



# Final Report

## Pilot Project Management of the Off-Grid Solar PV Power Plant (PLTS) (RUMI Model)

July 2018



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**Bekerja sama dengan:**



Directorate General for New,  
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## Issue

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## Abbreviations

AD/ART	Article of association
BUMDes	Regional Owned Agency
CSR	<i>Corporate Social Responsibility</i>
CEFE	<i>The Competency based Economies through Formation of Entrepreneurs</i>
EnDev	<i>Energising Development</i>
EBTKE	New Renewable Energy and Energy Conservation
GIZ	<i>Deutsche Gesellschaft für Internationale Zusammenarbeit</i>
ESDM	Energy and Mineral Resources
KESDM	Ministry of Energy and Mineral Resources
KK	Family
KLU	North Lombok District
KPDT	Ministry of Development of Disadvantages Regions
KSU	Multi business Cooperative
KUKM	Cooperative of Small Medium Enterprise
KUR	People Business Credit Program
kWp	<i>kiloWatt peak</i>
NTB	West Nusa Tenggara
Pemda	Local Government
PJU	Public Lighting
PLTS	Solar PV Power Plant
Puskesmas	Public Health Center
Pustu	Supporting Public Health Center
Riset Dikti	Ministry of Research, Technology and Higher Education
RKP	Government Work Plan
RPJMDes	Village Medium Term Development Plan
SAMOTA	Teluk Saleh, Pulau Moyo, dan Gunung Tambora
SKPD	Regional Work Unit
SDM	Human Resources
TPLD	Village Electricity Management Team
TSP	<i>Technical Support Provider (Penyedia Layanan Teknis)</i>
UKM	Small Medium Enterprises
WUB	New Entrepreneur



## Forewords

RUMI Model or Management Model of Off-Grid Solar PV Power Plant is a pilot project that was conducted by GIZ for eight (8) months through EnDev Indonesia project in collaboration with Directorate General of New Renewable Energy and Energy Conservation (DG NREEC), under Ministry of Energy and Mineral Resources (MEMR), Local Government of West Nusa Tenggara Province (WNT), and Transform Agency.



The projects which are implemented at four (4) locations in 2017, were aiming to develop an off-grid PLTS management model that involves not only Solar PV Power Plant management and government agencies who are dealing directly with the construction of the Off-grid Solar PV Power Plant, but also with government agencies whose duty is to improve the living standards of rural communities

Thus the RUMI Model works not only at the community level of the off-grid Solar PV Power Plant recipient, but also at the district and provincial levels, through the collaboration with stakeholders consisting of local government, universities, vocational schools, and local technicians. The RUMI Model views that the sustainability of off-grid Solar PV Power Plant operation is not only the duty and responsibility of the technical service who provides the power plants, but all stakeholders.

This based on the facts that a number of off-grid Solar PV Power Plant that were built had short life time due to the lack of well management as the result from the minimal resources of the remote villages, such as the low education level, difficult road acces, limited communication tools and low income. To make matter worse, the accessible local Solar PV Power Plant technicians are also limited.

On the other hand, these remote Solar PV Power Plant villages have considerable potential to increase the welfare of their people. Thus, the development of off-grid Solar PV Power Plant should be done integrately with other village development programs, in order to increase the capacity and welfare of the people at the villages who receive the Solar PV Power Plant to maintain the sustainability of Solar PV Power Plant's operation.

It is expected that RUMI model can be the approach model for the implementation of rural villages electrification program, so that the development of more than 600 off-grid Solar PV Power plant with capacity of 1 to 150 kWp can contribute significantly to achieve the electrification ration target of 97,7% in 2019 which was proclaimed by the Government of Indonesia.



# CONCEPT AND APPROACH OF RUMI PROJECT MODEL

In general the development of off-grid Solar PV Power Plant is understood as an effort to meet the electrification for the remote, isolated and poor areas that only pays attention to the technological aspects. In reality, there are other requirement to be concerned about to ensure that off-grid Solar PV Power Plant can operate in long term, such as:

1. The existence of an accountable and professional legal institution.
2. The ability of the people to pay the agreed tariff.
3. The existence and the ease of accessing the local technicians for the management.
4. The existence of good road or transportation and communication access to facilitate the management and maintenance of Solar PV Power Plant or to encourage the development of village's economy.

