Status, Opportunities and Challenges for Residential Rooftop Solar PV Market

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INDOEBTKE ConEx 2018 Workshop on

"Rooftop Solar Photovoltaic Market Development in Indonesia"

Jakarta, August 31st, 2018

Agenda

- Introduction to Solar PV
- Government support on the Rooftop Solar PV
- Market condition in residential buildings
- Residential Business Case of Rooftop Solar PV under Current Regulatory Framework.

Introduction to Rooftop Solar PV (1)

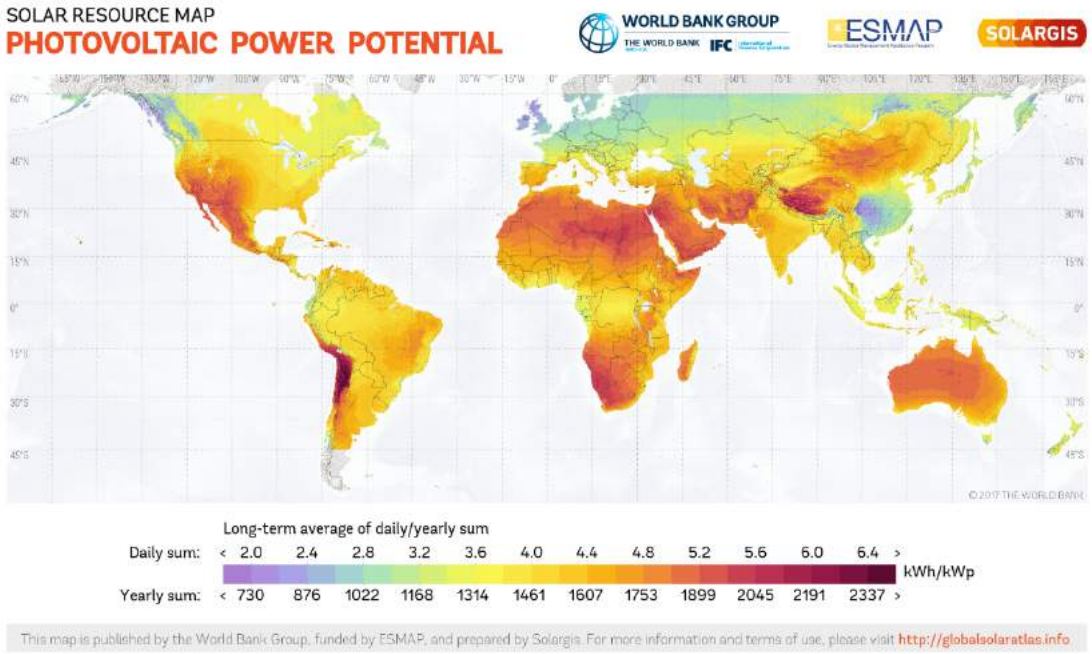
Firm & Steady as fossil plants

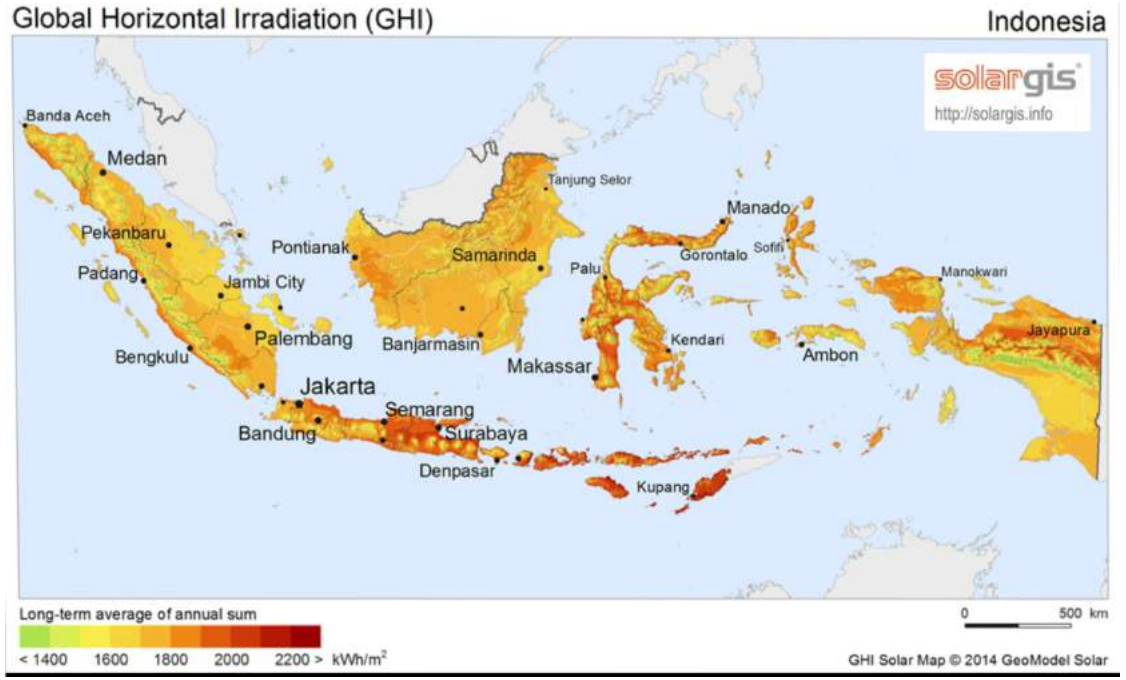
1. Hydropower (PLTA, PLTM/m/p)
