼ Is the processing of permits included in the services? ☼ Does the offer include the delivery of all required components and services to produce electric power and feed it into the grid? ☼ Are grid-connection, and commissioning of the PV plant included? In other words: is it a turn-key installation? ☼ Is the client stipulated to provide any item (e.g. scaffolding or labour)? ☼ Are optional and mandatory items distinguished and terms and conditions of the contract included? ☼ Does the installer observe current applicable standards and guidelines and know compliance standards set by the electrical and distribution codes valid in the Philippines? ☼ Payment conditions: are instalments included?	**choice of installer**

Useful Tips:

- ☼ **Ask your installer to conduct on-site inspection to consider existing electrical installations at the building**
- ☼ **A calculation of the estimated yield should be included in the technical proposal so you can calculate the potential savings.**
- ☼ **Include in the contract, the installer's declaration stating compliance with current applicable standards, guidelines and rules.**
- ☼ **Check on insurance for the PV installation. It should provide security against storms, hail, lightning, overvoltage, theft, vandalism and other circumstances.**
- ☼ **Always include regular inspection of the PV system and a prompt service in case of a defect.**

4.C.1 Comparing offers

In order to compare different offers, it is necessary that all basic items are listed. Some components can be a useful add-ons, but not critical to the operations of the PV system - like a data logger, an operation and maintenance contract, warranty extensions (usually offered for the inverter) and an insurance policy for the PV system.

In case of comparable offers, a local company is preferable. Another useful aspect to consider is the possible date of installation of the PV system.

items to be included

- PV modules: Number, manufacturer, cell technology, type(s) certificates
- PV generator capacity (STC)
- Inverters: Number, manufacturer, type(s), rated output power
- Mounting system: Manufacturer, type, certified statics
- DC-cabling (modules to inverter): Type, length and diameter
- AC-cabling (grid connection): Type, length and diameter
- Protection devices
- Lightning and surge protection (if applicable)
- Installation of mounting system, PV modules, inverter and DC cabling
- Grid connection
- Commissioning (incl. tests)
- Compilation and delivery of documentation, instruction for maintenance and operation

Recommendations

- **Demand a module layout plan with proposed location of modules and wiring**
- **Demand a block diagram of whole PV system.**
- **Check if all necessary items are included (list shown above).**
- **Demand information about statically testing of offered mounting system.**
- **Check if offer and terms and conditions clearly state the obligations of PV system provider and client. Demand more details if this information was not provided.**
- **You can also ask for advice in the internet, e.g. at www.photovoltaicboard.com**

4.D Return of investment

In contrast to conventional power plants PV systems have no fuel costs. Moreover, there are no mechanically or thermally highly stressed parts; therefore the maintenance is limited primarily to few activities.

Nevertheless it is prudent to allocate a small financial reserve for the eventual replacement of defective parts. For instance the inverter may have to be replaced once within 20 years. Besides you have to know (1) your yearly demand for electricity, and (2) the exact price you are currently paying for this electricity. The more money you spend on electricity, the higher the return of investment (ROI) for the installed PV system will be.

The quote for the PV installation should also include an estimate of cost-effectiveness. This calculation has to be based on the expected yield, the electricity demand and the achievable degree of self-consumption. Besides, the energy produced which is not consumed onsite and is fed into the grid will be credited to the next monthly electricity bill.

Recommendations

- **Ask your installer to provide an estimate of cost-effectiveness.**
- **Provide the installer with your current electricity purchase price and previous rate of increase (1-5 % p.a.).**
- **Make sure that expected yield, self-consumption, and excess feed-in are according to current pricing for purchased electricity and feed-in tariffs.**

4.D.1 How to calculate the return of investment on your solar installation

The example below shows a sample ROI calculation of a solar roof top in the Philippines. Please check with your solar installer and your DU the numbers applicable to your solar roof top.

Disclaimer: This example is a hypothetical calculation which should illustrate the methodology of calculating the return of investment of a solar roof top under net-metering rules in the Philippines.

No	Assumptions		
1	Life time of PV	Years	20
2	Rated Capacity of PV System (RC)	KWp	6
	Module Efficiency (ME)	%	16%
	Hours/Year	Hours	8,760
3	Yield (RC * ME * hours/year)	kwh/year	8,410
4	Degradation Factor	%	0.5%
5	% Own Consumption	%	70%
6	DU Total Customer Charge	PHP/kWh	12.5718
7	Annual Increase in DU/Generation Charge	%	3%
8	% Net Export	%	30%
9	DU Generation Charge	PHP/kWh	5.4951
10	Operations and Maintenance/Year/KWp	PHP	900
	Cost of installed PV System	PHP/kWp	120,000
11	Cost of installed PV System total	PHP	720,000
	Key Performance Indicators		
	Total Solar Energy Produced	kwh	160,438
	Total Cost	PHP	828,000
	Total Savings	PHP	2,133,227
	Break Even	Year	8
	Internal Rate of Return	%	12%

Year	Total Solar Energy Produced	Solar Energy Own Consumption	DU Total Customer Charge	Avoided Cost	Solar Energy Export	Generation Charge	Credit from Export	Savings	O&M	Total Savings	Investment and Cumulative Savings
	kWh	kWh	PHP/KWH	PHP	kWh	PHP/KWH	PHP	PHP	PHP	PHP	PHP
1	**3 - 4(per year**	**B*5**	**6 + 7(per yea**	**C*D**	**B*8**	**9 + 7(per yea**	**F * G**	**E + H**	**2 * 10**	**I-J**	**11 - K**
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
											(720,000)
1	8,410	5,887	12.5718	74,007	2,523	5.4951	13,863	87,870	5,400	82,470	(637,530)
2	8,368	5,857	12.9490	75,846	2,510	5.6600	14,208	90,054	5,400	84,654	(552,876)
3	8,326	5,828	13.3374	77,730	2,498	5.8298	14,561	92,292	5,400	86,892	(465,985)
4	8,284	5,799	13.7375	79,662	2,485	6.0046	14,923	94,585	5,400	89,185	(376,800)
5	8,243	5,770	14.1497	81,642	2,473	6.1848	15,294	96,935	5,400	91,535	(285,264)
6	8,201	5,741	14.5742	83,671	2,460	6.3703	15,674	99,344	5,400	93,944	(191,320)
7	8,160	5,712	15.0114	85,750	2,448	6.5614	16,063	101,813	5,400	96,413	(94,907)
8	**8,120**	**5,684**	15.4617	**87,881**	**2,436**	6.7583	**16,462**	**104,343**	**5,400**	**98,943**	**4,036**
9	8,079	5,655	15.9256	90,064	2,424	6.9610	16,872	106,936	5,400	101,536	105,572
10	8,039	5,627	16.4033	92,303	2,412	7.1699	17,291	109,593	5,400	104,193	209,765
11	7,998	5,599	16.8954	94,596	2,400	7.3850	17,720	112,317	5,400	106,917	316,682
12	7,958	5,571	17.4023	96,947	2,388	7.6065	18,161	115,108	5,400	109,708	426,390
13	7,919	5,543	17.9244	99,356	2,376	7.8347	18,612	117,968	5,400	112,568	538,958
14	7,879	5,515	18.4621	101,825	2,364	8.0697	19,075	120,900	5,400	115,500	654,458
15	7,840	5,488	19.0160	104,355	2,352	8.3118	19,549	123,904	5,400	118,504	772,962
16	7,800	5,460	19.5865	106,949	2,340	8.5612	20,034	126,983	5,400	121,583	894,545
17	7,761	5,433	20.1740	109,606	2,328	8.8180	20,532	130,139	5,400	124,739	1,019,284
18	7,723	5,406	20.7793	112,330	2,317	9.0826	21,043	133,373	5,400	127,973	1,147,256
19	7,684	5,379	21.4026	115,121	2,305	9.3550	21,565	136,687	5,400	131,287	1,278,543
20	7,646	5,352	22.0447	117,982	2,294	9.6357	22,101	140,084	5,400	134,684	1,413,227
Total	160,438	112,306		1,887,623	48,131		353,604	2,241,227	108,000	2,133,227	

Source: Markus Dietrich, GIZ Consultant

4.E Important aspects considering the installation

4.E.1 Quality aspects of installation and mounting

On flat roofs, protection mats should be provided as an installation foundation, as these protect the roof membrane. Enough space should be provided in between PV arrays for accessibility in times of servicing and repair purposes. The commissioning of the PV system hast to be carried out by a registered electrician. During the commissioning a protocol has to be written by the PV plant installer. This document points out important data about the PV plant and records measured electrical values.

☼ The running cables has to be short circuit proof, if possible laying the positive and negative lines separately, with a double isolation. ☼ The cables have to be UV resistant and properly fixed on the substructure or be conducted in adequate fixings to prevent a lying on the roofing or on sharp edges. ☼ Some modules require the earthing of a pole (e.g. thin-film modules with string-ribbon cells: negative pole; Sun power cells: positive pole) ☼ For self consumption: appropriate meters have to be installed. Under the net metering rules, two unidirectional meters are installed to measure delivered and received electrical energy separately. They are called import meter and export meter.	**issues to consider during installation**

☼ Before switching on the PV plant several values are logged: earthing resistance of the grounding system, insulating resistance of the PV plant, insulating resistance of the DC main line, short circuit current for each string, open circuit voltage of the generator, open circuit voltage for each string. ☼ After switching on the PV installation: check the operation current of each string as well as voltage drop of diodes and fuses. Important is that the inverter feeds in and that the generator is not running in open circuit but in the operation point, generally the maximum power point (MPP).	**protocol of plant commissioning**

Recommendations

- ☼ **Check if cables are properly fixed. No lying on the roofing or on sharp edges.**
- ☼ **Include Protection class for outdoor installation.**
- ☼ **Ask installer to use appropriate cables and material for DC installation.**
- ☼ **Preferential use of solar cables (characterization: PV1-F).**
- ☼ **Connectors have to fit together and should not be permanently under water.**
- ☼ **Avoid looped circuits.**
- ☼ **Observe distance of at least 0.5 m between cabling and lightning protective systems.**

4.E.2 Quality assurance during operation time

The installer should offer a warranty on construction works for a certain period of time (at least one year). This has to be reviewed with the installer and should form part of the documentation of the PV plant. The inverter should be checked on a regular basis (on vision panel or data logger).

Recommendations

- ☼ **Check monitoring data (on inverter or online via data logger)**
- ☼ **Monthly: check yield values on meter**

4.E.3 Maintenance of the PV system

For maintenance measures by the PV plant owner, regularly monitor performance to avoid disruptions. Maintenance work consists mainly on control of operational readiness of the system in order to rapidly resolve any failures. An operational manual for the inverter and a documentation of the installation (like the "Anlagenpass/PV Passport)" provided by the installer are necessary. For illustration purposes and to show how such documentation could look like, the German PV Passport has been included in the annex of this guide. It could also contain a maintenance contract and also maintenance recommendations.