Broadly speaking, the ideal conditions that are expected in the management of off-grid Solar PV Power Plant can be seen in the diagram below::

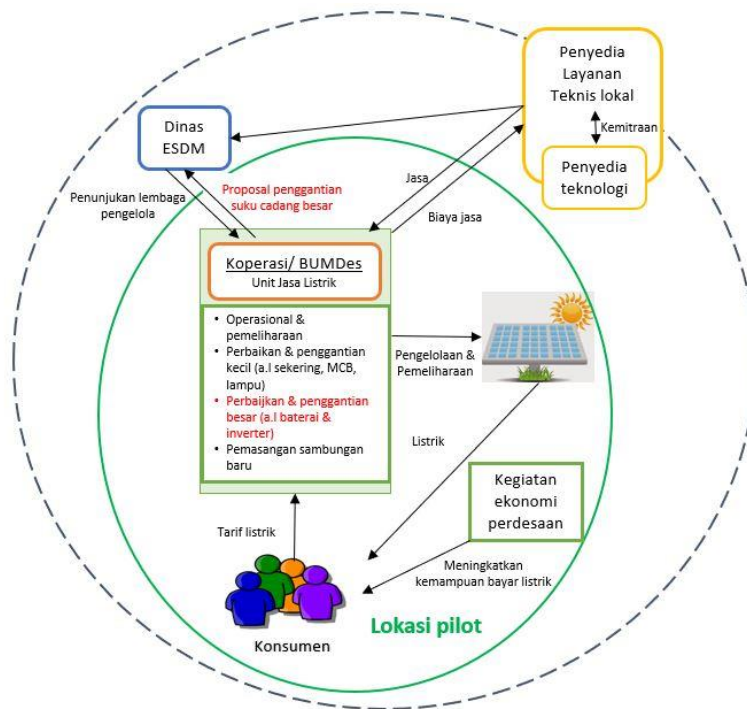


Diagram 1 Concept of off-grid Solar PV Power Plant management model

Based on this understanding RUMI was designed to empower the receipt community in order to be able to manage their Solar PV Power Plant independently. Giving that the cooperation of various stakeholders is needed to reach this objective, RUMI model took two way approach as seen in the diagram below:

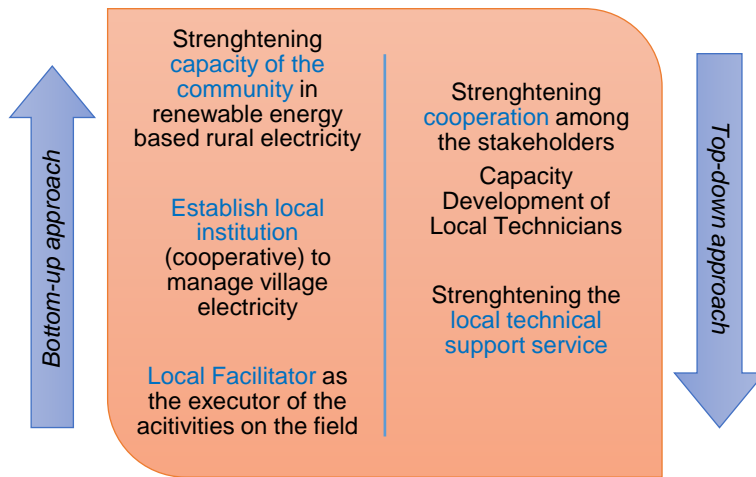
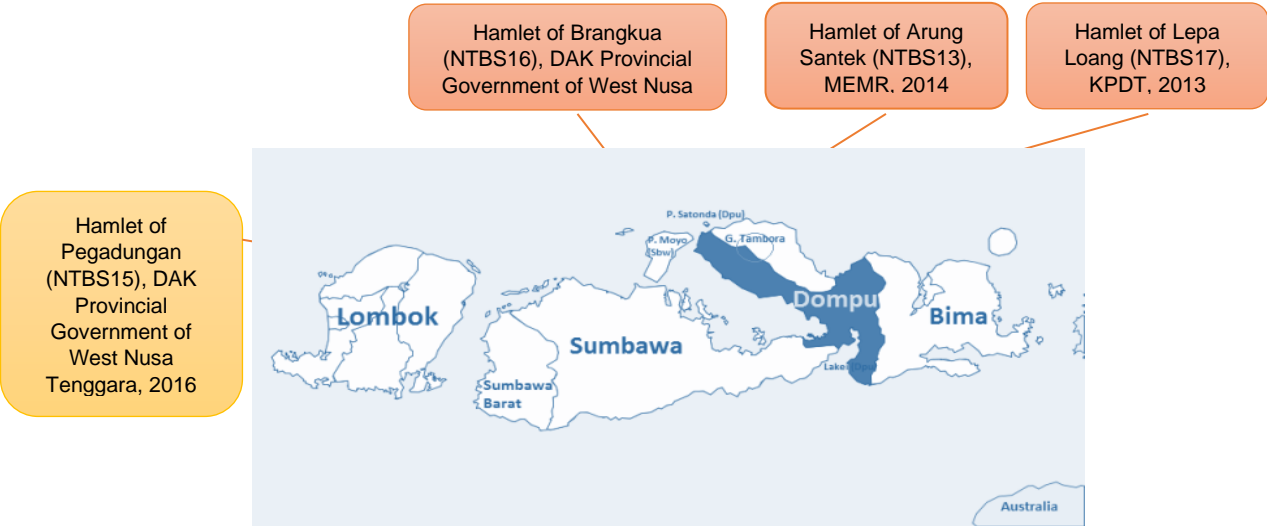


