



# Realizing Feasible Solar Cell Project through Appropriate Funding Mechanism and Awareness of Local People in Indonesia

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# Outline of Presentation

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1. Reason of Utilising Solar Cell Energy in Indonesia

2. Type of Utilising Solar Cell Energy in Indonesia

3. Governmental Policies to Build Project of Solar Cell Energy in Indonesia

4. Funding Sources of Solar Cell Energy Development in Indonesia

5. Government Agencies to Build Project of Solar Cell Energy in Indonesia

6. Governmental Funding Scheme to Build Project of Solar Cell Energy in Indonesia

7. How to Propose Solar Cell Project to Ministry of Energy and Mineral Resources

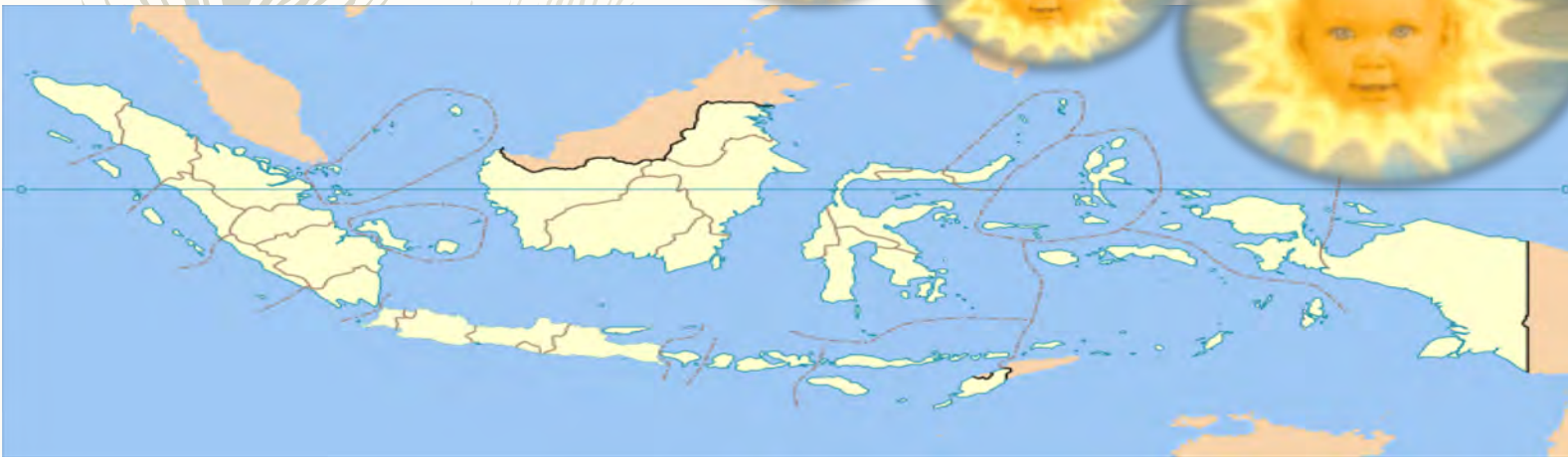
8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

9. Recent Issues and Next Plans



# 1. Reason of Utilising Solar Cell Energy in Indonesia

Indonesia has 17.480 islands dispersed in all areas, with coastal line as 95.181 km (Kusumo, 2010).



More than 2.500 villages are not supplied by PLN's electricity grid (Kementerian ESDM, 2017)

In Indonesia, the potency of solar energy is very large, approximately 4.8 KWh/m<sup>2</sup> or 112,000 GWp (2000 h per year) in Indonesia. Of its potency, only 10 MWp is used (Ministry of ESDM 2008a; ESDM, 2012).

East Area like Islands of Sulawesi, Nusa Tenggara, Maluku, and Papua has the highest sunlight, but those areas, especially in Nusa Tenggara and dan Papua has electrification ratio less than 50%. (Rauch, 2014)

The number 76% of area in Java Island get electricity supply from PLN by 2011. Whereas, in outside of Java Island, totally the number 64% area that get electricity supply from PLN by 2011 (Adam, 2016).