Recommendations

- **Maintain the system at least twice a year. This includes visual inspection and removing of leaves lying on the modules, as shading would reduce PV yield.**
- **Consider cleaning of the modules twice a year, particularly near to sources of high emissions like motorways, railroad tracks or pig farms. Use lime-poor water. Do not use cleaning supplies.**
- **Twice a year check if the roof OK. Check if all modules are attached and fixed. Have cables been bitten by animals? Are the connectors OK?**
- **After a lightning: Did the electric-surge arresters remain intact? (Check vision panel).**

5. How is it done: Solar roof top installations in the Philippines

In 2013 the solar roof top market in the Philippines is expected to double in size from 2.5MW to 5MW. The passing of the net-metering rules and interconnection standards enabling all on-grid end-users to install a solar roof top will further boost the market as now the regulatory framework has been set. The following examples of solar roof top installations give an overview of different applications in the residential, commercial and industrial setting.

11.76 kWp - Orphanage installation, Southern Leyte

Project overview
This project is a 11.76kWp residential installation at an orphanage in Southern Leyte. Consisting of 48 CNPV 245 watt-peak polycrystalline modules, a light weight aluminium Intersol mounting system by Donauer Solartechnik, and a display of 2 SMA Sunny Mini Central Inverters (6000 Watts each), this system is designed to maximize the given roof space of the orphanage while utilizing the future benefits of net metering to ultimately lower the operations of cost of the orphanage.

The project partners
Name of solar installer: MATEC
Name of Distribution Company: Southern Leyte Cooperative
Name of customer: Orphanage – Southern Leyte

Project site
Southern Leyte

Project setup
A study of the consumption pattern of the facility showed that an average of 30% of the Solar production is used by the facility on the weekdays, due to the children leaving the orphanage during school (Although increasing significantly during weekends), amounting to an estimated savings of Php 3,200.00 per month. The remaining 70% is designed to be fed out to the grid and will benefit the facility by an estimated Php 3,700 per month (When Net-metering is implemented by the Southern Leyte Cooperative, which is the local distribution company that has given permission to connect to their grid before installation).

Key facts and figures
The layout of arrays follows an East-West facing design (24 modules 90º East at 20º inclination; 24 modules 90º West at 20º inclination) while the inverters are set on Single-phase grid at 230Volts.
Over the first year of operation, this system has a yield of 1350 kWh per kWp, or 15,876 kWhs a year.

22.05 kWp - Commercial/office building installation, Quezon City

Project overview
The purpose of this 22.05kWp installation of the solar power system is to produce supplementary power to the entire 4-story commercial/office building during weekdays while eventually taking advantage of the Net-Metering scheme on the weekends.

The project partners
Name of solar installer: MATEC

Project setup
The layout of the array was made to maximize the roof space given by the building, which was specifically designed to easily install the largest possible grid-tied system for the given area. The entire array will be placed on a South Facing roof at a 15º inclination on a rib-type metal sheet, allowing for a quick installation and an optimal yield. An inverter room was provisioned on the top floor to house the 4 single phase inverters designed to connect to the building's 3 phase Delta grid (230V Line-Line), which is a common grid constellation found in Manila.

Key facts and figures
Consisting of 105 Evergreen 210 watt-peak polycrystalline modules, a simple yet robust mounting system designed by Schletter, and a display of 4 Single phase grid tied Inverters by SMA (2 x SMC 7000, 2 x SMA 4600).

Over the first year of operations, it is expected to produce close to 31,750 kWhs of energy. Once the building is in full operation, it will utilize an anticipated 71% of solar power produced while the remaining 29% will be fed into the grid, mainly during the weekends, through Net-metering upon full implementation and completion of the building.

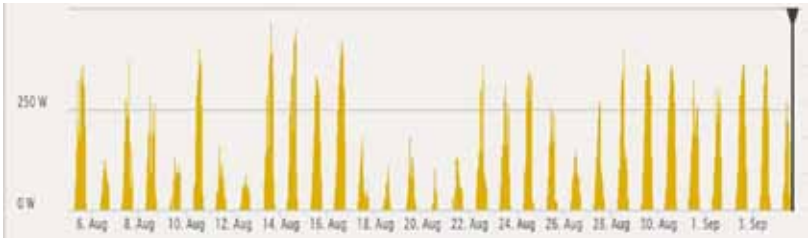
0.49 kWp - Residential installation

Project overview
The On-Grid Solar PV was installed with three (3) components namely: 1) the PV module; 2) the Micro-inverter and 3) the Power Manager.

The project partners
Name of solar installer: Solarus Partners Inc

Project setup
Two panels were put on the roof. Each panel is rated at 245Wp, totalling 490kw capacity for the entire system. Since the system uses micro-inverters, one unit of micro-inverter was attached per panel. The mounting structure is made of fibreglass to avoid corrosion. Its lightweight characteristics reduce strain on the roofing structure. The installation was quick and easy. The frame was bolted on the roof in less than a day; the actual fitting of the solar panels on the frame took about an hour only.

Key facts and figures
Last July 2012, the Solar PV 460W modules were installed with a cost of Php 78,000 or Php 170/Wpeak. With an 803 kWh annual production (estimate) and using a rate of P11.91/kWh avoided cost (without net metering), the simple payback of this project is 7.42 years. The 460W Solar PV can supply 3 x 6W CFL, a 14 inch TV and a 228W refrigerator. On a rainy month of August 2013, the average output was 2.20 kWh/day.



PROJECT PERFORMANCE		
Energy Produced	kWh/yr	803
Energy Produced	Php/yr	9,563
Energy Produced over life	Php	177,860
GHG emission reduction	tCO2/yr	0
Nominal Pre-tax Project IRR		12%
NPV Before Debt Service		7,461
Payback Period	yrs	7.42

11 kWp - Residential/office installation, Marikina City

Project overview
11Kw Residential / Office Roof Mounted Solar Grid Tie System

The project partners
Name of solar installer: UNI SOLAR INC.
Name of customer: Private Residential / Office

Project site
Located inside a gated subdivision in Marikina City, Philippines

Project setup
The client's intention is to save on electricity cost since the bulk of his electrical consumption is during daytime

Key facts and figures
It is an 11kw system mounted on a Corrugated Roof on the 3rd floor with the following specifications:

- *Panels:* ***250Wp Monocrystalline Solarworld- Germany***
- *Inverter:* ***SB5000TL-21 x 2 SMA***
- *Mounting System:* ***Aluminum and Stainless Mounting System***
- *Performance Ratio:* ***83.50%***

System Size (kwp): ***11Kw***
Annual output (kwh): ***15,930.30kwh***
No of modules: ***42 pcs.***

ROI calculation: ***6 years***

6.16 kWp - Pilot installation, MERALCO, Pasig City

Project overview
Installation of Solar system at MERALCO Compound in Pasig City

The project partners
Name of solar installer: Greenheat Corporation (subsidiary of PROPMECH Corp)
Name of customer: Manila Electric Company

Project site
MERALCO Compound, Ortigas Avenue, Pasig City

Key facts and figures
Components used

- *Suntech Solar Panels*
- *SMA Inverter*
- *Schletter Mounting Frames*
- *Zhongli Solar CAables*

System Size (6.16 kwp)
First Year Energy Yield: 6.87 MWHr

5 kWp - Bank installation, Makati City

Project overview
Solarus Partners Inc (SPI), a renewable energy company accredited by the Philippine Department of Energy and registered at the Securities and Exchange Commission with its German partner, mp tec, offered the Bank of the Philippine Islands (BPI) a 90-day trial period wherein the Bank could directly experience the benefits of the solar PV system through reduced carbon emissions and increased energy savings.

The project partners
Name of solar installer: Solarus Partners Inc
Name of customer: Bank of the Philippine Islands

Project site
BPI Branch located in Ayala Avenue Extension, Makati City

Project setup
BPI is a strong promoter of energy efficiency and the application of green technology. Given this background, Solarus Partners offered them a 90 day trial in which they could directly experience the benefits of installing a solar PV rooftop system. SPI installed a grid-tied system with a capacity of 5kWp on the roof and parapet of the BPI branch. During the 3 month period, avoided GHG emissions were 628.98 kg tons and avoided cost was PHP 9,273.60

Key facts and figures
Components used
- *Panels – 20 Panels (CS6P 245)*
- *Inverter – 2 Units (SMA)*
- *Mounting System – 1 Lot (Mp tec)*
- *Web Box – 1 Unit (SMA)*

System Size -5kwp

ROI calculation – 7 years

62 kWp - Toyota Marilao, Bulacan

Project overview

Toyota Showroom – Marilao, a car show room and service facility in Bulacan was exploring the option of utilizing renewable energy solutions to manage increasing energy costs. The facility operates 10 hours a day, 6 days a week, with an average energy consumption of 12,000 kWh every month and at a rate of Php 12.61 per kWh. With the abundance of sun power all over the Philippines this grid-connected system allows direct use of energy generated from the PV system during the day, while evening energy requirements are covered from the grid. The System is Generating savings of about **120,000 Peso every month** and helped the client to reduce their electricity bill by almost **40%**.

The project partners
Name of solar installer: CEnAG Solar
Name of customer: Toyota Marilao Bulacan

Project site
Toyota Marilao, Bulacan MacArthur Hwy Abangang Sur Marilao, Bulacan

Project setup
- Involved: Toyota Marilao Bulacan, Arch Nazareno
- Motivation: Design a Canopy that Provides shading to lower the Aircon Consumption and produces Solar Power
- Experience: The 12 Meter high construction has to withstand strong winds. Highest safety standards were applied and only trained professionals did the installation.
- Specialties: Internet Monitoring System, and TV live Monitor, Special Mounting System design, 100% German Components

Key facts and figures
Components used
- *SolarWorld 245Wp Poly (made in Germany)*
- *SMA Sunny Mini Central 7000-HV (made in Germany)*
- *Schletter Customized FixZ15 (made in Germany)*
- *Webbox Monitoring System, Schneider MCB*
-

System Size 62kWp
Annual output 86800kWh
252 Modules

ROI Calculation
7 Years

6. How to finance solar roof tops

Authors: Silver Navarro, Jr., Renewable Energy & Financing Consultant; Noel Verdote, Operations Officer, IFC - Sustainable Energy Finance; Rustico Noli De La Cruz, Assistant Vice President, Development Bank of the Philippines

Solar Technology is characterized by high capital cost requirements but have a low operating cost and a long service life. The ability to finance a solar system eases up the burden on the initial cost of procuring the system and spreads this cost over the long term while the system is already generating savings on electricity costs. This makes solar affordable to more users who cannot afford to pay upfront for the system in a single payment.

The two main financing options are the Term Loan and Equipment Lease.

6.A Term loan

A Term Loan from the bank can be used to purchase the solar system. Usually, 70% of the project cost is financed by the bank with 30% equity required from the lender. The loan term can be three (3) to seven (7) years or longer depending on the project requirement. Loan payments can be equal or unequal and tailor-fit to the project's cash flow. Payment includes principal plus interest set in a monthly or quarterly basis. A grace period of 6 months to 1 year with the deffered payment on the principal can be offered during construction of the system. The interest rate depends on the prevailing market rates that can be on a variable or fixed basis. Typically accepted collateral are real estate mortgages on residential or commercial properties, chattel mortgage on equipment, and joint and/or several signatures of principal stockholders for corporate borrowers.