2. Geothermal
3. Biomass
   - non-woody, fired
   - gasified palm slury
   - gasified palm kernels
   - woody biomass (gasified or fired) from “energy” plantation
   - Co-firing in coal-fired power plants

Intermitten: not firm, fluctuating

4. **Solar PV**, Solar Termal
5. Wind
6. Sea
   - tidal
   - wave
   - current
   - temperatur difference (OTEC)

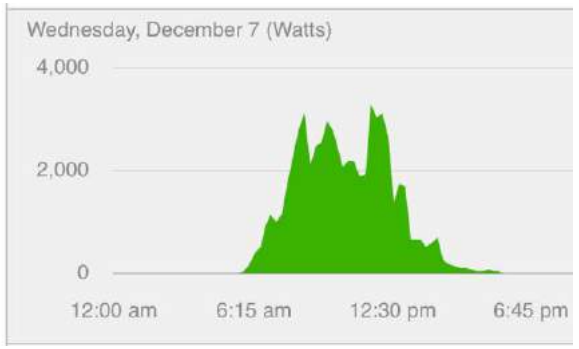
Intro (2): Global & Indonesia Solar Power Maps

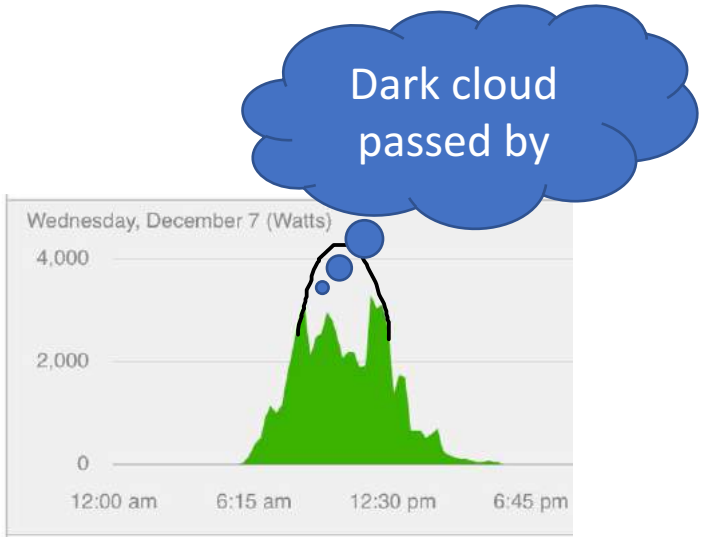




Indonesia has moderate solar irradiation. Typical yield factors are 3,5 hour per day in Jakarta area, and >4 hr/d in the eastern regions.