## 2. Type of Utilising Solar Cell Energy in Indonesia

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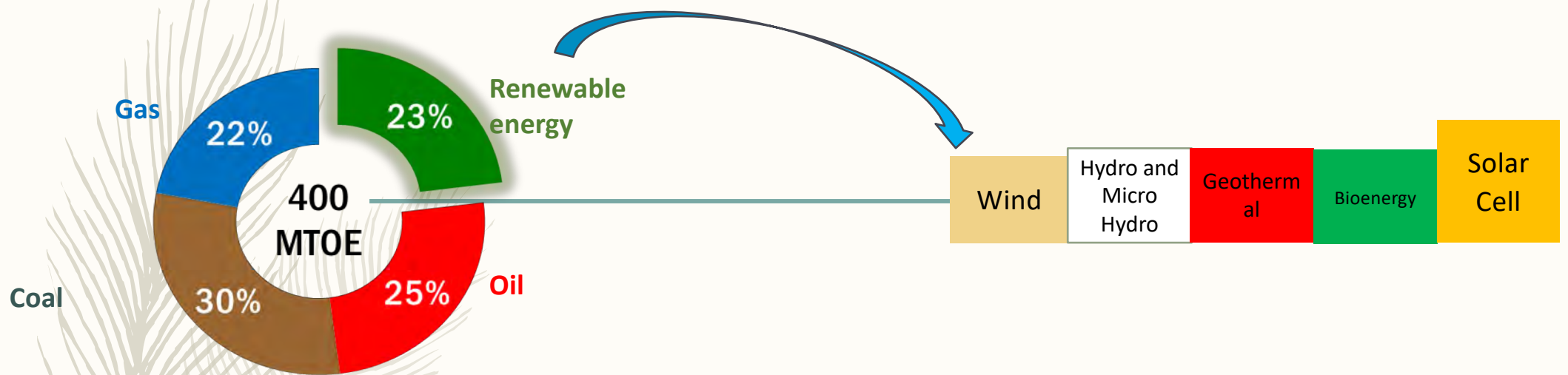
- Utilising solar cell energy is divided into two types:
- Off Grid (Not connected to electricity grid provided by state-owned electricity enterprise/PLN) – Centralised Solar Cell (PLTS) and Solar Dispersed Solar Home System like Solar Home System (SHS) and Energy-Saving Lamps based on solar cell (*LTSHE* or *SEHEN*).
- Case of off grid centralised solar cell is also called *Independent Power Producer (IPP)*
- On Grid (connected to electricity grid provided by state-owned electricity enterprise/PLN) – Centralised Solar Cell (PLTS)

### 3. Governmental Policies to Build Project of Solar Cell Energy in Indonesia



- Several regulations supporting development of solar cell energy in Indonesia such as:
- Regulation of Minister of ESDM No.17 Year 2013 about “Purchasing of Electricity Energy by a state-owned electricity enterprise (PLN) from solar cell
- Regulation of Government (PP) No. 79 Year 2014 about “National Energy Policy”. Energy mix is increased from 17% NREs of total energy by 2025 to 23% NREs of total energy by 2025
- Regulation of President No. 22 Year 2017 about General Plan of National Energy
- Regulation of Indonesian National Standardization (SNI 8395:2017) as Main Guide to Develop Solar Cell Energy Generator
- Regulation of Minister of ESDM No 16 Year 2015 about Criteria and/or Requirements in Utilising The Income Tax Facilities to Invest in Specific Fields or Areas on Energy and Mineral Resources Sector.
- At common, policy for developing energy solar cell in Indonesia is responsibility of General Directorate of New and Renewable Energy - Ministry of Energy and Mineral Resources (Dirjen EBTKE-Kementerian ESDM). But, related to finance regulation of developong renewable energy, it refers to Regulation of Ministry of Finance. For example: Regulation of Ministry of Finance No PMK 89 /PMK010/2015 **about** Mechanism for Providing Income Tax Facilities to Invest in Specific Fields or Areas
- In 2017 year, there are only 7 companies that their proposals in the document verification stage in proposing allowance of income tax to invest solar cell generator ( investment value by 0,069 US\$).

### 3. Governmental Policies to Build Project of Solar Cell Energy in Indonesia



Based on:

Regulation of Government (PP) No. 79 Year 2014  
Regulation of President No. 22 Year 2017

1. Geothermal, 7,2 GW
2. Hydro, 17,9 GW
3. Microhydro, 3 GW
4. Biomass/biogass, 5,5 GW
5. Solar cell, 6,5 GW
6. Wind, 1,8 GW
7. Other Renewable energy, 3,1 GW