6.B Leasing

Leasing is a transaction whereby an owner of an asset (the Lessor) grants the use of the asset to a Lessee for a fee over a period of time. The asset is then turned over to the Lessee after the lease period. Leasing can either be a Direct Lease of equipment or Sale and Lease Back of the equipment with a term of up to 7 years. A Guaranty Deposit of around 20% or equivalent to the Residual Value of the equipment after the lease period is required. Full release of the net amount to be financed is done after payment of the Guaranty Deposit. The interest rate is composed of the Bank Base Rate plus Spread with rate-fixing option for 1 or 3 years. Lease payment is composed of the amortized principal plus Interest after the grace period. The Equipment financed serves as the Collateral subject to the standard conditions, representations, warranties, covenants, and events of default stated in the term loan agreement.

If the projected savings generated by the solar system is not enough to cover the amortization, the user has to show its financial capacity for the additional expense needed for the debt payment over the financing period. This additional expense can be recovered by the user on the savings generated over the rest of the service life of the system beyond the financing term.

6.C Philippines Sustainable Energy Finance (SEF) Program

The SEF Program is both an investment and an advisory program being implemented by the International Finance Corporation (IFC) in different regions around the world. The Philippines SEF Program was launched in 2008, the first in the ASEAN region. SEF works with private banks to encourage lending to energy efficiency (EE) and renewable energy (RE) projects by supporting them through: 1) Technical Advisory (TA) services which help them build capacity to develop/establish this new business line (through training, product development, pipeline development); and 2) Risk Sharing Facility (RSF) where IFC covers 50% of the loan losses in case of default. With RSF, client banks are more inclined to finance EE/RE projects which enhances

their portfolio build up. At present, PSEF has three (3) partner private banks: Bank of the Philippine Islands (BPI), Banco De Oro (BDO), and BPI Globe BanKO (BanKO), with BPI having access to the RSF.

More businesses investing in EE and RE technologies do not only mean cost efficiency and better processes but also less fossil fuel use which ultimately contributes to climate change mitigation. Since the launch of its Phase II in 2009 up to June 2013, PSEF has catalyzed investments in 87 sustainable energy projects.

These projects are projected to save 96,055 MWh/year from the EE projects and generate 843,613 MWh/year from the RE projects implemented. Overall, the investments are expected to reduce 967,447 tons of CO2/year.

Eligible projects include EE measures in buildings (retrofit or replacement of lighting, space cooling, air compression, and building management systems) and industrial/manufacturing processes (boiler upgrades, motors, manufacturing equipment, etc.) in order to save energy, and renewable energy projects (biomass, biogas, mini-hydro, wind energy and solar energy, including solar roof tops) for electricity generation, thereby maximizing energy use, reducing the use of fossil fuels, and cutting greenhouse gas emissions.

Aside from working with the banks, IFC has also built partnerships with other key stakeholders in the value chain, such as end-users, service and technology providers, industry associations, non-profit organizations, regulatory agencies, and other business groups to further advance awareness and develop the EE and RE markets.

Typical process flow for RE financing is as follows:

- Introduction of SEF program
- Submission of Project Information Memo or PIM
- Data validation by the bank through site visit and PIM review
- Presentation of RE project assessment and financing recommendation
- Financing

After going through the abovementioned stages, bank client decides on whether to pursue bank financing. SEF client bank/s goes through its usual financing procedure. IFC SEF team assists the bank at all levels of the workflow.

6.D Development Bank of the Philippines – Upcoming financing for solar roof tops

Even prior to the passage of the Renewable Energy Law (R.A. 9513), DBP has been in the forefront of financing renewable energy projects such as hydro, wind, solar and biomass since early 1990s. For solar projects, it is mostly solar home systems for rural electrification wherein the borrowers are associations/cooperatives. DBP has also funded several solar water heaters on industries to promote the use of renewable energy. To balance the investment cost and affordability of solar technology, DBP uses the Official Development Assistance Funds sourced from multi-lateral and bilateral funders to be able to provide long-term financing of up to 15 years.

DBP has assisted various private companies, electric cooperatives, and local government units in the development of their respective renewable energy projects. To date, DBP remains aggressive in financing renewable energy projects using ODA facility entitled Environmental Development Project (EDP).

6.D.1 Environmental Development Project (EDP)

EDP is a policy-based lending facility funded by the Japan International Cooperation Agency (JICA) intended among others, to support viable environmentally-sound and profitable investment projects on renewable energy such as but not limited to hydro, wind, solar, biomass, biofuels, geothermal and other emerging technologies.

Eligible borrowers for the facility are private corporation/enterprises, Renewable Energy Service Companies/ Corporations, Qualified Third Parties (QTPs) for Energy Projects, Private Utility Operators, Local Government Units (LGUs), Non-Governmental Organizations (NGOs), Electric Cooperatives (ECs), and Participating Financial Institutions (PFIs).

Eligible expenditures under the facility include the following:

- Project Preparation Activities
- Capital investment
- Working Capital
- Interest during construction period
- Consultant's services
- CDM Registration

The loan facility offers a repayment term of up to fifteen (15) years with up to three (3) years grace period based on project cash flows. The equity requirement for private companies is minimum of 20% of the total project cost, while for LGUs, ECs, NGOs is minimum of 10% on the total project cost.

6.D.2 Future plans for net-metering

With the approval of the Net-Metering scheme by the Energy Regulatory Commission (ERC), there is a potential market to be developed for residential and commercial customers. As a Bank for the environment and to further reduce our carbon footprint portfolio, DBP will embark on Net-Metering scheme to encourage other electricity end-users, most specially our borrowers and depositors, to participate in the Net-Metering program of the government. Presently, DBP is in the process of crafting a Net-Metering financing program for residential.

7. List of useful links and organizations

This chapter provides a listing of the stakeholders and links to their respective websites in the solar roof top market from the public, private and civil sector

7.A Philippine solar roof top installer companies

Adtel, Inc. – A Lopez Group Company
2nd floor Benpres Building, Exchange Road, Ortigas Center, Pasig City
Website: www.adtelinc.com.ph
Contact person: Reymond Oliver S. Batara
Tel: 436-5103 loc. 304, 0922-8542449, 0917-5708616
E-mail: rsbatara@adtelinc.com.ph

AVGarcia Power Systems Corp.
7H 20 Lansbergh Place, 170 Tomas Morato Ave., Quezon City, Philippines, 1103
Website: www.avgarciapowersystems.com
Contact person: Jan Aaron Augustus F. Garica
Tel:+632 3729247
E-mail: info@avgarciapowersystems.com

Cebu Solar Inc
Bancasan, San Remigio, Cebu
Website: www.cebusolar.com
Contact person: Tommy Tirey
Tel:+639292561847
E-mail: sales@cebusolar.com
Membership in association: VSPA

CEnAG Solar
6747 Taylo St. cor Dela Rosa St. Brgy. Pio Del Pilar. Makati City 1230, Philippines
Website: www.cenag-solar.com
Contact person: Holger Schenk
Tel: +639178770832
Email: h.schenk@cenag.org

ClixLogic Inc
88 Don Primitivo, Don Antonio Heights, Brgy Holy Spirit, Quezon City 1127
Website: www.clixph.com
Contact person: Ramon Fernando
Tel: +63 999 881 3944
E-mail: montf55@gmail.com
Membership in Association: REAP

Del Genta, Inc.
Unit 301, PASDA Bldg, P. Forentino St. Cor. Araneta Ave. Quezon City, 1103 Philipines
Website: www.delgenta.com.ph
Contact person: Mr. Gem S. de la Calzada
Tel:+632-9175621817;+632-9088656835; +632-4136224; +632-4661040
E-mail:gem@delgenta.com.ph
Membership in association: REAP

Edward Marcs Phils Inc.
2F Timog Bldg. 28 Eugenio Lopez Drive, South Triangle, Quezon City. 1103 Metro Manila, Philippines
Website: www.edwardmarcsphilinc.com
Contact person: Felix Richard A. Cordova
Tel: +632-922-1371; +63917-6288839; +632-922-1658
E-mail: rickycordova@edwardmarcsphilinc.com

Enfinity Philippines Technology Services Inc.
9th floor, Ayala Life FGU-Center 6811 Ayala Avenue Makati City
Website: www.enfinity.biz
Contact person: Marcus C. Ong
Tel:+63 917 8109680
E-mail: mong@enfinity.ph
Membership in association: PSPA

Freidrich Enterprise.
#394 Paz St., Morningbreeze, Caloocan City
Website: www.freidrichent.webnode.com
Contact person: Freidrich P.de Guzman
Tel: +6323611876: +639293928483
E-mail: philrenew@yahoo.com
Membership in association: REAP

Greendot Corporation (financing arm of Propmech Corporation)
BLK 47 Lot 2C, Phase 3E-2, C-4 Rd., Kaunlaran Village, Malabon City
Website: www.greendotmovement.asia
Contact person: Robert L Buhatin
Tel: +6324050267
E-mail: robert.buhatin@propmech.com

Greenheat Corporation (a subsidiary of Propmech Corporation)
A. Soriano corner Arzobispo Sts. Intramuros, Manila 1002
Website: www.greenheat-intl.com
Contact person: Mario Camacho
Tel: +632 5279045; +63 9175779581
Email: mario.camacho@propmech.com
Membership in association: PSPA

G.T. Solar Corporation
Rm. 404 4th Floor FEMII Bldg. A. Soriano Sr. Street, Intramuros, Manila 1002
Website: www.germantechsolar.com.ph
Contact person: Mario J. Tolentino, Gerardo J. Tolentino
Tel: +63 2 405 02 33; +63 949 7456378; +63 915 1173991
E-mail: info@germantechsolar.com.ph; gtolentino@aol.com; germantechsolar@yahoo.com.ph

JS Engineering and Marketing Service
1st. Street Sanroe Subdivision, San Roque, Zamboanga City 7000
Contact person: Samuel S. Julio, PEE, MPA
Tel: 062-955-1329; 0907-704-6297
E-mail: jsengineering_mktng@yahoo.com
Membership in association: IIEE, PAMEE

Maschinen & Technik, Inc.(MATEC)
Tech Center, Buencamino St., Alabang, Muntinlupa City 1770
Website: www.matec.com.ph; www.solar-philippines.com
Contact person: Caldwell S. Hoey
Tel: +632 850 6450 -52
E-mail: re.admin@matec.com.ph
Membership in Association: PSPA, REAP

PhilSolar Equipment and Trading Corporation
2F Cargohaus Naia Complex Paranaque City, 1700. Manila
Contact person: Danny Maesen
Tel:+63 917 5121340
E-mail: danny.maesen@me.com
Membership in association: PSPA