Intro (3): Yield factor of Solar PV





- **Cloud reduces intensity of solar irradiation.** Cloud emerges easily at archipelagic countries. Wattage rating of a PV panels are tested at 1000 W/m^2 light source, higher than actual sun light here.
- **Solar cells efficiency reduce with increasing temperature.** Tested at 25^o C, with e.g. 0,5% *temperatur coefficient of power rating*, at 65^o C the output of PV decreases 20%, at 85^o C decreases 30%.
- Cloud and high temperature consitute low effective hour: 3,5 hour/day for Jakarta. 1 kWp PV produces 3,5 kWh per day (annual average).

Intro (4): Impact of On-grid Solar PV on the Grid

1. Solar farm (few to hundreds MWp per site)

- Solar electricity reduces fuel consumption in fossil-fired power plants.
- Passing cloud fluctuates solar farm output, other power plants in the same grid compensate it to maintain the supply-demand balance. Each generator keeps rotate at 50 turn/second (50 Hz).
- The grid collapse if other power plants fail to compensate, because supply is too low (or too high) than demand so that generator rotation going down (or going up) which results in disconnection of each generator from the grid.
- Solar electricity portion in the grid is limited up to a level where the grid stability can be maintained.

2. Rooftop PV (few kWp per house/building)

- Rooftop owners pay less electricity bills. Solar electricity reduces fuel consumption in fossil-fired power plants.
- Passing clouds give much less impact on grid stability because rooftop PVs are widely spread in large area, not concentrated in a single site.
- Higher penetration of solar electricity portion as compare to solar farm case; more wide spread means higher portion.

Intro (5): Strategic issues on Solar PV

1. GOI promises to reduce emission by 26% from BAU; which is a Nationally Determined Contribution (NDC) for COP 21 Paris. Proliferation of Rooftop Solar PV is an attractive option.
2. Consumers in developed countries demand for products and services with lower ***carbon footprint*** including products ***made in*** **Indonesia**. RE-100 manufacturer companies operating in Indonesia require access to renewable energy including solar PV.
3. On-grid rooftop PV reach ***grid parity*** in places with access to grid, customers have choice to source green energy.
4. Declining cost of ***energy storage*** allowing people to grow offgrid, and also rapid development of fossil-renewable hybrid electricity generation in places without access to grid.

Regulations on Renewable Energy & PV (1)

1. **Law No. 30/2007 on Energy ➤ RE**

   *Pasal 20 butir (5): Penyediaan energi dari sumber energi baru dan sumber energi terbarukan yang dilakukan oleh badan usaha, bentuk usaha tetap, dan perseorangan **dapat memperoleh kemudahan dan/atau insentif dari Pemerintah** dan/atau pemerintah daerah sesuai dengan kewenangannya untuk jangka waktu tertentu hingga tercapai nilai keekonomiannya*

2. **Law No. 30/2009 on Electricity ➤ RE**

   Pasal 6 butir 2: Pemanfaatan sumber energi primer sebagaimana dimaksud pada ayat (1) harus dilaksanakan dengan mengutamakan sumber energi baru dan energi terbarukan.

3. **Government Regulation No. 74/2014 on National Energy Policy ➤ RE**

   Pasal 9 huruf f angka 1: pada 2025 peran energi baru dan energi terbarukan paling sedikit 23%.

4. **Presidential Regulation No. 22/2017 on National Energi Planning ➤ PV**

   *Lampiran-1 halaman 79: .. mewajibkan penggunaan **30%** luas atap **seluruh bangunan Pemerintah** serta **minimum 25%** dari luas atap bangunan **rumah mewah, kompleks perumahan, apartemen**, untuk rooftop solar PV melalui **Izin Mendirikan Bangunan (IMB)**.*

Regulations on Renewable Energy & PV (2)

5. **MEMR Regulation No. 50/2017 on RE for IPP ➢ RE including PV**

   Pasal 5: Rules on how PLN purchases electricity from solar farm.