**TARGET OF PRIMARY MIX ENERGY ON 2025**

## 4. Funding Sources of Solar Cell Energy Development in Indonesia

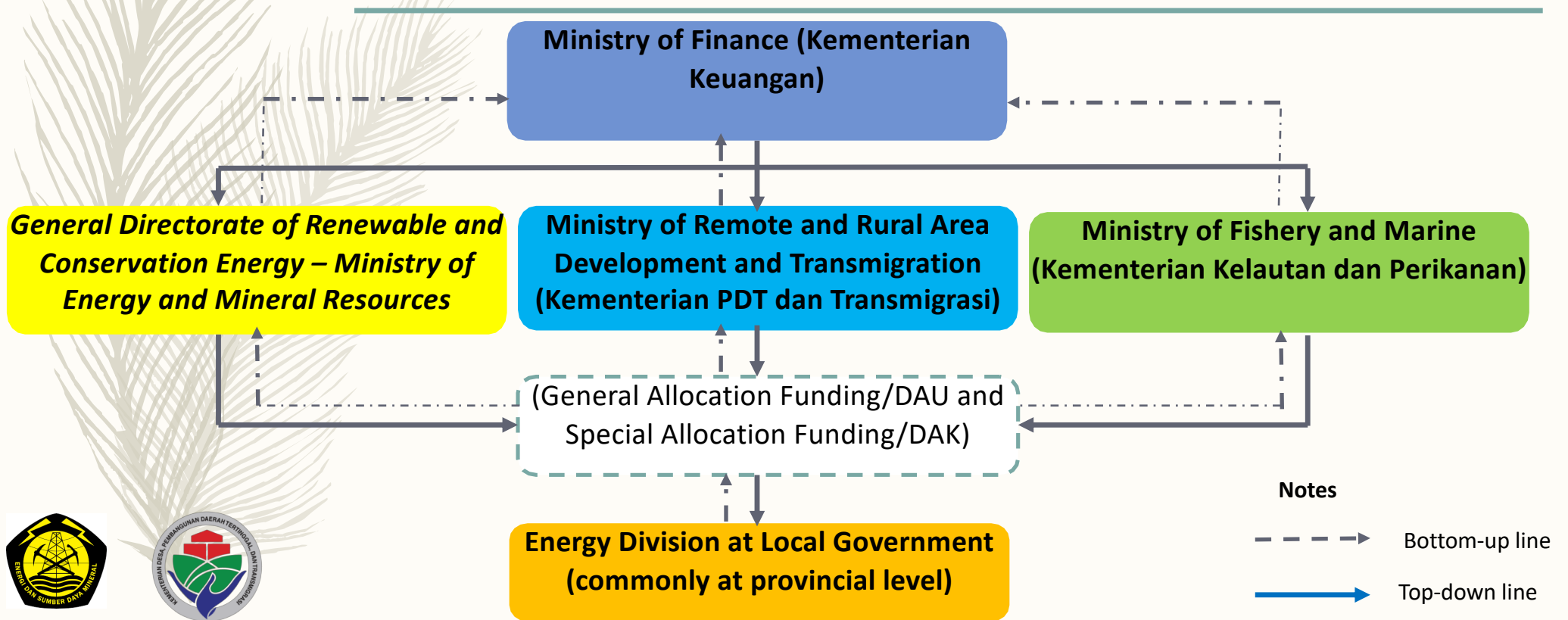
Donor	Type of Solar Cell	Funding Scheme	Goal
Government Agencies	Centralised Solar Cell (PLTS) – off grid Dispersed Solar Cell (solar home system/SHS and SEHEN/LTSHE)	Full Governmental Budget (General Allocation Funding/DAU and Special Allocation Funding/DAK)	<ul style="list-style-type: none"> <li>▪ Increasing electrification ratio</li> <li>▪ Widening electricity grid to remote and frontier areas</li> <li>▪ Fulfilling political aspect in constituent area</li> </ul>
State-Owned Electricity Enterprises (PLN)	Centralised Solar Cell (PLTS)	Company Budget	Profit goal to support PLN's electricity grid
Private Sector	Centralised Solar Cell (PLTS) Dispersed Solar Cell (SHS)	Company Budget (Grant)	<ul style="list-style-type: none"> <li>• Widening electricity grid to remote and frontier areas</li> <li>• Corporate Social Responsibility</li> </ul>
Individual or Community	SHS, SEHEN	Personal or communal budget	To lighten houses and surrounding area