Philippine Pure Energy Solutions INC (SOLARPINOY)
SolarPinoy Greenhills Garden Square 297 Col. Bonny Serrano Ave, Q.C
Website: www.solarpinoy.ph
Contact person: Gerry Chua
Tel: 02-579.1700
E-mail: sales@solarpinoy.ph

Physics Research – Sales & Services Corp.
Unit 4, Krystal Mall, San Isidro, Talisay City, Cebu 6045
Website: www.prcebu.com
Contact person: Alvin N. Urgel
Tel: (032) 505 - 7185 / 09177107469
E-mail: prsearch2000@yahoo.com
Membership in Association: VSPA

Sasonbi, Inc.
U3004 Antel Global Corporate Center, 3 Julia Vargas Avenue, Ortigas Center, Pasig City 1605
Website: www.sasonbisolar.com
Contact person: Dante M. Briones
Tel: +63 918 9374930; +63 2 6689679
E-mail: dante.briones@sasonbisolar.com
Membership in association: PSPA

Sierra Solar Inc.
16 Ruby St. Ph7, Pacita Complex, San Pedro 4023
Website: www.sierrasolar.ph
Contact person: Marvin Lazaro
Tel: 02-5537774, 02-5654432, 09178867921, 09478963638
E-mail: info@sierrasolar.ph; marvlazaro@sierrasolar.ph
Membership in association: PSPA

Solar Star Marketing
67 Echavez Street, Cebu City 6000
Website: www.sophilcor.com and www.solarstarph.com
Contact person: Alfonso Soriano
Tel: 0921-333-7979
E-mail: sophilco@gmail.com

Solarpower Corp.
3rd Flr. Unit 3, VFP-MDC Bldg.II, Veterans Industrial Center, Taguig 1630
Website: solarpowercorp.biz
Contact person: Leonides A. Santos / Khey T. Mirador
Tel: +632839-1673; +632839-0538
E-mail: sales@solarpowercorp.biz; lsantos@solarpowercorp.biz
Membership in association: ENPAP

Solar Systems Philippines
Unit 505-506, Sugbutel Building S. Osmena Blvd., Corner Road East North Reclamation Area (Near SM). Cebu City 6000
Website: www.solarsystemsphilippines.com
Contact person: Eng'r. Dioscoro A. Merilo
Tel: 032 2600329; 09153686755
E-mail: dmerilo@solarsystemsphilippines.com
Membership in association: PSPA

Solarus Partners Inc.
Unit 902 Paragon Plaza, EDSA cor. Reliance St., Mandaluyong City
Website: www.solaruspartnersinc.com
Tel: (632) 234-2281
Email: jcaballero@solaruspartnersinc.com
Membership in association: PSPA

Solenergy Systems Inc.
TECO Ninoy Aquino Highway, Barangay Bundagul, Mabalacat Pampanga 2010
Website: www.solenergy.com.ph
Tel: +63 2 624 3861; +63 917 8384723
E-mail: info@solenergy.com.ph
Membership in association: PhilGBC

Solutions Using Renewable Energy Inc.
Unit 602 OMM Citra Bldg., San Miguel Ave, Ortigas Center, Pasig City
Website: www.sure.com.ph
Contact person: Claire Marie Yvonne Lee
Tel: +632 6347945
E-mail: clairemy.lee@gmail.com; claire@sure.com.ph
Membership in association: PSPA

Stromfluss Enterprises
8-J 9 Teodoro Evangelista St. BF Homes Paranaque City 1720
Website: www.stromfluss.net
Contact person: Uwe Stefan Madamba
Tel: (02) 8076081; (0917) 5237460; (0920)9477261
E-mail: uwe.madamba@stromfluss.net

Transnational Uyeno Solar Corporation
The Penthouse, Net Quad Building, 4th Avenue Corner 30th Street, Bonifacio Global City, 1634 Taguig City
Website: www.tuscsolar.com
Contact person: Marlon Joseph S. Apanada
Tel: (02) 830 8888 LOCAL 8266
E-mail: marlon.apanada@tdgworld.com
Membership in association: PSPA

Uni Solar Inc.
8-J Saint Peter St. P. Tuason, Cubao, Quezon City 1109
Website: www.unisolar.com.ph
Contact person: Mr. Ronaldo R. Villon
Tel: 632-7251453 / 632-4158259
E-mail: info@unisolar.com.ph
Membership in association: PSPA

7.B International solar companies

Conergy Asia & ME Pte. Ltd.
20/F Regus, Zuellig Building, Makati Ave. Corner Paseo de Roxas, Makati City 1226
Website: http://singapore.conergy.com
Contact person: Colin Steley
Tel: +63 2 465 9296; 63 927 248 0819
E-mail: c.steley@conergy.com
Membership in association: PSPA, GPCCI

IBC Solar AG
Am Hochgericht 10, 96231 Bad Staffelstein, Germany
Website: www.ibc-solar.com
Contact person: Nils Szymczak
Tel: 0049-9573-9224-538
E-mail: hybrid@ibc-solar.com
Membership in association: BSW

Inutec Solarcenter International Gmbh
Im Gewerbegebiet 17, 38315 Schladen. Germany
Contact person: Alexander Kaub
Tel: +49 5335 808 996
E-mail: a.kaub@inutec-solarcenter.de

PT. Inutec Solarcenter Indonesia- The Academy of Solar Power Education
Cityloft Office and Apartment, 25th Floor, Unit 21, Jl. KH Mas Mansyur Kav. 121
Jakarta Pusat 10220, Indonesia
Website: www.inutec.co; www.TheAcademyOfSolarPowerEducation.com
Contact person: Alexander Kaub
Tel: +62 21 2991 8930
E-mail: a.kaub@inutec-int.com
Membership in association: BSW

Phoenix Solar Pte Ltd
209 Syed Alwi Road, Singapore 207742
Website: www.phoenixsolar.sg
Contact person: Jeffrey Tan
Tel: +65 6511 9330
E-mail: jeffrey.tan@phoenixsolar.sg
Membership in association: BSW

Schletter (Shanghai). Solar Technology Co., Ltd
255 BeiheGong Road, Building No. 1, Jiading, 201807 Shanghai, PR China
Website: www.schletter.cn

Contact person: Johannes Salzeder
Tel: +86 21 3998 3623
E-mail: johannes.salzeder@schletter.cn
Membership in association: BSW

SMA Solar Technology AG
Sonnenallee 1, 34266 Niestetal, Germany
Website: www.SMA.de
Name of Contact person: Dipl.-Phys. Matthias Hermes, Deputy Director, Sales New Markets
Tel: +49 561 9522-4033; +49 172 5863986
E-Mail: Matthias.Hermes@SMA.de
Membership in association: BSW

Vis Solis, Inc.
256 Seaboard Lane Suite E-106 Franklin TN 37067 USA
Website: www.vis-solis.us
Name of contact person: Tim Hayes / Carlos Mayer
Tel: 00 1 615 796 3512
E-mail: info@ vis-solis.com
Membership in association: SEIA

7.C Philippine distribution utilities

Angeles Electric Corporation
Don Juan D. Nepomuceno corner Teresa Avenue
Nepo Mart Complex, Angeles City 2009
Contact person: Engr. Conrado D. Caguiat
Tel. 045-888-2888 / 045-322-8311 to 13
Mob. 0999 994 0814
Fax. 045-888-1810
Email: dcaguiat1625@yahoo.com / aec_engg@comclark.com
Membership in association: PEPOA

Bohol Light Company Inc
P. Enerio Street, Tagbilaran City, Bohol
Website: http://www.bohollight.com
Contact Person: Eulogio M. Signe, General Manager
Email: emsigne@yahoo.com.ph
Tel: (038) 235-5809, (038) 501-9972
Membership in association: PEPOA

Cabanatuan Electric Corp
Contact Person: Engr. Leonardo C. Apan
Mob: 09258140104
Email: Leonardo_apan@yahoo.com
Membership in association: PEPOA

Cagayan Power & Light Co.
No. 33 T. Chaves St. 9000 Cagayan de Oro City. Philippines
Website: cepalco.com.ph
Contact Person: Jorey T. Alfaro
Tel: +639177060333
Email: jtalfaro@cepalco.com.ph
Membership in association: PEPOA

Clark Electric Distribution Corporation
N2830 Bayanihan Street, Clark SEZ, Pampanga
Contact Person: Wellmar Policarpio
Email: wapolicarpio@clarkelectric.ph
Mob: 0999-888-6281
Membership in association: PEPOA

Cotabato Light & Power Co.
Sinsuat Ave., Cotabato City
Website: http://www.cotabatolight.com
Tel: 816-2881
Membership in association: PEPOA

Dagupan Electric Corp
Website: http://www.dagupanelectric.com
Contact person: Dominador Liwag
Email: ddliwag@yahoo.com
Tel: 0922 884 6297
Membership in association: PEPOA

Davao Light and Power Company
Website: http://www.davaolight.com
Contact Person: Mervin Dalian, Manager
Tel: 229-3524
Officers:
Ruby Barnes Tel: 229-3667
Honey Micabani Tel: 229-3558
Jessimer Enriquez Tel: 229-3548
Membership in association: PEPOA

Ibaan Electric & Engineering Corporation
Eng Carwana
Email: ibaan_electric_2010@yahoo.com
Tel: (043) 3111-231
Mob: 09497224771
Membership in association: PEPOA

Iligan Light & Power Inc
Bro. Jeffrey Road, Pala-o, Iligan City 9200 Lanao del Norte, Philippines
Website: http://www.iliganlight.com
Contact Person: Engr. Danilo Bagtasos
Tel: (063) 223-1773, 09173942400
Email: dcb@iliganlight.com
Membership in association: PEPOA

La Union Electric Company
Quezon Avenue, San Fernando City, La Union
Website: http://www.luecoinc.com
Tel: 072 700 5205, 072 700 1237
Membership in association: PEPOA

Mactan Electric Company
Sangi Road, Lapu-lapu city
Tel: (032) 341-0236, (032) 340-1208
Membership in association: PEPOA

MERALCO
Lopez Building, Ortigas Avenue, Pasig City 0300
Website: www.meralco.com.ph
Please contact your local Meralco business center. Details can be found via the following link: http://www.meralco.com.ph/customer/page-cusContact-business.html

Olongapo Electricity Distribution Co., Inc.
2270 Ecaldre Bldg., Rizal Avenue, 2200 Olongapo City
Contact Person: Arjay M. Villanueva
Tel: 222-2579 or 222-9410
Email: amvillanueva@cepalco.com.ph
Membership in association: PEPOA

Panay Electric Company
Website: http://panayelectric.com
San Agustin, Iloilo City 5000, Philippines
Contact Person: Randy Pastolero - VP for Operations
Mob: 0917-302-6363
Email: eam_peco@yahoo.com
Membership in association: PEPOA

San Fernando Electric Light & Power Co
San Fernando, Pampanga
Website: http://sfelapco.com
Contact Person: Engr. Michelle Almario
Tel: 045 961 2727, loc 110; 0917 910 5483
Email: malmario@sfelapco.com
Membership in association: PEPOA