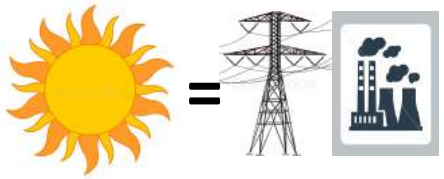
6. **MEMR Regulation No. xx/2018 on Solar PV (in waiting) ➢ PV**

   Ministry of EMR discussed with stakeholders on policy initiatives to support solar PV development in Indonesia.

   Residential customers are allowed to do 1:0.x net metering.

7. **PLN Regulation No. 0733/2013 on Utilization of Rooftop PV ➢ PV & SPLN D5 005-1-2015 on PV Connection to PLN Grid**

   Interpretation: PLN Customers are only allowed to install maximum 30 kW-peak; 1:1 net metering

Grid Parity (1) 

1. **Grid parity**: *the break-even cost of an alternative energy source, where the **cost of PV-generated electricity** equals **the cost of electricity purchased from the grid****
2. ***Market price*** of electricity in the deregulated electricity market consists of 60% energy price and 40% dispatch, transmission, and distribution costs. In case of Indonesia, (BPP x 10/6) is a good ***proxy*** for the market price.
3. Cost of PV-generated electricity is the ***levelized cost of energy (LCOE)***, which is investment cost over total of electricity generation during the life time of equipment**.

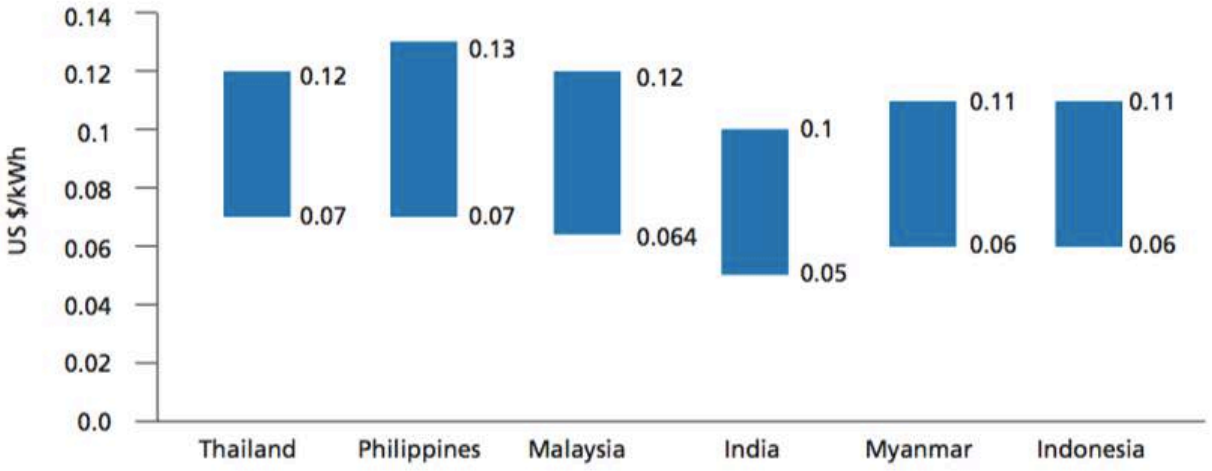
*) - definition from NREL, National Renewable Energy Laboratory, USA