Diagram 2 RUMI Model project's approach

# GENERAL DESCRIPTION OF RUMI MODEL PROJECT'S LOCATIONS

RUMI Model project was implemented at four hamlets in North Lombok and Sumbawa Regency, West Nusa Tenggara Province.



Map 1 RUMI Model Project Locations

## A. Utilization and Management Pattern of off-grid Solar PV Power Plant

In general there is no difference in the utilization pattern of the off-grid Solar PV Power Plant at the four hamlets, especially for the home lighting in addition public facility and public road lighting, as we can see in the table below::

Table 1 Utilization Patterns of the off-grid solar PV Power Plant

Hamlet	Capacity of Solar PV Power Plant (kWp)	Connected Family	Public Lighting	Public Facilities			
				Schools	Mosques, Temples	Meeting Hall	Puskesmas, Pustu
Hamlet of Pegadungan, North Lombok	30	79	10	0	2	0	1
Hamlet of Brangkua, Sumbawa	30	105	50	1	1	1	1
Hamlet of Arung Santek, Sumbawa	15	104	52	1	1	1	0
Hamlet of Lepa Loang, Sumbawa	10	63	0	1	1	0	1

Solar PV Power plant at the four hamles were already operational when the RUMI project was started, and the management was carried out informally by Village Electricity Management Team (TPLD). Every location has different operational hours as follow:

1. At **Hamlet of Pegadungan** and **Hamlet of Arung Santek**, Solar PV Power Plant operate from 17.00 to 06.00 the next day. However, Solar PV Power Plant is operated should electricity is required when there is cultural event or social activities during the day.
2. At **Hamlet of Brangkua** and **Hamlet of Lepa Loang**, Solar PV Power plant operates 24 hours from 06.00-17.00, with two (2) times electricity cut off schedule a week during the day. The electricity cut off schedule at both of the hamlets take place on Saturday and Tuesday for the system maintenance purpose. However should there are celebrations need to be carried out by the resident, Solar PV Power Plant will be operated according to the rules agreed by all the residents.

## **B. Transportation and Communication Access**

Hamlet of Pegadungan in North Lombok district and the three hamlets at Moyo Island Sumbawa district have different level of difficulties in terms of transportation access.

Hamlet of Pegadungan, which is located  $\pm$  106 km away from Mataram, at hillside of Mount Rinjani can be reached by car or motorbike in approximately 2,5 hours. The road condition is good, paved with hotmix asphalt. This 4 km asphalt road as the entering access to the Hamlet of Pegadungan was recently built by the government of North Lombok District in November 2017. Previously the road was only a bumpy and rocky dirt road that will allow cars to drive at only 10 km per hour.