## 5. Government Agencies to Build Project of Solar Cell Energy in Indonesia

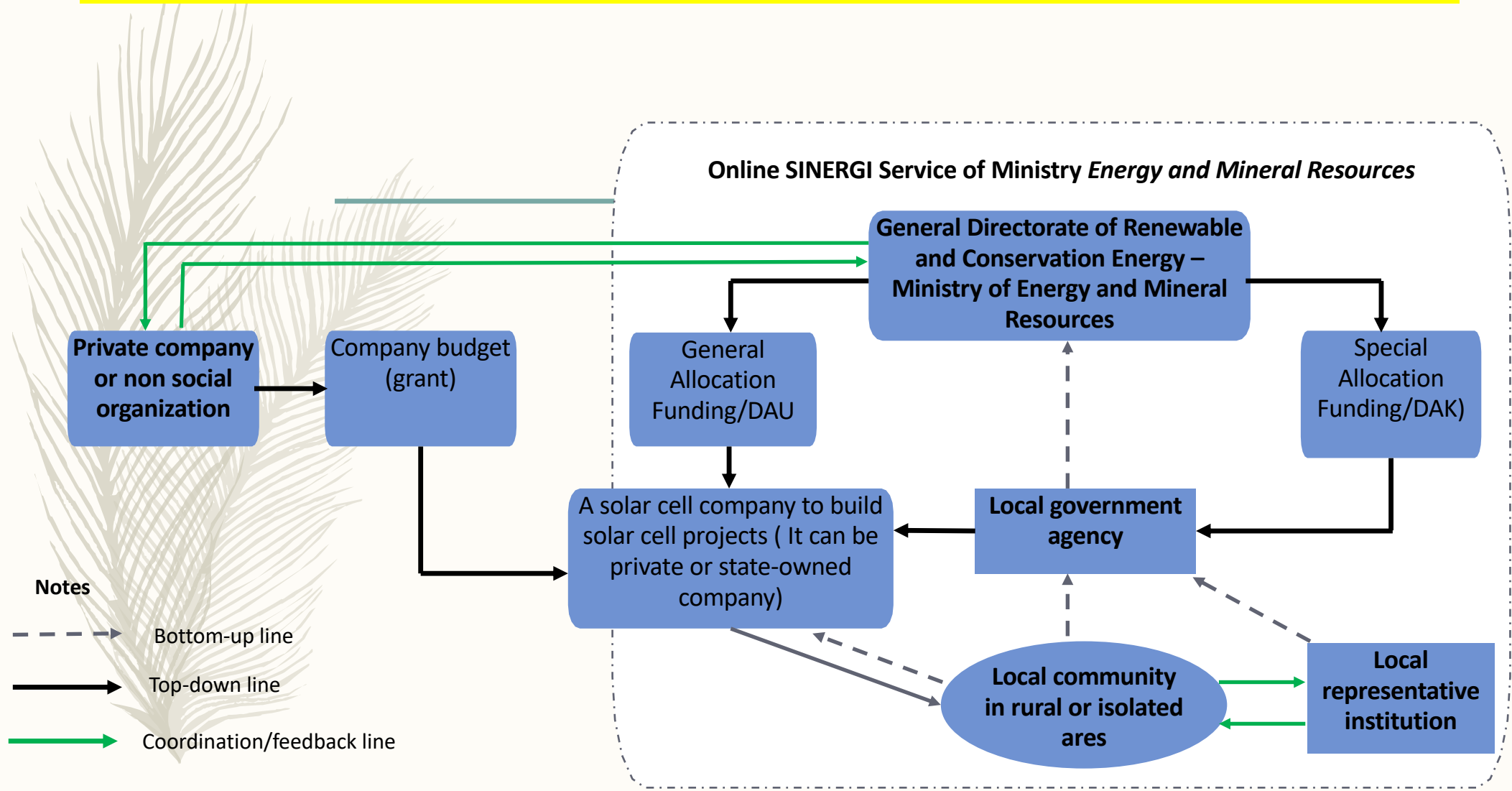
Government Agencies	Type of Solar Cell	Capacity of Solar Cell	Focus of Area
General Directorate of New and Renewable Energy - Ministry of Energy and Mineral Resources (Dirjen EBTKE-Kementerian ESDM)	Centralised Solar Cell (PLTS) – off grid Dispersed Solar Cell (SHS and SEHEN)	More less 15-100 Kwp  Totally 20 watt consisting 3-4 lamps, each lamp 5 watt	All remote, rural, hinterland, rontier areas, and other areas in Indonesia
Ministry of Remote and Rural Area Development and Transmigration (Kementerian PDT dan Transmigrasi)	Centralised Solar Cell (PLTS) – off grid	More less 30-55 Kwp	All remote, rural, hinterland, rontier areas in Indonesia
Ministry of Fishery and Marine (Kementerian Kelautan dan Perikanan)	Dispersed Solar Cell (SHS and SEHEN/LTSHE)	Totally 20 watt consisting 3-4 lamps, each lamp 5 watt	Coastal areas
Energy Division at Local Government (commonly at provincial level)	Dispersed Solar Cell (SHS and SEHEN/LTSHE)	Totally 20 watt consisting 3-4 lamps, each lamp 5 watt	Areas where there is no PLN's electricity grid, particularly at local administration area



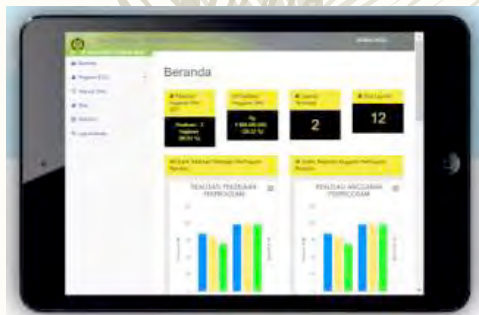
## 6. Governmental Funding Scheme to Build Project of Solar Cell Energy in Indonesia