**) - assuming discount rate electricity from PV = inflation rate of electricity tariff

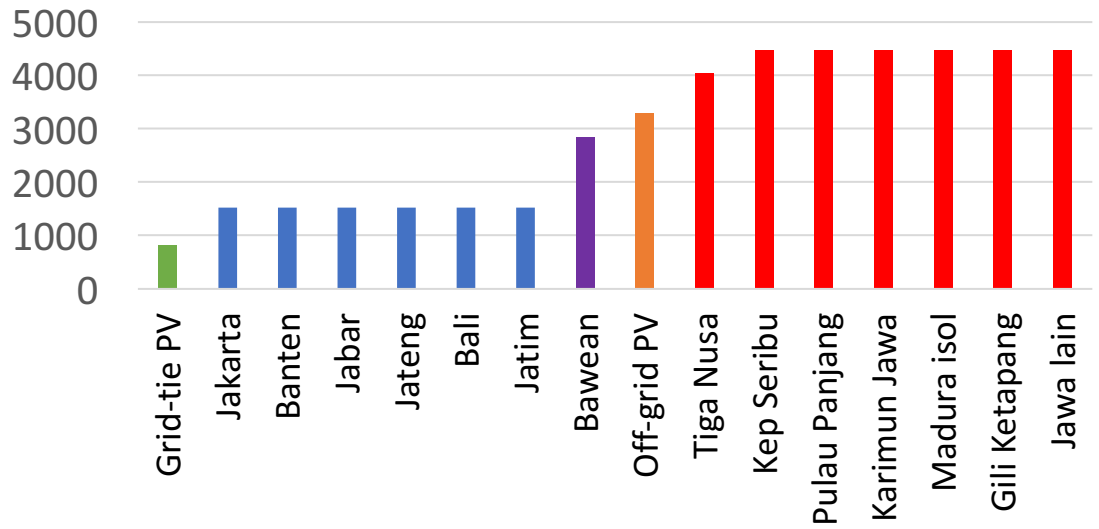
Grid Parity (2): Capex & LCOE of On-Grid Solar PV

	Indonesia	Thailand	Philippines	Malaysia	Myanmar	India
CAPEX (in US $ per kW)	1100-1700	1100-1700	1200-1800	1100-1700	1000-1600	950-1400

Source: Mott MacDonald, 2017



Source: Mott MacDonald, 2017

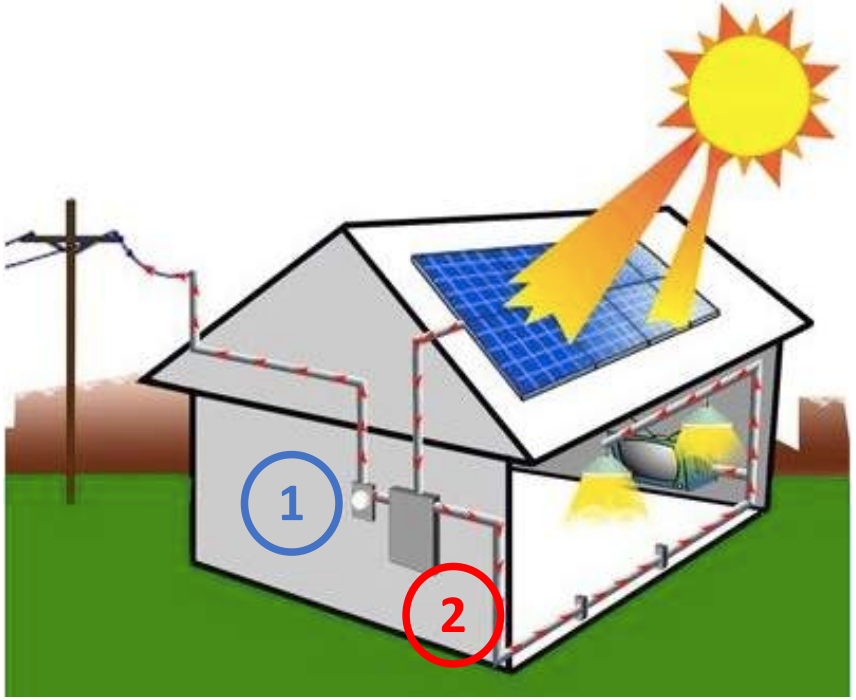


Since LCOE on-grid PV < market price (and tariff), there will be a rapid development of utilization of rooftop solar PV by PLN customers with access to *grid*. Neither campaign nor subsidy nor incentives is required. What is required is an accomodative Government Regulation so that banks and insurance industries will finance rooftop PV development.