*Access road to Hamlet of Pegadungan before and after the paving work with hotmix asphalt*

The access from city of Mataram to the location of Solar PV Power Plant at the three hamlets in Labuhan Aji Village, Moyo Island must be taken in about 2 days in the following way:

1. City of Mataram to city of Sumbawa Besar: by car (1 day trip) or by plane (30 Minutes and 3 flight schedules a day).
2. City of Sumbawa Besar to the three hamlets of Solar PV Power Plant (located closed to each other):



*Access to three hamlets in Moyo Island Sumbawa*

- By regular fishermen boats that sail once a day at 13.00 o'clock. Trip will take about 2 hours. Once arrived to the village center at Moyo Island's west coast, the trip to the three hamlets at the east coast is continued with 2 hour motor bike ride crossing the forest in between the east coast and west coast. This

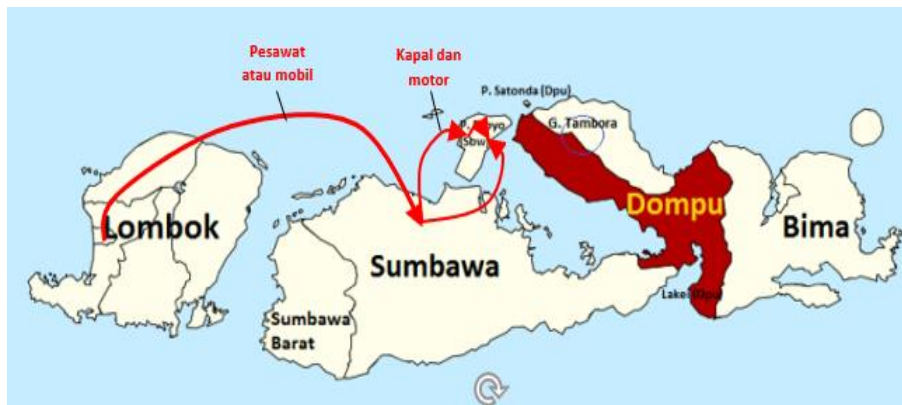
connecting road is steep rocky at some spot that make it so difficult to pass during the rainy season, whilst very dusty during the dry season. The motorbike (ojek) ride costs about Rp 200.000 per trip.

- By renting motorboat that cost about Rp 3 millions. The trip duration using the motorboat is about 1 hour when the see is calm.
3. The government has established 2,5 meters wide cement road along the east coast line of Moyo Island for connecting the three hamlets.



Connecting road for the three Hamlets at Moyo Island

The difficult access of transportation hampers the village development process. Meanwhile the four hamlets can receive good cellphone signal for communication access.



Map 2 Transportation access to the three hamlets in Moyo Island

### C. Profile of the People and Natural Resources

The people living in the four hamlets are farmers who mostly live below the welfare line, even though the standard of living in Pegadungan village can be said better due to the easier road access. Based on the village potential data in 2015, the distribution of poverty rates per hamlets is as follows:

Table 2 Poor people data in four hamlets RUMI Model Project

Hamlets	Number of Family	Poor Family	% Poor Family
Pegadungan	792	557	70,33
Brangkua	125	99	79,20
Arung Santek	111	70	63,06

The high level of poverty in these four hamlets is caused by several things including the dry agricultural land and the lack of basic infrastructure such as roads, irrigation, market and health facilities. The commodities planted by the farmers in the four hamlets in general are the same, as can be seen below:

*Table 3 Agricultural commodities in four hamlets RUMI Model Project*

Hamlet of Pegadungan		Hamlet of Brangkua, Arung Santek and Lepa Loang	
Food crops	Plantation	Food crops	Plantation
Rice, corn, nuts	Cashew, coffee, chocolate, coconut, banana, teak, mahogani	Red rice, sesame seed, tuber plants	Cashew, coconut, banana, teak, mahogani

Those plants except the wood plants are harvested once a year and sold as the raw material to the collectors or the middlemen who come to the hamlet. However there are some farmers who sell their harvest to the market. The reason for the farmers to sell their harvest is because they do not possess the skills and expertise to process their harvest in to semi-finished or finished goods.

Special case in Moyo Island, the people also rely their income on harvesting honey in the forest around their hamlets. The honey harvesting is done two times a year in May-June and November-December. The surprising things is that eventhough Moyo Island in general is surrounded by sea with the highest fishing potential in West Nusa Tenggara, almost all of the people in those three hamlets of Moyo Island do not possess culture in fishing. There are only small number of people in Hamlet of Lepa Loang go fishing. However this activity is done after they finish farming and with the purpose to meet daily consumption for the family. Beside farming, small number of the people earn their living from working as the farm labor, public and private employees, and as a trader in small stalls or kiosks.