## 7. How to Propose Solar Cell Project to Ministry of Energy and Mineral Resources

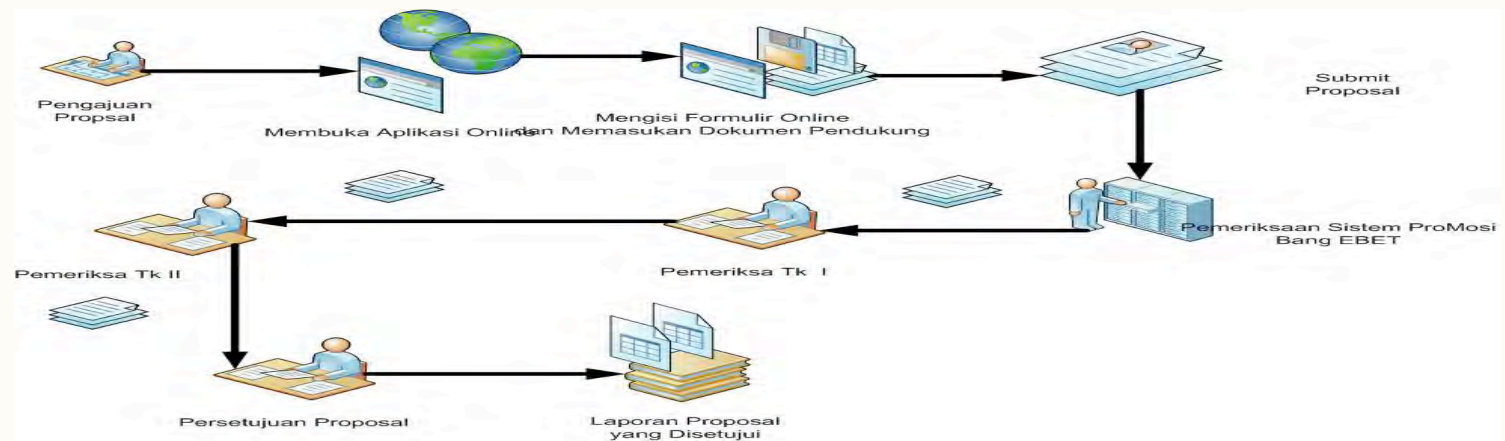


## 7. How to Propose Solar Cell Project to Ministry of Energy and Mineral Resources



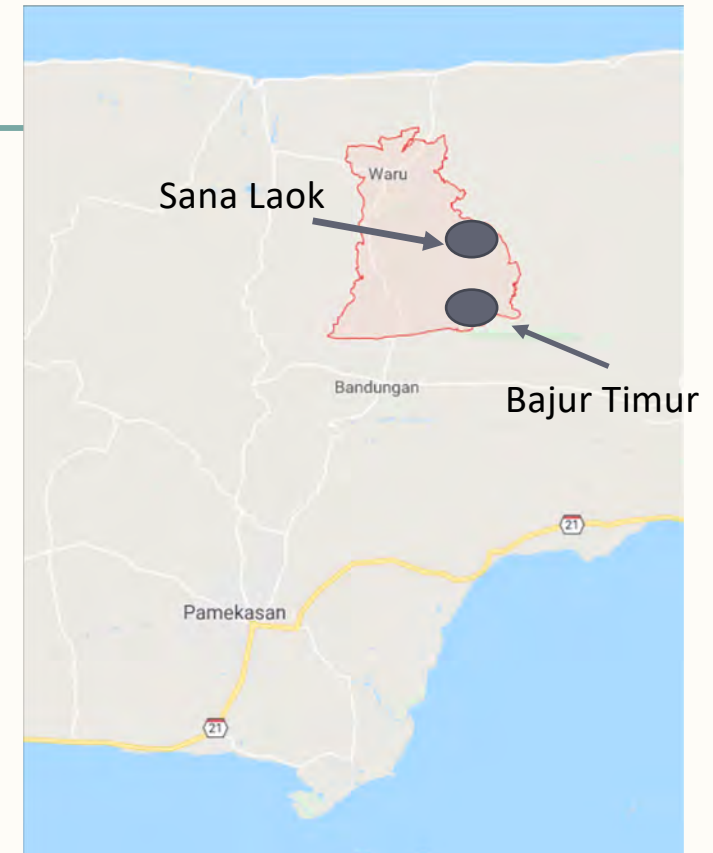
### Information System of Rural Energy (SINERGI)

- SINERGI created by Ministry of ESDM is present to increase electrification ratio in Indonesia. In 2018, it is accounted by 97,5% fo electrification ratio in Indonesia (about 2500 villages have no electricity access). Most of villages are located in small islands, frontier areas, and mountainous/hill areas. The SINERGI Program has received as Top 99 Innovation Award in delivering public service in Indonesia.
- It can be accessed by local government agency to propose infrastructure development of solar cell or other new and renewable energy sources for example energy-saving lamps based on solar cell (LTSHE) in area where no electricity is existing.
- The site of SINERGI: <http://sinergi.ebtke.esdm.go.id>



## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

- Bajur Timur and Sana Laok village are located in Waru sub-Regency, Pamekasan Regency
- Sana Laok and Bajur Timur village have 11,683 and 4.959 inhabitant
- Before 2014, just a few household have electricity. In 2014, Sana Laok village received centralized solar cell from Ministry of energy and mineral resources. It serves 153 household
- In 2015, bajur timur village received household scale solar cell and centralized solar cell from Pamekasan government. It serves 103 household



## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies



Solar cell coverage area (sana laok)



Household scale solar cell (Bajur Timur)



## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

### Livelihood assets - *Physical assets*

- Physical assets that used by villagers are house, road, agricultural tools, and electricity
- With or without electricity, most important assets is house. Place for living and for various usage, such as storage and money generator

Before solar cell project	After solar cell project
<ul style="list-style-type: none"><li>• House without electricity, less to no activities at night</li><li>• Broken road, limited drainage, and street lighting. Leads to isolation during night</li><li>• Limited household with electricity by hitching from other household. Dedicated on grid electricity is not available yet.</li></ul>	<ul style="list-style-type: none"><li>• House lighting, activities at night lead to productivity</li><li>• Street lighting at Sana Laok village</li></ul>

## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

Road without street lighting  
and drainage channel



House with solar  
cell



## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

Dimension	Sana Laok Village	Bajur Village
Name of sub-villages	Mataba (1 sub-village)	Aresan and Bajur (2 sub-villages)
Year	2014	2015
Type of solar cell	Two units of centralised solar cell ( <i>PLTS</i> )	1 unit centralised solar cell ( <i>PLTS</i> ) and 1 unit dispersed solar cell (SHS)
Implementer	Dirjen-EBTKE at MoEMR.	Local Government of Pamekasan
Funding source	MoEMR's national income and spending budget of 2014 year	Specially allocated-budget ( <i>DAK</i> ) of 2015 budget year from Dirjen-EBTKE at MoEMR.
Capacity	15kwp per unit of <i>PLTS</i>	15kwp for <i>PLTS</i> and 20 watt for SHS
Beneficiaries	71 households and 82 households	83 households of <i>PLTS</i> , and 20 households of SHS
Number of lamps	4-5 LED lamps or 20 watt/household	4-5 LED lamps or 20 watt/household
Solar cell installer	<i>PT INTI</i> (state-owned enterprise)	<i>PT Galang Cipta Utama</i> for <i>PLTS</i> and <i>CV Mahawan</i> for SHS (private enterprise)



## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

Dimension	Sana Laok Village	Bajur Village
Duration of solar cell	10-12 hours/day (normally using)	10-12 hours/day (normally using)
Fee Charge	IDR 10.000/household/month for 2 units of <i>PLTS</i>	IDR 15.000/household/month for <i>PLTS</i> , and free of charge for SHS
Person in Charge	Operator at field (local people)	Operator at field (local people)
Important Figure	Nothing	<i>A Carek</i> , a bigwig of local village leader who responsible to manage solar cell
Main function of solar cell	Lamps only (no television, no refrigerator, and so on)	Lamps only (no television, no refrigerator, and so on)
Big problem	<i>Ngetol</i> behaviour (reave excessive electricity access surreptitiously) Flawed solar cell equipments due to minimal understanding and information to maintain it. Limitation of funding, information and public access in maintaining solar cell components	<i>Ngetol</i> behaviour (reave excessive electricity access surreptitiously) Flawed solar cell equipments due to minimal understanding and information to maintain it. Limitation of funding, information and public access in maintaining solar cell components

## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

### The *off grid* PLTS In Buaya Island Village



Buaya Island is small and remote island located in Alor Regency. PLTS was built in Buaya Island in 2017 with electricity capacity by 100 Kwp to lighten 228 households and public facilities. Each households receives electricity supply by 600 watt and must pay IDR 10.000/month for operating PLTS. It is built by Ministry of ESDM by appointing private company of PT Indo Elektrik as builder.

***PLTS is well working due to in guarantee time of solar cell manufacturer***



## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

### The Off Grid PLTS In Belemana Village



Belemana Village is mountainous area that does not receive electricity supply from PLN. PLTS was built in 2016 with electricity capacity by 20 Kwp to lighten 89 households and 4 public facilities. It was built by Ministry of ESDM by appointing a private company of PT Focus Indolighting

***PLTS is not working well since September 2017 due to flash attack while heavy raining***



## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

### Praktik PLTS *off grid* di Desa Tanglapui/Kaipera – Kabupaten Alor – Provinsi NTT



Tanglapui/Kaipera village is a new rural area located in mountainous area, it is new village occupied by local transmigrant. PLTS was built in 2016 with electricity capacity 30 Kwp to lighten 150 households. It was built by Ministry of Remote and Rural Area Development and Transmigration. Each household must pay by IDR 15.000/month to operate PLTS.