Subic Enerzone Corporation
Website: http://www.subicenerzone.com
Corner Canal & Labitan Rds, Central Business District
Subic Freeport Zone, Zambales
Tel: 750-1391, 817-9508
Membership in association: PEPOA

Tarlac Electric Inc.
Mabini Street, 2300 Tarlac, Tarlac City, Philippines
Contact Person: Grelson A. Manuel
Tel: (045) 982-5000
Mob: 0998-978-1785
Email: gmanuel@tei.ph
Membership in association: PEPOA

Visayan Electric Co., Inc.
VECO Compound, J. Panis Street, Cebu City
Website: www.veco.com.ph
Contact Person: Richard Alfafara
Tel: 00 63 926 964 2767
E-mail: richard.alfafara@veco.com.ph
Membership in association: PEPOA

7.D Philippine financial institutions

Banco de Oro (BDO)
6/F South Tower, BDO Corporate Center, 7899 Makati Avenue, Makati City 0726, Philippines
Website: www.bdo.com.ph
Contact Person: Edward G. Wenceslao/ Vivian De Chaves
Tel: (632) 878-4567
Fax: (632) 878-4570
E-mail: dechavez.vivian@bdo.com.ph
IFC Sustainable Energy Finance Partner

Bank of the Philippine Islands (BPI)
9/F Ayala wing, BPI Building 6768 Ayala Avenue, Makati City
Website: www.bpiexpressonline.com
Contact Person: Nanette A. Biason
Tel: (632) 845-5855
Fax: (632) 845-5935
E-mail: nabiason@bpi.com.ph
IFC Sustainable Energy Finance Partner

BPI Globe BanKO
4/F BanKO Center, Ortigas Avenue, North Greenhills, San Juan, Metro Manila 1500, Philippines
Website: www.banko.com.ph
Contact Person: Ronald Francis N. Cada / Floyd Macuha
Tel: (632) 754-9980 local 1011
Fax: (632) 754-9980
E-mail: ronaldfrancis.cada@banko.com.ph / floyd.macuha@banko.com.ph
IFC Sustainable Energy Finance Partner

Chinabank
5/F China Bank Building, 8745 Paseo de Roxas corner Villar Street, Makati City 1226 Philippines
Website: www.chinabank.ph
Contact Person: William C. Whang / Layne Arpon
Tel: (632) 885-5560; 885-5515
Fax: (632) 892-02-28
E-mail: lyarpon@chinabank.ph; alcmtan@chinabank.ph
IFC Sustainable Energy Finance Partner

Development Bank of the Philippines
DBP Building. Sen Gil J. Puyat Avenue, Makati City
Website: http://www.dbp.ph
Contact Person: Jericho N. Martinez
Tel: 818-9511 Loc 2340
Email: jnmartinez@dbp.ph

International Finance Corporation -Access to Finance - Sustainable Energy Finance
23rd Floor, One Global Place, 5th Avenue corner 25th Street. Bonifacio Global City, Taguig City, 1634 Philippines
Website: www.ifc.org
Contact person: Noel Verdote
Tel: +63 2 4652700
Fax: +63 2 4652747
E-mail: nverdote@ifc.org

7.E Associations and organizations in the Philippines

Philippine Solar Power Alliance (PSPA)
8/F, Strata 100 Bldg., F. Ortigas Jr. Road, Ortigas Center, Pasig City1605
Website: www.phsolar.org
Contact Person: Tetchi Capellan, President
Tel: +(63 2) 631-1581
E-mail: hlalcantara@cepalco.com.ph

Private Electric Power Operators Association (PEPOA)
8/F Strata 100 Bldg., F. Ortigas Jr. Road, Ortigas Center, Pasig City
Contact Person: Ranulfo Ocampo, President
Tel: +63 2 635 6291
E-mail: ranyocampo@yahoo.com

Philippine Rural Electric Cooperative Association (Philreca)
Casman Building, Quezon Avenue, Quezon City
Contact Person: Wendel Ballesteros
Tel: 0917 810 85 38
E-mail: philreca@skydsl.com.ph

Renewable Energy Association of the Philippines (REAP)
Contact Person: Engr. Olegario S. Serafica
Tel: +63 2 809-5953, +63 917-534-0162
Email: acifares@yahoo.com
Website: https://sites.google.com/site/mmierdc/people/reap

German-Philippine Chamber of Commerce and Industry (GPCCI)
8/ F Döhle Haus Manila, 30-38 Sen. Gil Puyat Avenue, Barangay San Isidro, Makati City 1234
Website: www.gpcci.org
Contact person: Nadine Fund, General Manager
Tel: +63 (0) 2 336 6845
Email: info@gpcci.org

European Chamber of Commerce of the Philippines (ECCP)
19/F Philippine AXA Life Centre, Sen. Gil Puyat Avenue corner Tindalo Street, Makati City1200
Website: www.eccp.com
Contact Person: Martial Beck, Vice President and General Manager
Tel: +632 845.1324; +632 759.6680
E-mail: info@eccp.com

International Copper Association Southeast Asia Ltd.
Suite 907A West Tower, Philippine Stock Exchange Center, Exchange Road, Ortigas Center, Pasig City 1605
Website: www.copper.org.sg
Contact Person: Jessie L. Todoc, Country Manager - Philippines
Tel: +63 2 667 3686
E-mail: jessie.todoc@copperalliance.asia

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
2B PDCP Bank Centre, V.A. Rufino corner L.P. Leviste Street, Salcedo Village, Makati City

Project Development Program (PDP)
Contact Person: Markus Dietrich

Tel: +63 2 239 82 16
E-mail: markus.dietrich@asei.com.ph

Support to the Climate Change Commission in Implementing the NCCAP
Contact Person: Hendrik Meller
Tel: +63 2 479 2900 ext. 338
E-mail: hendrik.meller@giz.de

7.F International organizations

BSW - Bundesverband Solarwirtschaft e.V.
Quartier 207, Friedrichstraße 78, 10117 Berlin, Germany
Website: www.solarwirtschaft.de

DGS - Deutsche Gesellschaft für Sonnenenergie
Landesverband Berlin Brandenburg e.V.
Wrangelstr. 100, 10997 Berlin, Germany
www.dgs-berlin.de

7.G Government agencies

Department of Energy - Renewable Energy Management Bureau (DOE-REMB)
3/F DOE Multi-purpose Bldg., Energy Center, Rizal Drive, Bonifacio Global City, Taguig City, 1632
Website: http://www.doe.gov.ph
Contact person: Mr. Mario C. Marasigan, Director
Tel: (02) 840-2268
E-mail: mmarasig@doe.gov.ph

Department of Energy -Consumer Welfare and Promotion Office (DOE-CWPO)
1/F DOE Main Bldg., Energy Center, Rizal Drive, Bonifacio Global City, Taguig City, 1632
Website: http://www.doe.gov.ph
Contact person: Ms. Ava Kashima K. Austria, OIC-Division Chief
Tel: (02) 840-2267
E-mail: energycwpo@gmail.com

Department of Energy – Luzon Field Office
2nd & 3rd F PSJ Bldg., Mac Arthur Highway, Nancayasan, Urdaneta City, Pangasinan
Website: http://www.doe.gov.ph
Contact person: Mr. Efren L. Balaoing, Director
Tel: (075) 656-0114
E-mail: ebalaoing@doe.gov.ph

Department of Energy – Visayas Field Office
11/F Metrobank Bldg., Osmeña Blvd., Cebu City
Website: http://www.doe.gov.ph
Contact person: Mr. Antonio E. Labios, Director
Tel: (032) 253-2150
E-mail: alabios@doe.gov.ph

Department of Energy – Mindanao Field Office
5/F DOE Metrobank Plaza, Ramon Magsaysay Ave., Davao City

Website: http://www.doemfo.org
Contact person: Mr. Manuel M. Llaneza, Director
Tel: (082) 224-2231
E-mail: mllaneza@doe.gov.ph

Department of Trade & Industry -Bureau of Product Standards (DTI-BPS)
3/F Trade & Industry Bldg., 361 Sen. Gil Puat Ave., Makati City
Website: http://www.dti.gov.ph
Contact person: Engr. Gerardo P. Maglalang, OIC-Director
Tel: (632) 751-4700
E-mail: gpmaglalang@yahoo.com

Department of Trade & Industry -Bureau of Trade Regulations & Consumer Protection (DTI-BTRCP)
2/F Trade & Industry Bldg., 361 Sen. Gil Puat Ave., Makati City
Website: http://www.dti.gov.ph
Contact person: Atty. Victorio Mario A. Dimagiba, Director
Tel: (632) 751-3233/751-3288
E-mail: vmad@dti.gov.ph

Distribution Management Committee (DMC)
20/F Pacific Center Bldg., San Miguel Ave., Ortigas Center 1600
Website: http://www.gmcdmc.ph
Contact person: Mr. Tomas B. Vivero., Executive Director
Tel: (632) 638-2658
E-mail: totievivero@gmcdmc.ph

Energy Regulatory Commission (ERC)
16/F Pacific Center Bldg., San Miguel Ave., Ortigas Center 1600
Website: http://www.erc.gov.ph
Contact person: Atty. Francis Saturnino C. Juan, Executive Director
Tel: (632) 689-5365
E-mail: fscjuan@erc.gov.ph

National Electrification Administration (NEA)
57 NIA Road, Government Center, Diliman, Quezon City
Website: http://www.nea.gov.ph
Contact person: Engr. Edgardo R. Piamonte, Deputy Administrator
Tel: (632) 840-2267
E-mail: epiamonte@nea.gov.ph

Important documents

Renewable Energy Act 9513
AN ACT PROMOTING THE DEVELOPMENT, UTILIZATION AND COMMERCIALIZATION OF RENEWABLE ENERGY RESOURCES AND FOR OTHER PURPOSES
http://www.gov.ph/2008/12/16/republic-act-no-9513/

ERC Resolution on Net-Metering and Interconnection Standards
Resolution No. 09, Series of 2013, A Resolution Adopting the Rules Enabling the Net-Metering Program for Renewable Energy. Date Docketed: July 01, 2013
http://www.erc.gov.ph/IssuancesDownload/FileDownload/5919

Manual for interconnection - Report for supporting the interconnection of rooftop-PV systems in the Philippines
http://www.giz.de/fachexpertise/downloads/Fachexpertise/giz2013-en-manual-interconnection-rooftop-pv.pdf

Administrative Procedures - Rules and Processes for On-Grid PV Project Development in the Philippines
http://www.giz.de/fachexpertise/downloads/Fachexpertise/giz2013-en-administrative-procedures-philippines-on-grid.pdf

It’s more sun in the Philippines- Facts & Figures on Solar Energy in the Philippines
http://www.giz.de/fachexpertise/downloads/giz2012-en-pv-in-the-philippines-policy-brief.pdf

Annexes

Anlagenpass “PV Passport”
Clarification for net-metering to ERC
ERC response letter to clarification issues