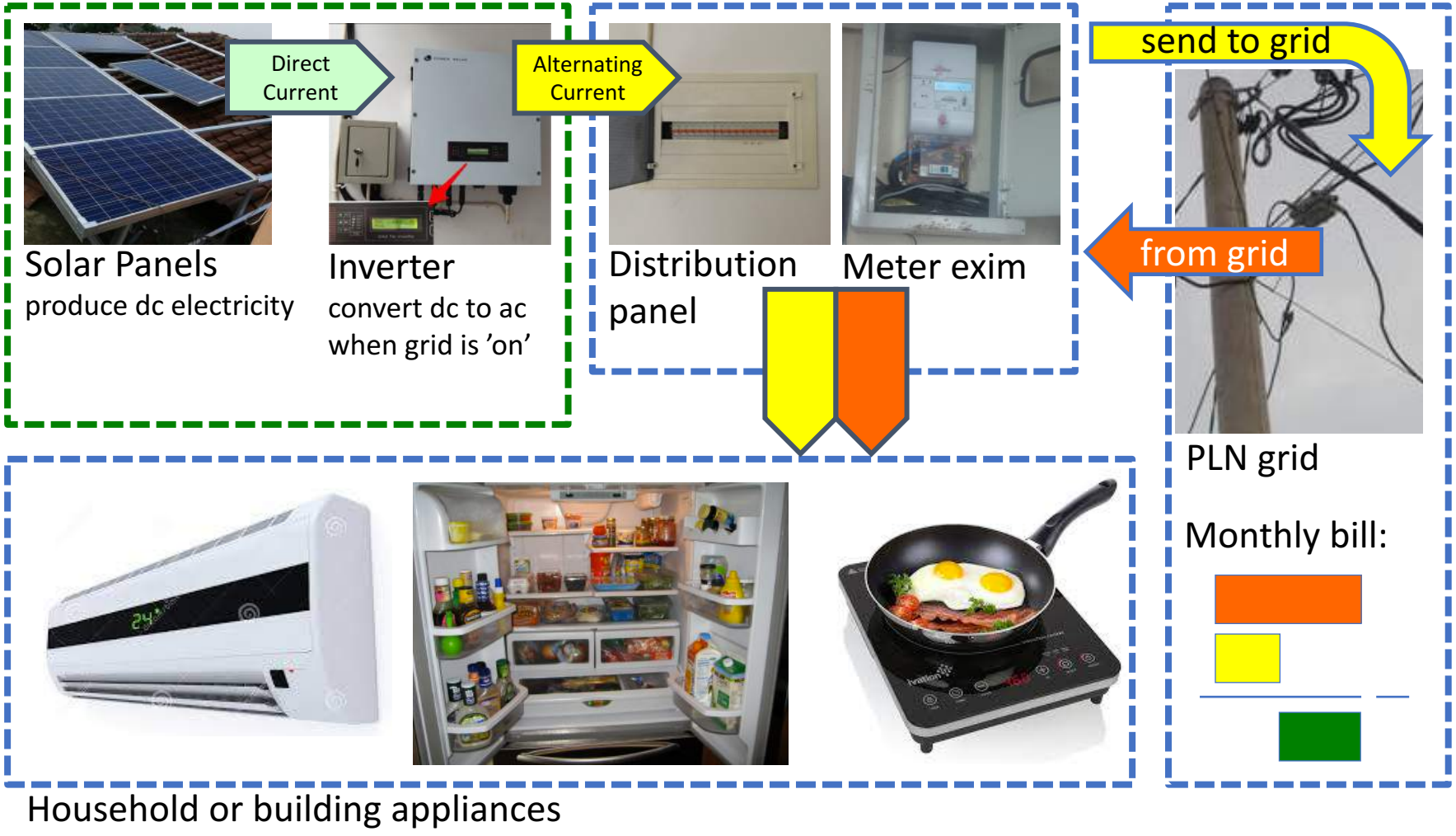
Rooftop PV for Offices, Workshops and Homes