***PLTS is well working due to any disturbance***



## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

### The *on grid* PLTS in Oelpuah Village – Regency of Kupang –East Nusa Tenggara (NTT) Province



PLTS was built in Oelpuah village with capacity 5 MW and it is the largest centralised solar cell project in Indonesia. It was built by a PT LEN (state-owned company) and PT SEI (private company) in 2015 year. It is operated by PLN to supply electricity supply in Kupang area and its surrounding area. PLN utilises it as business project. It was built in the state border area between Indonesia and Timor Leste. ***PLTS is well working well due to presence of PLN***



## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

- The off grid Centralised solar cell (off-grid PLTS) built in rural or remote areas can sustain up to 2-3 year only. After the guarantee time provided by a solar cell manufacturer as builder of solar cell project is over (The guarantee prevail only 1 year maximally) , many troubles emerge of solar cell projects. Even, few of them are not working at all. It is caused by various factors like flash while raining, technical disturbance, thief of solar cell components by local people, and stealing/pilferage electricity power surreptitiously .
- Several off grid PLTS is sustainable (well working) because there is no technical disturbance like flash or thief. The sustainable off grid PLTS is not caused from awareness and capability of local people in rural areas in maintaining solar cell components, or not caused by government intervention or solar cell manufacturer as builder of project.
- Several off grid PLTS built without direct involvement from business operator like PLN will be not working, while on grid PLTS managed by PLN will be working well because it is directly connected to fossil-resource based energy. For example in on grid PLTS in *Oelpuah Village* – Regency of Kupang that is connected to PLN's electricity grid in *Timor* Island as central electricity source in Province of East Nusa Tenggara (NTT) .
- Local people at rural, hinterland, isolated areas are limited on funding, information and knowledge, access, and technological capability in maintaining PLTS

## 8. Limited Capability of Rural Community in Maintaining Solar Cell Project: Case Studies

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- Ministry of Energy and Mineral Resources (Ministry of ESDM) can guarantee repair and rejuvenate broken solar cell provided:
  - The guarantee is not over and it has not been handed over to local government. The period of handing over from The Ministry of ESDM to Local Government is about 2-3 years, while the guarantee time of solar cell components is 1 year. Actually, The Ministry of ESDM will repair or rejuvenate at least after 1 budget year . The first year is planning a, the second year is execution. But the problem like thief or increasing broken solar cell components is emerging, so the budget is not sufficient in repairing or rejuvenating solar cell components.
  - *Dirjen-EBTKE* at Ministry of ESDM and other related government agencies are present to deliver public service, business sector is reluctant to enter this area due to business consideration.
  - Private solar cell company plays role as manufacturer or builder of solar cell project only
  - PLN role as operator of using electricity from various sources (electricity provider in Indonesia). PLN is not separated from profit-oriented goal. For example: PLN focuses to build electricity grid on more than 30 kwp
  - Investment must more less IDR 100 million
  - It needs a non government organization to mentor and empower local people in operating and maintaining solar cell in rural areas