Annexes to PV Passport No. _____-_____-_____

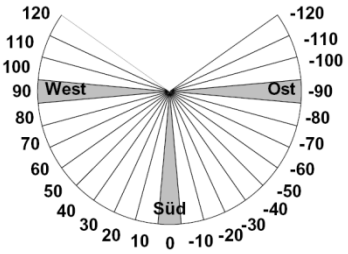
PHOTOVOLTAIC SYSTEM

Installed system capacity

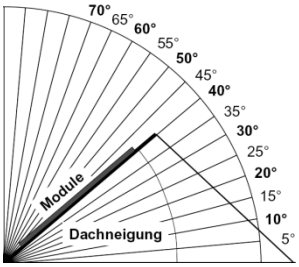
Nominal output of all modules _____ kWp

Alignment and roof pitch

Alignment



Roof pitch



Please circle the appropriate degree

System operator / Contractor

_____
(First and last name or name of company)

_____
Street, house number

_____
Postal code, city

Location of system (if different from above)

_____
Building/property owner (first and last name or name of company)

_____
Street, house number

_____
Postal code, city

Photo / description of system

(Type of building, sloped roof, flat roof, contiguous system or divided into sections, rooftop/integrated, …)

Commissioning, metering system

Date of commissioning: _____

Feed-in / reference meter No.: _____

Meter reading at handover _____ kWh

PV measuring device, meter No.: _____

Meter reading at handover _____ kWh

Demand and yield forecasts

Expected electricity yield: _____ kWh/year

Of which, expected direct consumption: _____ %

☐ No forecasts have been made

Feed-in management pursuant to EEG

☐ Effective power reduction ☐ Remote control capability

Storage system in place (see storage passport)

☐ no ☐ yes :_____kWh

PV PASSPORT ISSUING BODY

This PV passport was issued by:

_____
Company

_____
Authorized person (first name, last name)

_____
Street, house number

_____
Postal code, city

The signee confirms that all information contained in this PV Passport and in Annexes 1 – 4 applies to the PV system that is described above and handed over to the buyer [1)2)]

_____
Date, signature of system builder/system vendor

www.photovoltaik-anlagenpass.de

This seal confirms that the issuing company is registered with the BSW and ZVEH "PV Quality Group" (*Qualitätsgemeinschaft Photovoltaik*); see Internet site for benefits and list of installers.

Company stamp

PV Passport Seal with Registration number

1) The PV Passport is only complete with Annexes (1) to (4)
2) While this PV Passport was compiled with greatest possible care, a guarantee for the attested characteristics cannot be given in terms of liability regardless of negligence.

Annex 1: Components used

Photovoltaic modules

Number of module types used: _____ If multiple module types: Module type No. _____ *(for multiple module types, please fill out a separate sheet for each type)*	
General information *(for details see attachment)*	
Manufacturer (company name, headquarters)	Module type (name)
PV module capacity: _____ Wp	☐ CE compliance is fulfilled.

Photovoltaic Inverters

Number of inverters used: _____ *(for more than three inverter types, please fill out a separate sheet)*	
General information *(for details see attachment)*	
Inv. No. _____	
Manufacturer (company name, headquarters)	Inv. type (name)
Inv. No. _____	
Manufacturer (company name, headquarters)	Inv. type (name)
Inv. No. _____	
Manufacturer (company name, headquarters)	Inv. type (name)

Annex 1: Components used

Photovoltaic Mounting System

General information
Manufacturer (company name, headquarters)
Type, description if applicable

Type of fastening system *(see attachement for details)*

Mounting location: ☐ flat roof ☐ sloped roof (>5° slope) ☐ facade ☐ open space

Design: ☐ integrated ☐ parallel ☐ elevated (non-parallel) ☐ tracking

Fastening system: ☐ weight-loading: ☐ fastening provided ☐ other

☐ estimated static friction coefficient: _____ ☐ calculated static friction coefficient: _____

☐ **All relevant requirements pertaining to building authority regulations, such as state building code (*Landesbauordnung*), building rules lists (*Bauregelliste*) and technical building specifications (*technische Baubestimmung*) have been met.**

The dimensioning of the photovoltaic mounting system, including all fasteners and the applied load, has been carried out in accordance with relevant norms and standards, e.g. DIN EN 1991, as demonstrated by:

☐ separate verification, issued by:

☐ object-specific system calculation / type structural calculation, issued by:

☐ general building authority approval:

Roof hooks (if applicable)
Manufacturer (company name, headquarters)
Type, description if applicable
Roof hook installation: ☐ milled roof tile ☐ pre-fab with pre-installed fastener ☐ ventilation tiles used for cable channels

Annex 1: Components used

Cables / Power lines

General information (for details see attachment)		
PV string cable / power line		
Manufacturer	Type	Cross-section
PV main cable / power line (DC)		
Manufacturer	Type	Cross-section
Inverter supply cable / power line (AC)		
Manufacturer	Type	Cross-section

Feed-in Management / Communication

General information *(for details see attachment)*

☐ effective power reduction pursuant to EEG:

☐ 70% provision ☐ other provision (e.g. KfW support measure): _____%

Implementation takes place with:

☐ permanent inverter settings ☐ feed-in management system

☐ other measures: _____

Type, manufacturer (company name, headquarters)

☐ communication of effective feed-in levels to network operator:

Yield protection, system security

The system has integrated function monitoring capability: ☐ Yes ☐ No

If yes: ☐with a clearly perceptible alarm system ☐ with remote monitoring capabilty

The following theft-control measures have been implemented:

☐ theft protection of mounting system/modules through:

☐ theft protection of inverter through:

☐ other measures:

Installation

General
☐ The installation of the PV system was carried out in accordance with recognized technical rules and standards.
☐ The PV system was built with minimal shadowing effect. ☐ A shading analysis was incorporated into the yield forecast (required given a notable degree of shading).
Structural information
☐ For roof-mounted systems, the load bearing capacity of the substructure has been assessed by (name):
☐ For roof-mounted system, the aging condition of the rooftop surface has been assessed by (name):
☐ The anchoring and load application was carried out in accordance with the manufacturer's calculatory proofs or the type structural calculations for the moiunting structure as well as relevant mounting instructions.
☐ The fastening of the modules was carried out in accordance with the manufacturer's guidelines. ☐ Using alternative means (description, reason):
☐ Roof perforations were carried out in accordance with technical rules and standards.
☐ If roof hooks come into contact with roofing tiles or stones, approval has been given by the roofing tile/stone manufacturer.
Height of building: _____m Wind load zone: _____ Snow load zone:_____
Edge distances: eave: _____m Roof ridge: _____m Gable: _____m
Fire safety measures
☐ Smoke and heat exhaustion systems are fully functional.
☐ Firewalls and fire compartments have been taken into consideration in accordance with fire protection regulations.
☐ Other measures:

Annex 2: Information regarding planning and installation

Electrical safety, choice and installation of electrical equipment
The system and the choice and installation of equipment was installed according to the general provisions of DIN VDE0100 and the specific provisions of VDE 0100-712 and VDE-AR-N 4105, and inspected according to the provisions of E DIN IEC 62446 (VDE 0126-23). Among others, the following specifications were met:
☐ The PV system's cables and power lines were selected and installed in a way that makes them “earth fault and short circuit safe” in accordance with VDE 0100-520.
☐ The installation of the inverter(s) with regard to max. input voltage and voltage at the maximum power point (MPP) was carried out in accordance with the manufacturer’s guidelines.
☐ The location of the installed inverter was chosen in accordance with the manufacturer’s guidelines on heat dissipation and IP protection ratings.
☐ The cables and power lines used in outside areas have sufficient UV and temperature resistance in accordance with manufacturer’s guidelines for PV systems in outside areas.
☐ The cables are attached to the frame, have no contact to the surface of the roof and are not routed over sharp edges. If possible, cables have been laid in shaded areas. The necessary strain relief has been ensured at all connection points.
☐ The circuit breakers used in the direct-current circuit are sufficient according to the manufacturer’s guidelines with regard to the direct-current suitability and load switching capacity.

Lightning and voltage surge protection		
Note: A PV system does not necessarily require the installation of a lightning protection system, which can be required in compliance with state building regulations (Landesbauordnung – LBO) or according to the respective contractual situation (e.g. insurance policy).	Yes	No
1. Is a lightning protection system required for the building? (building law, risk assessment, VdS) **If no, continue with point 11. Retrofitting is recommended!**	☐	☐
2. Does a test report exist for the lightning protection system?	☐	☐
3. Was the outside lightning protection system adjusted accordingly?	☐	☐
4. Have separation distances been calculated?	☐	☐
5. Have separation distances been observed?	☐	☐
6. Is the PV generator directly connected to the lightning protection system?	☐	☐
7. Has lightning protection equipotential bonding been carried out?	☐	☐
8. Are type 1 DC lightning arresters installed in proximity to the entry point to the building’s string cable?	☐	☐
9. Is a type 1 lightning arrester installed on the AC-side of the inverter?	☐	☐
10. Is a type 1 lightning arrester installed at the feed conduit’s building entry point?	☐	☐
11. Is there a type 2 DC surge arrester installed in front of the inverter on the DC side?	☐	☐
12. Is there a type 2 surge arrester installed in front of the inverter on the AC side?	☐	☐
13. Has a type 1-2-3 combination arrester been installed at the feed conduit’s building entry point?	☐	☐
14. Has equipotential bonding been carried out for the mounting structure? Note: Separate lightning protection = min. 4 mm² (unprotected cable channels) Combined lightning protection = min. 16 mm²	☐	☐

Annex 3: Test certificate / test reports

Test certificate

pursuant to E DIN IEC 62446 (VDE 0126-23, draft), Attachment A

Annex	**Inspector/installer**
System owner (first name, last name)	Inspector (first name, last name)
Location street, house number (building/property)	Company
Location postal code, city	Street, house number
The test certificate is based on test reports for the inspection of the PV string in accordance with recommendations from VDE 0126-23, and on the AC side of the PV system in accordance with VDE 0100-600 (see following pages).	Postal code, city

Construction, substructure, inspection and electrical testing	
I/we, the person(s) responsible for the testing of construction and substructure, inspection as well as electrical testing of the photovoltaic system, have undertaken inspection and testing of construction and substructure with the necessary expertise and diligence, and hereby confirm that I/we have carried out the work that I am/we are responsible for according to the best of our knowledge and expertise.	
Test results	
☐ No deficiencies were found	
☐ The photovoltaic system conforms to the recognized standards of electrical engineering.	
Comments:	
Test of construction:	
Place, date of test	Name and signature of inspector
Testing of substructure:	
Place, date of test	Name and signature of inspector
Inspection:	
Place, date of inspection	Name and signature of inspector
Electrical testing of DC-side (see protocol)	
Place, date of test	Name and signature of inspector
The scope of liability that applies to the signee(s) is limited to the above-described activities.	