1 **Bidirectional Energy-meter (kWh-meter export-import)**

2 **Grid Tie Inverter**



On-grid Rooftop Solar PV with Net-metering



Customer's "Saving" in PLN

A	Maksimum Offset Tarif/Daya Baru TTL Baru			Rp	718,439
	3. Rupiah PTL Bruto (1+2)			Rp	976,680
	4. Rupiah Kompensasi TMP			Rp	0
	5. Jumlah PTL Netto (3-4)			Rp	976,680
	6. Jumlah Rupiah Pemakaian Tenaga Listrik (PTL) yang ditagihkan			Rp	976,680
	7. Tagihan Lainnya			Rp	0
	8. Jumlah Rupiah Pemakaian Tenaga Listrik (PTL) (6+7)			Rp	976,680
	9. PPN			Rp	97,668
	10. Pengurang Taglis Fotovoltaik			Rp	718,439
	Total Penyerahan Listrik			Rp	976,680
	PPN DIBEBASKAN SESUAI PP NOMOR 81 TAHUN 2015				
II	Pajak Penerangan Jalan (PEMDA) (...% X PTL Netto)			Rp	48,834
	PTL	5.00(%) x	976,680 Rp	48,834	
III	Penyerahan Non Listrik				
	1. Sewa Trafo / Pemakaian Trafo / Sewa Kapasitor, dll			Rp	0
	2. PPN			Rp	0
	Total Penyerahan Non Listrik			Rp	0
IV	Jumlah Tagihan (I + II + III)			Rp	307,075

TERBILANG

Tiga Ratus Tujuh Ribu Tujuh Puluh Lima Rupiah

Data Saldo Fotovoltaik :

a. Saldo Awal Hutang		Rp	1,658,142.00
b. Penambah Hutang Bulan Berjalan (Pemakaian kWh import)		Rp	737,396.00
c. Pengurang Hutang Bulan Berjalan (Pengurang Taglis Fotovoltaik)		Rp	718,439.00
d. Saldo Akhir Hutang	(a + b) - c	Rp	1,677,099.00

Batas Akhir Masa Bayar 20 April 2018
Status : LUNAS (11)

Tanggal Bayar : 03/04/2018
Biaya Keterlambatan (BK) : Rp. 0
Bea Meterai : Rp. 3,000

Depok, 04-04-2018
MANAJER

Saldo Awal Hutang
Penambahan Hutang
Pengurang Hutang
Saldo Akhir Hutang

PV is an attractive option for RE 100 Corporations

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Apple plugs into solar power in Singapore

Sunseap, which has installed solar panels atop some 800 buildings here, has signed a landmark solar power deal with Apple that will start in January next year. PHOTO: SUNSEAP

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Solar energy from S'pore to power Microsoft

Microsoft yesterday said it will buy 100 per cent of the electricity generated from Sunseap's 60 megawatt-peak solar power project for 20 years for its Singapore data operations. Sunseap has solar panels on hundreds of rooftops across Singapore. PHOTO: SUNSEAP

https://www.straitstimes.com/tech/apple-plugs-into-solar-power-in-singapore
https://www.straitstimes.com/business/companies-markets/solar-energy-from-spore-to-power-microsoft

Solar PV Promotors

Organizations:

AESI: Asosiasi Energi Surya Indonesia (Indonesia Solar Association)

PPLSA: Perkumpulan Pengguna Listrik Surya Atap (Rooftop PV Users Club)

APAMSI: Solar PV Moduls Producers Association

Initiatives:

GNSSA: Gerakan Nasional Sejuta Surya Atap (installing 1 GW of Rooftop PV nation-wide).

CEIA: Clean Energy Investment Accelerator (include: endorsing Renewable Energy Corporate Buyers Club).

ICEF: Indonesia Clean Energy Forum, a panel of activists to endorse policy initiatives on clean energy.

Solar PV Installers:

PT Contained Energy Indonesia (www.containedenergy.com)

PT TML Energy (www.tmlenergy.co.id)

PT LEIN-Power (leinpower.com)

Investors/Developers

Thank you