Unlike in Moyo Island, the people in Hamlet of Pegadungan are very familiar with savings and loan economic institutions. There are five (5) savings and loan group managed by the women communities, and one (1) savings and loan group managed by the men communities, as follow:

*Table 4 Savings and loan group in Hamlet of Pegadungan*

Name of Group	Managed by	Members	Group's Saving
<b>Keluarga Harapan group</b>	Women	10 people	Rp 6.500.000,-
<b>Gunung Rinjani group</b>	Women	10 people	Rp 4.500.000,-
<b>Puspa Harum group</b>	Women	10 people	Rp 3.600.000,-
<b>Kuak Manis group</b>	Women	10 people	Rp 3.000.000,-
<b>Muda Maju group</b>	Men	20 people	Rp 23.000.000,-



## RUMI MODEL ACTIVITIES AND ACHIEVEMENT

RUMI Model activities are divided into three main stages, which are (A) project preparation, (B) project implementation, and (C) project closing. During the planning stage, the result expected to be achieved are:

- To establish cooperation among the related stakeholders in West Nusa Tenggara Province.
- To establish two (2) cooperatives or Regional Owned Agency to manage the Solar PV Power Plant.
- Increasing the number of business group in local commodity processing.
- Availability of trained technicians who can be accessed easily and quickly by the Village Electricity Management Team.
- The participation of women in the management and development of small business.



### A. Project Preparation

During this stage the conducted activity was socialization of the concept and approach of RUMI Model to all the related stakeholders through the series of visits and discussions to receive support towards the project implementation. During this process, the stakeholders studied the targetted locations of the project together.

On 16 May 2017, join agreement between The Government of West Nusa Tenggara Province and GIZ was signed. One (1) location in North Lombok District (Hamlet of Pegadungan in Sambik Elen Village) and three location in Moyo Island, Sumbawa District (Hamlet of Brangkua, Hamlet of Arung Santek, and Hamlet of Lepa Loang in Labuan Aji Village), were agreed to be the locations of the pilot projects.



### B. Project Implementation

RUMI Model project was implemented through various of activities such as workshops, training for stakeholders and training for the Solar PV Power plants managers. Moreover, field facilitation mainly related to (1) tranformation informal groups into formal institution for managing Solar PV Power Plant, (2) developing SMEs, and (3) increasing active participation of women in all the RUMI Model's activities. Community facilitation and asstance were carried out simultaneously since the begining of the project until the project ended both formally (group meetings and villages meetings) and informally (small discussions).



## 1. Capacity Development of Stakeholders

This stage was started with **Workshop “The Mapping of Stakeholder’s Role and Support in the Sustainability of off-grid Solar PV Power Plant Management”**, which aimed to get agreement on the problems faced in Solar PV Power Plant management, what solutions to be taken, and what contributions can be given by the stakeholders to solve the problems. This workshop was attended by 28 participants from the provincial and district apparatus, universities, chief of the village, chief of the hamlets as well as the Village Electricity Management Team in all four hamlets.

The workshops has produced an agreement on the problems and proposed solutions in Solar PV Power Plant management which will be used as the reference when all the parties are planning the supports to provide. Detail of the agreement can be seen in the table below:

*Table 5 Agreement Result in the Workshop*

	EXISTING PROBLEM	SOLUTIONS PROPOSED
<b>A. TECHNICAL FACTOR</b>		
1	<ul style="list-style-type: none"> <li>▪ <b>Illegal electricity connection</b></li> <li>▪ Excess use of electricity.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Need for enforcement of regulation and supervision.</li> </ul>
2	<ul style="list-style-type: none"> <li>▪ <b>Spare parts are not locally available</b></li> <li>▪ <b>Lack of support from the local government</b> to encourage the procurement of local sparepart.</li> </ul>	<ul style="list-style-type: none"> <li>▪ To form cooperative unit for supplying spare parts</li> <li>▪ To communicate with the spare part supplier cooperatives in Lombok (if any)</li> </ul>
3	<ul style="list-style-type: none"> <li>▪ <b>Lack of technical assistance</b> for the Village Electricity Management Team.</li> <li>▪ <b>Lack of technical knowledge</b> of the Village Electricity Management Team, especially the operators.</li> <li>▪ <b>Unavailability of local technicians</b> that can be quickly accessed by the operators.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Capacity development of the Village Electricity Management Team and the technicians of the Solar PV Power Plant technicians (training).</li> </ul>
4	<ul style="list-style-type: none"> <li>▪ <b>Lack of tools</b> to check the batteries and other components of Solar PV Power Plant.</li> <li>▪ Tools price is relatively expensive.</li> <li>▪ Limited amount of cables and energy limiter for new installation.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Contribution needs to be adjusted.</li> <li>▪ Increase the income and the purchasing power of the people.</li> <li>▪ Extend the warranty period.</li> </ul>
<b>B. ORGANIZATION FACTOR</b>		
	<ul style="list-style-type: none"> <li>▪ <b>Village’s budget or Regional Government Budget are not directly reach the electricity program.</b></li> </ul>	<ul style="list-style-type: none"> <li>▪ The people need to propose the budget for the maintenance of the Solar PV Power Plant through Village Musrenbang (which can not be funded by the savings of the the Village Electricity Management Team).</li> </ul>
2	<ul style="list-style-type: none"> <li>▪ Lack of awareness of the people to join an organization.</li> <li>▪ The conflict among the people.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Counseling and socialization of Solar PV Power Plant and its management.</li> </ul>
3	<ul style="list-style-type: none"> <li>▪ <b>The management agencies are not accountable.</b></li> <li>▪ Management agencies do not have the article of association and are not yet legal entities.</li> <li>▪ The discussions to reach agreement on the use of electricity are not yet optimal.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Management agencies must be encourage to become an accountable legal entity.</li> <li>▪ The formed agencies must be nurtured by related institutions.</li> </ul>

- 4
  - **Organization’s managers are not trained** technically or managerially. Thus their knowledge is lacking.
  - **Low ability** of the **network** managers.
- 5
  - The payment of the contribution is not smoothly done.

- Capacity development of the agencies managers.
- Human resources capacity development for the managers of the organization.
- Training and mentoring.
- Encourage the implementation of “*awig-awig*”.
- Contribution payment need to be adjusted with the income pattern.
- To form weekly social gathering (arisan) on electricity for women.
- Application of sanctions.

### C. ECONOMIC FACTOR

- 1
  - **Lack of operation and maintenance cost.**
- 2
  - Lack of knowledge and information regarding the operation and maintenance.
  - Lack of information on Solar PV Power plant’s financing.

- Increase the amount of the contribution.
- Encourage the preparation of budget plan for maintenance, spare part purchasing, salaries for the managers of Solar PV Power Plant, etc.
- Human resources capacity development of the management.
- Capacity development of the institution.
- Provide information on maintenance and spare parts cost.
- Network with private parties (CSR, KUR).



- 3
  - **Added value of the product is still low**
  - **Number of the business owner still low**

This resulted:

- Low economic level.
- Lack of people’s income.
- Unstable people’s income.

Potential that can be developed:

- The mainstay product of chasew on average 200 kg per family, a total of 20 tons per village.
- Income every family from sesame, honey, cashew about Rp 2-6 millions per season.

- Establish business entity (cooperative).
- Capacity development of product processing.
- Mentoring from related local government agency (Plantation office).

### D. ENVIRONMENTAL FACTOR

- 1
  - **Transportation access** to get the spare part and to sell the business product is difficult and expensive
- 2
  - **People understanding** is still low.
  - Lack of education facilities.
  - Lack of activeness of the people.

- Improvement of transportation infrastructure.
- Form cooperatives that supply the spare part.
- Counseling and Socialization.
- Increase reading/media for independent learning.

- 3
  - Strong wind 2x in 1 year affects electricity distribution and produce corrosion.
  - Establish network with people around the Solar PV Power Plant.
  - Corroton protection for the components.

The workshop was continued with **Training on Introduction to off-grid Solar PV Power Plant** which was attended by the same participants. This training for the stakeholders has increased the knowledge and understanding of the technical and management aspect of off-grid Solar PV Power Plant. This understanding is very helpful for the stakeholders in planning their contribution to encourage the sustainability of solar PV power plant’s management.