PV PAssport, version 10/2013 – All rights reside with BSW-Solar/ZVEH – see www.photovoltaik-anlagenpass.de

Test report construction, substructure, inspection

in accordance with VDE 0126-23, Attachment B

Testing	
Test date: _____ Start of test: _____ am/pm, End: _____ am/pm	Inspector: _____ (first name, last name)
Electric circuits inspected (for large-scale systems and separate inspections, please use one sheet per inspection): ☐ Total photovoltaic system ☐ Following electric circuits: _____	

	Construction and installation of the PV generator
☐	The direct-current system was constructed, chosen and installed in accordance with the general provisions of IEC 60364 and the specific provisions of IEC 60364-712.
☐	The direct-current components are designed for direct-current operations.
☐	The direct-current components are designed for maximum direct-current voltage and maximum possible fault current.
☐	Protection is ensured through the use of class II or equivalent insulation on the direct-current side.
☐	PV cables were chosen and installed so that the risk of earth fault and short circuits is reduced to a minimum (IEC 60364-7-712 sec. 522.8.1).
☐	The wiring system was chosen and installed in such a way that it will withstand the expected external forces such as wind, ice build-up, temperature and sun radiation (IEC 60364-7-712 sec. 522.8.3).
☐	Alternate-current and direct-current cables are physically separated from each other.
☐	This system does not have string fuses.
	☐ If there are no string fuses: The dimensioning of the module reverse current (I_r) is greater than the possible reverse current.
	☐ If there are no string fuses: The string cables are installed in such a way that they can absorb the maximum amount of combined fault current from parallel branches.
☐	There are direct-current circuit breakers installed on the direct-current side of the inverter (IEC 60364-7-712 sec. 536.2.2).
	PV system / surge protection / protection against electrical shock
☐	The inverter has a simple separation between alternate-current and direct-current side.
☐	If necessary, a fault current protection system is installed on the AC-side of the inverter, in accordance with a type B FI protection switch (IEC 60364-7-712 sec. 413.1.1.2).
☐	The surface area of all cable loops has been kept as small as possible (IEC 60364-7-712 sec. 54).
☐	The equipotential bonding connection conforms to local specifications.
☐	If protection/functional equipotential bonding system cables are installed, these are routed in parallel and in as close contact as possible to AC and DC cables.

Annex 3: Test certificate / test reports

Test report construction, substructure, inspection (cont'd)

	Special considerations regarding alternate-current electric current of the PV system
☐	On the alternate-current side, provisions are in place facilitating the separation of the inverter.
☐	The PV power line/cable (AC) must be connected to the supply side of the protective system for the automatic shut-down of power supply to current-using equipment through the designated protective system.
☐	The safety settings of the inverter are set in accordance with local specifications.
	Labeling and identification of PV system
☐	All electric circuits, protective devices, switches and connection terminals are labeled accordingly.
☐	All direct-current junction boxes display a warning that the active components inside the box are supplied by a PV string and can still be live after disconnection from the PV inverter and from the public power supply.
☐	The alternate-current power main circuit breaker displays a clearly identifiable label.
☐	At the point of interconnection, there are warnings pertaining to the dual power supply.
☐	A schematic circuit diagram is displayed on site.
☐	An indicator sign in accordance with VDE-AR-E 2100-712 is displayed on site for emergency workers.
☐	A general overview is displayed for emergency workers.
☐	All symbols and labels are suitably and permanently fastened.
	General (mechanical) installation of PV system
☐	The frames and materials used in the PV modules are appropriate to the respective location (proofs attached).
☐	The PV modules are, in accordance with manufacturer's guidelines, properly fastened and stable, and rooftop connection components are weather-resistant.

Comments to all test reports

Test report on electrical testing of PV system's direct-current side (in accordance with VDE 0126-23, Attachment C)

Testing

Tested PV strings (for large-scale systems and separate tests, please use multiple sheets):

☐ Overall photovoltaic system

☐ Following strings: _____

Testing equipment:

_____

Weather conditions		☐ **Sunny**	☐ **Partly cloudy**		☐ **Overcast**		☐ **Heavy cloud cover**	
String		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Brand/model of PV inverter									
Serial number of PV inverter									
PV generator	Module								
	Number								
String parameter according to data sheet	U_{OC} (STC)								
	I_{SC} (STC)								
String voltage surge protection device	Type								
	Rated input current (A)								
	DC rating (V)								
	Switching capacity (kA)								
Wiring	Type								
	Active conductor (mm^2)								
	Grounding conductor (mm^2)								
Testing of polarity and identification									
Insulating resistance of string	Test voltage (V)								
	Positive electrodes – earth (MΩ)								
	Negative electrodes – earth (MΩ)								
Measured values of string	U_{OC} (V)								
	I_{SC} (A)								
	U_{mpp} (V) (if needed)								
	I_{mpp} (A) (if needed)								
Mains power failure test (e.g. network and system protection)									
Conductivity of grounding conductor (if given) to a grounding system									

Conductivity of functional equipotential bonding conductor (if given) (<;_;_ 1 Ω demonstrated)

Foundation earth	☐	Equipotential bonding rail	☐	Main grounding	☐	PE rail in distributer	☐	…….	☐

electrode				rail					

Annex 3: Test certificate / test reports

Test protocol of the PV system's direct-current side in accordance with VDE 0100-600

according to form 1/2007 ZVEH/Bundesfachverband Elektrotechnik

Testing

Test date: _____

Start of test: _____ am/pm, End: _____ am/pm

Inspector:

(first name, last name)

Description of work to be tested:

Testing according to: DIN VDE 0100-600 ☐ DIN VDE 0105-100 ☐ BGV A3 ☐ …./…… BSV ☐ E-Check ☐

Network …… / …… V Network configuration: TN-C ☐ TN-S ☐ TN-C-S ☐ TT ☐ IT ☐

Network operator:

Inspect	OK	not OK		OK	not OK		OK	not OK
Choice of equipment	☐	☐	Labeling of electric circuit, equipment	☐	☐	Accessibility	☐	☐
Circuit breaker and switching devices	☐	☐	Labeling N- and PE-conductors	☐	☐	Main equipotential bonding	☐	☐
Fire-resistant sealings	☐	☐	Conductor connections	☐	☐	Additional local equipotential bonding	☐	☐
Building automation systems	☐	☐	Protection and monitoring equipment	☐	☐	Documentation, see additional sheets	☐	☐
Cables, power lines, power rails	☐	☐	Protection against direct contact	☐	☐		☐	☐
	☐	☐		☐	☐		☐	☐
Test								
Functional testing of system	☐	☐	Function of protection, safety and monitoring equipment	☐	☐	Right-handed rotary field of three-phase socket	☐	☐
FI circuit breaker (RCD)	☐	☐	Rotation direction of motors	☐	☐	Building automation systems	☐	☐

Measure Power circuit distributor No.:

Power circuit		Power lines/cables		Voltage surge protection device			R_{iso} (MΩ)	Fault current protection device (RCD)					Error code
No.	Target name	Type	Conductor Number x diameter (mm²)	Type Characteristic	I_n (A)	Z_s(Ω) ☐ I_k(A) ☐	without ☐ with ☐ consumer	I_n/type (A)	$I_{\Delta n}$ (mA)	I_{mess} (mA) ($I_{\Delta n}$)	Period of measurement tA (ms)	U_L ….V U_{mess} (V)	
			X										
			X										
			X										
			X										
			X										
			X										
			X										

Conductivity of grounding conductor 1 Ω ☐ Grounding resistance: R_E ….. Ω

Conductivity of equipotential bonding (1 Ω demonstrated)

Foundation earth electrode	☐	Main water line	☐	Heating system	☐	Computer system	☐	Antenna system/BK	☐
Equipotential bonding rail	☐	Main grounding conductor	☐	Air conditioning	☐	Telecommunications system	☐	Building construction	☐
Water sub-meter	☐	Interior gas line	☐	Elevator system	☐	Lightning protection system	☐	……	☐

Measuring equipment used in accordance with VDE …….	Manufacturer: Type:	Manufacturer: Type:	Manufacturer: Type:

Test result: ☐ No deficiencies were found. ☐ The following deficiencies were found: _____

☐ The electric system conforms to the recognized standards of electrical engineering.

_____ _____

Place, date Signature

Annex 4: Overview of documents provided

The operator was provided the following documents:

A. Documents that must be provided:

☐ A1: Electric circuit diagram, including string layout and list of equipment

☐ A2: (Rooftop) configuration plan with inverter positioning

For PV modules used

☐ A3: Technical data sheets

☐ A4: User information, assembly and instruction manual

☐ A5: List of serial numbers of all modules (e.g. flash list)

☐ A6: Warranty documentation

☐ A7: Copies of test certificates

☐ A8: Conformity declarations

☐ A9: Manufacturer's statement on normal combustibility

For inverters used:

☐ A10: Technical data sheets

☐ A11: User information, assembly and instruction manual

☐ A11: List of serial numbers of all inverters

☐ A13: Warranty documentation

☐ A14: Copies of test certificates

☐ A15: Conformity declarations

For all other components used:

☐ A16: Technical data sheets

☐ A17: User information

☐ A18: List of serial numbers

☐ A19: Warranty documentation

☐ A20: Copies of test certificates

☐ A21: Conformity declarations

For storage system used:

☐ A22: Technical data sheets

☐ A23: User information

☐ A24: List of serial numbers

☐ A25: Warranty documentation

☐ A26: Copies of test certificates

☐ A27: Conformity declarations

Annex 4: Overview of documents provided

For the mounting system used:

☐ A28: Requirements based on individual verification of structural strength or of system/type structural strength

☐ A29: General building authority approval, if necessary

☐ A30: Examination of structural strength of substructure

☐ A31: Mounting instructions of substructure components used

☐ A32: General building authority test certificate regarding the property of rigid roofing (only for integrated PV systems)

B. Additional documents (if applicable)

☐ B1 Calculation of yield forecast

☐ B2: Technical documentation of function monitoring system

☐ B3: Calculation of direct consumption rate

☐ B4: Calculation of static friction coefficient for ballasted roof systems

PV passport and Annexes (1) to (4) received: _____

Date/signature of system operator

REPUBLIC OF THE PHILIPPINES
NATIONAL RENEWABLE ENERGY BOARD
DOE Bldg., Meritt Road, Fort Bonifacio, Taguig City,
METRO MANILA

14 October 2013

HON. ZENAIDA CRUZ-DUCUT
Chairperson
Energy Regulatory Commission
Pacific Center Building,
San Miguel Avenue, Ortigas Center 1600,
Pasig City, Metro Manila

DOE - RECORDS
RECEIVED
OCT 14 2013
By: Time: 4:00

Dear Chairperson Ducut:

With the promulgation of the Rules Enabling Net-Metering for Renewable Energy under ERC Resolution No. 9, Series of 2013, NREB has tasked its Sub-Committee on Net-Metering to come up with a Net-Metering Reference Guide for the Distribution Utilities and the electricity consumers.

The Department of Energy (DOE) has also tentatively scheduled the launch of the Net-Metering Mechanisms during the Energy Week/Month on 4 December 2013.