## 9. Recent Issues and Next Plans

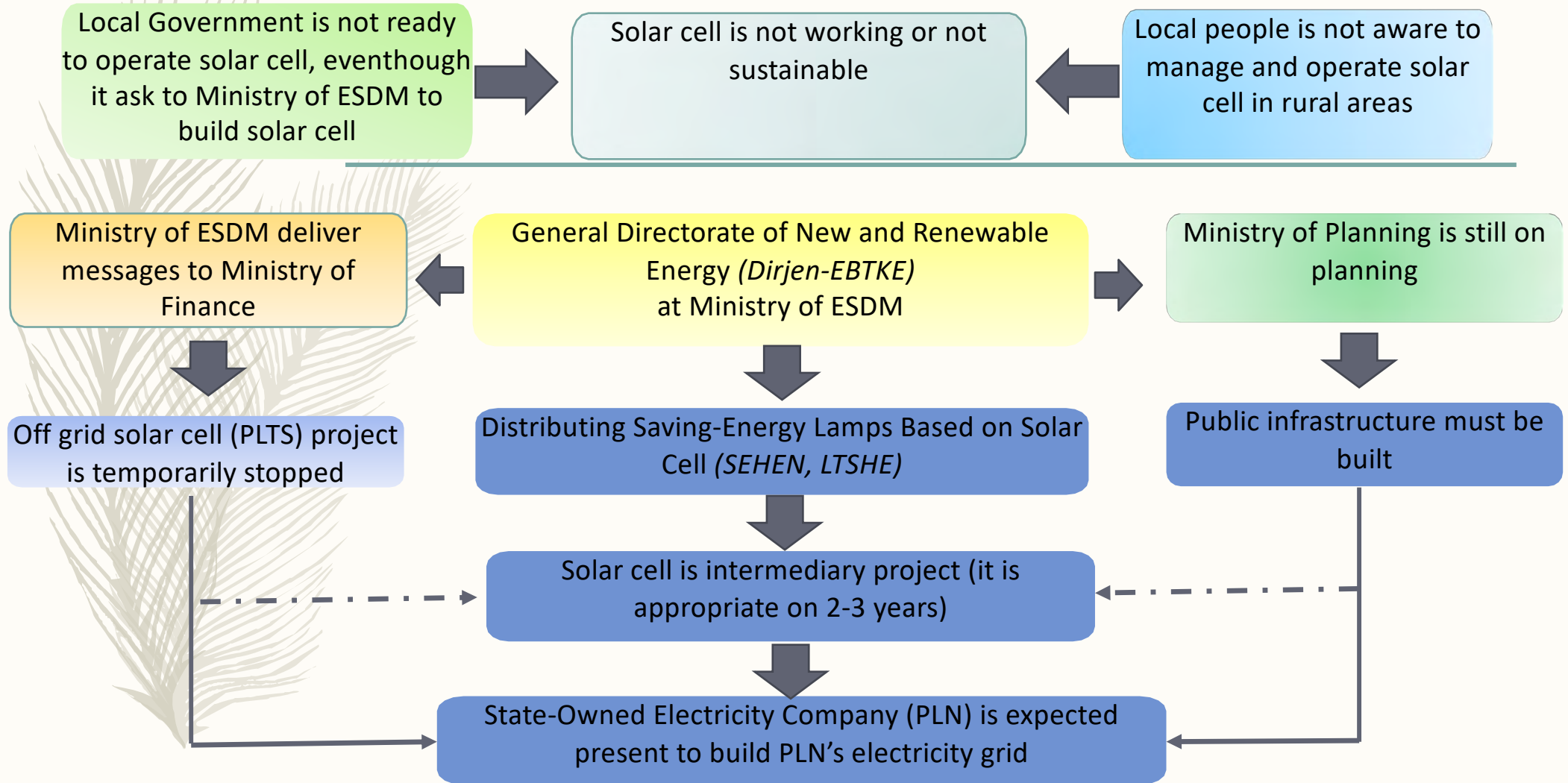
### Why is solar cell is not competitive in Indonesia ?

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- Investment of solar cells is costly (technology, components, land, public infrastructures)
- Solar cell components are available in big cities of Indonesia particularly in Java Island like cities of Jakarta, Surabaya, Bandung,
- In area where there are public good infrastructures like in Java Island or big cities, all electricity energy of enterprises and households are totally supplied by PLN. The main source of energy is derived from fossil fuel like coal and oil due to cost estimation (fossil-fueled energy is cheaper and easily implemented than solar cell energy). Besides, Government of Indonesia still subsidizes cost of fossil-fueled energy generated by PLN.
- Off-grid solar cell project built by Ministry of ESDM or other government agencies will be handed over to local government to be managed by local government. Due to it is not aimed to business goal, so that local government cannot sell electricity generated from solar cell energy to business enterprise. In this case, local government must manage solar cell project by local government funding, unfortunately, there is no special funding aimed to solar cell maintenance or operation. It is one of main reasons why solar cell project is broken or now working after 1-2 year at most.



## 9. Recent Issues and Next Plans



## 9. Recent Issues and Next Plans

How is appropriate mechanism to create fesible solar cell funding in Indonesia ?

How is proper mechanism to improve awareness of solar cell proect in Indonesia ?

- **Visiting to solar cell manufacturer(s) including on Indonesian Solar Cell Manufacturer Association/APAMSI in Bandung city – West Java Province (discussion).**
- **Discussing with governmental agencies like Ministry of Energy and Mineral Resources (Kementerian ESDM), Ministry of Remote and Rural Area Development and Transmigration (Kementerian PDT dan Transmigrasi), fiscal agency, solar cell expert(s), and other related agencies.**
- **If it is possible, visiting to solar cell sites (for example in Tanjung Hutan Village in Regency of Tanjung Balai Karimun in Riau Island Province ).**
- **Estimation of Research Time: End February 2019-End June 2019**
- **Research Method: Case study (Interview with key informants – staffs of government agencies, manufacturers, rural community/people, etc)**
- **Analysis of Research Result (Public Funding Scheme, Public Policy on Energy Sector and Rural Development, Local People Empowerment).**

# THANK YOU