## 2. Capacity Development of Village Electricity Management Team and people who receive the off-grid Solar PV Power Plant

In the field level, RUMI Model carried out 2 types of capacity development which related to the technical and management aspect of the Solar PV Power Plant, as well as the entrepreneurial aspect. Both capacity development was carried out in form of training field assistance.

**Technical and management capacity development** was carried out through “Operation, Maintenance, and Management training of off-grid Solar PV Power Plant” in two (2) locations which ara Hamlet of Pegadungan, Lombok Utara District and Hamlet of Arung Santek, which are the hamlets located between the hamlets of Brangkua and Hamlet of Lepa Loang in Moyo Island, District of Sumbawa.

The training was attended by the member of all male Village Electricity Management Team and five (5) female representatives from each hamlet. The purpose of this training is to equip the participants with knowledge and ability in operating and maintaining the Solar PV Power Plant properly, as well as the knowledge about cooperative and gender equality. The woman participation in this training is to encourage women to actively participate in the management of Solar PV Power Plant. The final result of the test showed that 60% of the participant has increased their knowledge

Currently the managers of Solar PV Power Plant are able to do their job well. The operator are also able to detect the source of failure in the component of solar pv power plant and fix the minor damage. However the operator still having the difficulties in technical skill needed for the major damages, beside that they do not possess adequate equipments and the great distance of the solar pv power plant’s spare part component sales center. Therefore the availability of the more accessible local technicians is very needed.



**Entrepreneurship capacity development** is carried out through “ Small Medium Enterprise Development Training” conducted after the training of operation, maintenance and management of Solar pv power plant is finished. This SME training was attended by some participants from the previous training, and the rest were the SME entrepreneurs who have started their business. The goal of this training is to encourage

village’s business development through development of entrepreneurial capabilities in an effort to increase people’s payability for the electricity contribution.

Like all the technical and management training of solar pv power plant, this training used the training approach for adults. The training method adopted the CEFE<sup>1</sup> method that allows the participants to understand problems and look for the solutions in the entrepreneur world easily. The stages of CEFE included learning from the experiences that was packed into role play and simulations. The training materials includes: (1) basing entrepreneurial attitudes, (2) maeketing, (3) creativity in entrepreneurship, (4) production management, (5) product development, and (6) financial management.

Beside the SME training carried out in RUMI Model, Cooperative Office, Idustrial Office and Trade Office and SME of North Lombok District also carried out a **technical training on making cakes using local ingredients**, that took place in the office all of Sambik Elen Village, District of Bayan.



This training was attended by 25 women and men from Hamlet Pegadungan and intended for (1) diversivication of local food processing and to (2) increase technical ability of the business owner in making local ingredient based cake like from sweet potato and cassava.

After the training is completed, the participant tried to practice their skill and bought the cooking utensils with their group members by making contribution of Rp 30.000 per person. The participants also began to try making the cake to be sold around. The cakes made by the training participants were also served as the dish during the visit of GIZ group to hamlet of Pegadungan in 21 July 2017.

Overall result of this training is that the participants, both those who have run SME before or those who have just started the business, can successfully develop their business which can be grouped into several business type, as follow:

Table 6 Number of SME before and after RUMI Model Project

	Old Business	New Business	Old Business	New Business	Old Business	New Business	
Hamlet of Pegadungan	4	6	0	11	0	0	21
Hamlet of Brangkua	5	1	1	2	0	0	9
Hamlet of Arung Santek	5	1	0	0	0	0	6
Hamlet of Lepa Loang	5	0	2	1	0	2	10
<b>TOTAL</b>	<b>19</b>	<b>8</b>	<b>3</b>	<b>14</b>	<b>0</b>	<b>2</b>	<b>46</b>



Furthermore, there are ten people consisting of one (1) man and nine (9) women from Hamlet of Pegadunagan submitted proposal for New Entrepreneur (WUB) to local government of Lombok Utara District. This WUB program is flagship program of Government of North Lombok District that aims to help the people who want to develop SMEs. From the verification result of the assessment team, the ten people were declared to be eligible to receive individual capital assistance of Rp 3 millions in 2018.



*Some of the small business owner in the village*

### 3. Off-grid solar PV power plant technical capacity development for the technicians in West Nusa Tenggara

This technical training is the first steps in the effort of building the professional Technical Service Provider (*Technical Support Provider/TSP*) in West Nusa Tenggara. The purpose of this effort is to provide the local technicians who can be easily accessed by the managers of solar PV power plant should there is failure in their system. In the future this effort will be realized through partnership among experienced companies in solar PV power plant with the local technicians.