However, we would like some matters to be clarified or confirmed first with the Commission before the Net-Metering Reference Guide is finalized for publication and distribution.

In this regard, please find attached discussion of the matters covered by the requests for clarifications or confirmations.

Thank you and we look forward to the Commission's response to NREB's request.

Very truly yours,

ATTY. PEDRO H. MANIEGO, JR.
Chairman

MATTERS FOR CLARIFICATION:

I. **Accumulated Peso Credits**

a. Sec. 15 of the Net-Metering Rules provides that if the resulting peso amount is negative, the DU shall credit the negative peso amount to the QE's electric bill in the immediately succeeding billing period. This presumes that if the peso credited to the exported energy for a particular billing month is more than the DU charges to the QE for the same billing month, the excess peso credit is carried-over to the succeeding billing month.

b. There are cases however that some QEs accumulate peso credits for the RE they export, but which they cannot consume within the calendar year they were earned.

c. The Net-Metering Rules are silent on what to do with these accumulated peso credits. To resolve these accumulated peso credits, the following options are available:

i. To perpetually carry-over the accumulated peso credits to the succeeding bills until they are all consumed by the QE *(this is already impliedly allowed under the rules)*; or

ii. Allow the DU to payout in cash to the QE the accumulated peso credits at the end of each calendar year.

d. The funds to be used for pay-out have already been collected by the DU. Sec. 13 of the Net-Metering Rules provides that the cost of RE exported to the DU system and purchased by the DU under net-metering agreements shall automatically be included in the DU's total generation cost to be recovered from all DU customers as part of the adjusted generation rate pursuant to Sec. 2, Art. 2 of ERC Resolution No. 19, Series of 2009.

e. *In this regard, NREB requests confirmation or clarification from the Commission that DUs are not precluded under the Net-Metering Rules from paying out in cash to the QE the accumulated peso credits at the end of each calendar year.*

II. Exemption from Universal Charge

a. Sec. 7, Rule 18 of the EPIRA IRR provides that all Self-Generation Facilities whether new, existing or under construction shall not be covered by the imposition of Universal Charge for a period of four (4) years from its imposition: Provided, That such Self-Generation Facilities shall register with the ERC and PSALM.

b. However, Sec. 17 of the RA 9513 (RE Law) provides that power and electricity generation through the Renewable Energy Systems (RES) for the generator's own consumption shall be exempted from the payment of the universal charge provided for under Sec. 34 of RA No. 9136.

c. The Repealing Clause under Sec. 39 of the RE Law further provides that any law, presidential decree or issuance, executive order, letter of instruction, administrative rule or regulation contrary to or inconsistent with the provisions of the RE Law are repealed, modified or amended accordingly.

d. NREB respectfully submits that Sec. 17 of the RE Law is deemed to have repealed Sec. 7, Rule 18 of the EPIRA IRR, and that a QE, under a net-metering arrangement, is exempted from the payment of the Universal Charge for RE generated for own use. It is to be noted that the universal charge for the RE exported by a QE to the distribution system is paid by the neighboring customers who consumed the exported RE.

e. *In this regard, NREB requests clarification or confirmation from the Commission that a QE, under a net-metering arrangement, is exempted from the payment of the Universal Charge for RE generated for own use pursuant to Sec. 17 of the RE Law.*

III. **COC for RE Facilities Under 100kW**

a. The Commission currently requires the issuance of Certificates of Compliance for Self-Generating Facilities (SGFs) with less than 1 MW aggregate installed capacity.

b. RE Facilities participating under the Net-Metering Program are primarily self-generating facilities whose installed capacity does not exceed 100kW.

c. Since Sec. 11 of the Net-Metering Rules provides that the executed Net-Metering Agreements between the DU and the QE shall be *deemed approved and effective* upon submission thereof to ERC, NREB submits that a QE should also be entitled to the issuance of a Certificate of Compliance (COC) upon submission by the DU of the executed Net-Metering Agreement to the ERC without need on the part of the QE to file for a separate application for the issuance of COC and the payment of fees.

d. *In this regard, NREB requests confirmation or clarification from the Commission that the QE is entitled to the issuance of a Certificate of Compliance (COC) upon submission by the DU of the executed Net-Metering Agreement to the ERC without need on the part of the QE to file for a separate application for the issuance of a COC and the payment of fees.*

III. On RE Facilities Greater Than 100kW Installed Capacity

a. Customers Who Do Not Intend To Export RE

i. Some Customers install RE facilities within their premises with more than 100kW capacity (such as biogas/biomass systems for hog/chicken farms or large solar rooftop systems by some offices, schools or hospitals) with the intention of utilizing all of their RE generation for their own use and not exporting any RE to the distribution system.

ii. In such cases, NREB submits that such customers are not precluded from installing within their premises RE facilities greater than 100kW; provided, they comply with the applicable standards for Variable Renewable Energy (VRE).

iii. In this regard, NREB requests confirmation or clarification from the Commission that customers who intend to consume all of their RE generation for their own use are not precluded from installing within their premises RE facilities greater than 100kW; provided, they comply with the applicable connection standards for Variable Renewable Energy (VRE).

b. Customers Who Intend To Export RE

i. There are also some Customers who want to install RE facilities greater than 100kW capacity and want to sell the RE they produce to their local DUs.

ii. On the other hand, the Renewable Portfolio Standards requires electricity suppliers to source an agreed portion of their energy supply from eligible RE resources.

iii. Some DUs are open to purchasing RE from their customers on a voluntary basis to comply with their anticipated RPS obligations under an RE Purchase Agreement (REPA); given certain conditions such as, the RE is supplied to the distribution

system only during peak hours of the DU (*to avoid impairment and stranding of existing supply contracts*), and that the purchase price is equivalent only to the blended generation cost of the DU (*to avoid any adverse rate impact on the rest of DU's customers*).

iv. Considering that the DU would be purchasing the RE from their customers in compliance with their anticipated RPS obligations; and that the terms of supply mentioned above will not have any adverse rate impact on the rest of the DU's customers, NREB respectfully submits that DU applications for the approval of a REPA should be subjected only to summary proceedings similar to the compliance filing cases, and the automatic approval thereof by the ERC.

v. Of course, the RE facility with capacity greater than 100kW would still be subject to the usual permitting requirements such as the ERC requirements for the issuance of a Certificate of Compliance (COC), and the DOE requirements for the issuance of a Renewable Energy Service (Operating) Contract.

vi. Under the foregoing premises, NREB respectfully recommends to the Commission that DU applications for the approval of the REPA should be subjected only to summary proceedings similar to the compliance filing cases of the ERC, and the automatic approval thereof; provided, the terms of the REPA provide that the RE is supplied to the distribution system only during peak hours of the DU, and that the purchase price for the RE supplied is equivalent only to the blended generation cost of the DU as calculated under Sec. 2, Article 2 of ERC Resolution No. 9, Series of 2009.

RESPECTFULLY SUBMITTED.

ENERGY REGULATORY COMMISSION • PHILIPPINES

25 November 2013

ATTY. PEDRO H. MANIEGO, JR.
Chairman
National Renewable Energy Board
DOE Bldg., Meritt Road, Fort Bonifacio,
Taguig City, Metro Manila

Dear Atty. Maniego:

This relates to the 14 October 2013 letter forwarded to the Commission where the National Renewable Energy Board (NREB) requests for clarification or confirmation anent several issues on Net-Metering arrangements. Specifically, confirmation is sought on the subject of accumulated peso credits, exemption from the imposition of the Universal Charge, Certificate of Compliance (COC) for Renewable Energy (RE) facilities, and the treatment RE facilities with installed capacity greater than 100kW.

On whether or not Distribution Utilities (DUs) can pay in cash to the Qualified End-User (QE) its accumulated peso credits at the end of each calendar year, the Commission confirms that the DU is not precluded from doing so. The Commission recognizes that a perpetual credit on the bill of the QE may occur and the Commission's rules do not proscribe the cash payment of accumulated peso credits after a certain period as may be agreed upon between the DU and QE.

Another clarification sought is on the QE's exemption from the imposition of the Universal Charge, on account of it being a Self-Generating Facility (SGF). In order to provide clarification on the instant issue, it may be well to initially point out the definition of an SGF, thus:

> "a power Generation Facility owned and constructed by an End-user for such End-user's own consumption or internal use excluding Generation Facilities for use by households, clinics, hospitals and other medical facilities."

The Commission notes that while the QE has generation facilities installed within its premises, it is presumed to have entered, or intends to enter, into commercial transactions on account of its Net-Metering arrangement with the DU. Thus, to such extent, it is not an SGF as it does not produce electricity for its own use only. With such determination, it appears that the provision on the imposition of the Universal Charge does not apply to a QE.

As to whether or not the QE is entitled to an automatic issuance of a Certificate of Compliance (COC) upon submission of the executed Net-Metering Agreement to the Commission, the same shall be addressed by the amendments being drafted to the existing Guidelines on the Issuance of COCs.

As regards the RE facilities with installed capacity of greater than 100kW, but intended for own use, the Commission posits that these are not prohibited so long as they do not participate in the Net Metering Program and that they comply with the applicable connection standards for Variable Renewable Energy (VRE). The connection standards for VRE referred to and earlier set by the Commission apply only to facilities intending to connect to the transmission grid and not to facilities embedded within the distribution grid. Thus, the Commission maintains that installation of said facilities must, at all times, comply with the connection standards of the distribution network where it intends to connect. The end-user shall also comply with the requirements of the Philippine Distribution Code on modifications to existing connections with the distribution system, *viz*:

> 5.3.3.2 The Distributor shall conduct Distribution Impact Studies to evaluate the impact of the proposed connection or modification to an existing connection on the Distribution System.
>
> 5.4.1.1 The Embedded Generator's Equipment shall be connected to the Distribution System at the voltage level agreed to by the Distributor and the Generator based on the Distribution Impact Studies.

Moreover, provided that these facilities cater to the exclusive needs of the end-user, and that no Net-Metering facilities are installed therein, the end-user shall be treated by the Commission as SGF and shall apply for the issuance of a COC as such.

Regarding the DUs' purchase during peak hours of the energy produced by embedded RE facilities with capacities greater than 100kW, at a price equivalent to the blended generation cost of the DUs, the Commission posits that, although such arrangement cannot qualify under Net Metering, the same may be allowed if such purchase is covered by a bilateral supply contract submitted to and approved by the Commission similar to other supply contracts entered into by the DUs for the supply to their captive markets. Note, however, that while the process to be undertake is the same as for the DUs' other supply contracts, the Commission may adopt a different approach in the review of such contracts between RE facilities with capacities greater than 100kW and the DUs as may be necessitated by the circumstances.

Finally, the Commission is unable to take cognizance and adopt conclusive determinations as to the other issues, inasmuch as the definitive policies on the RPS have yet to be issued.

We hope that we have fully addressed your concerns and clarified the matters stated in your letter. Should there be other concerns, please do not hesitate to let us know.

Very truly yours,

ZENAIDA CRUZ-DUCUT
Chairperson and CEO

dtl/fscj