This training of technicians was attended by 45 participants from individual technicians and representatives from five (5) companies in West Nusa Tenggara. The training was divided into two major themes which are (a) business opportunities for renewable energy service, and (b) technical training for maintenance and repair service of solar PV power plant. There were two programs during the theme of business opportunity which were in the form of seminars and workshop that discuss the partnership scheme for technical service units. Whereas during the technical theme, the technicians were trained on the maintenance and repairing of off-grid solar PV power plant.



*Introduction from Office of Energy and Mineral Resources North Nusa Tenggara Province (left), One of the sessions during the training for local technicians (right)*

#### 4. Strengthening the institutional management of off-grid solar PV power plant

At the beginning of the RUMI Model Project, off-grid solar PV power plant in the four hamlets were managed informally by the Village Electricity Management Team. This informal institution form needs to be formalized to have the strong legality and high accountability. This is important in the effort to increase the management quality of the solar PV power plant and strengthen the people and stakeholders' trust towards the institution's performance.



*Facilitation and counseling process of the cooperatives*

There are two options offered in the contexts of transforming Village Electricity Management Team into formal institutions which are: cooperative and Regional Owned Agency (BUMDes). From series of village meeting attended by the traditional leaders, chief of the hamlets, Village Electricity Management Team, and the people in four hamlets of the solar PV power plant's location, an agreement was achieved to form cooperative to replace the Village Electricity Management Team. The people preferred cooperative since they want an institution that can increase and help to improve their hamlet's economy, and institution that are managed and owned by the people itself.

The establishment of the cooperative received full support from the chief of Sambik Elen and Labuhan Aji villages. The chief of Labuhan Aji village even join as the member of the cooperative in Hamlet of Arung Santek. Other supports also come from the Office of Cooperative, Industry, Trade and SME of North Lombok and Sumbawa Districts, as well as Office of Cooperative and SME of West Nusa Tenggara Province. The names of the multi-business cooperative (KSU) in each hamlets are:

1. KSU Cahaya Surya Pegadungan, Hamlet of Pegadungan, North Lombok District
2. KSU Arung Pulau Moyo, Hamlet of Arung Santek, Pulau Moyo, Sumbawa District
3. KSU Karya Mitra Brangkua Mandiri, Hamlet of Brangkua, Pulau Moyo, Sumbawa District
4. KSU Karya Moyo Utama, Hamlet of Lepa Loang, Pulau Moyo, Sumbawa District

Through the meetings during the forming of the cooperatives, it was agreed that the amount of the principal deposit and mandatory deposit that will be used as the capital of the cooperatives are as follow:

*Table 7 Contribution composition of the member of cooperatives*

Name of the Cooperative	Deposit		Members
	Principal deposit (in Rp)	Mandatory deposit (in Rp)	
1. KSU Cahaya Surya Pegadungan	1.000.000	20.000	23
2. KSU Arung Pulau Moyo	500.000	250.000	20
3. KSU Karya Mitra Brangkua Mandiri	500.000	5.000	24
4. KSU Karya Moyo Utama	750.000	5.000	20

At the end of RUMI Model project implementation, the status of those cooperatives are as follow:

*Table 8 Legal aspects status of the cooperatives in the four hamlets*

Cooperative	Status
KSU Cahaya Surya Pegadungan	Notarial Deed No 23 year of 2018 and Permit for Establishment of Cooperative from Ministry of Cooperative of Small Medium Enterprise No: 007728/BH/M.KUKM.2/III/2018
KSU Arung Pulau Moyo	Notarial Deed and permit from Ministry of Cooperative of Small Medium Enterprise are still in the process
KSU Karya Mitra Brangkua Mandiri	Collection process of the principal and mandatory deposit
KSU Karya Moyo Utama	Collection process of the principal and mandatory deposit

The obstacles encountered during the approval process of the cooperatives are as follow:

1. Cash collection for the principal and mandatory deposit did not run smoothly due to the member of the cooperatives must wait until the harvest time from their field.
2. Many of the people interested to become member do not have enough money to contribute for the principal and mandatory deposit. Mandatory deposit that must be paid every month is considered difficult by the people due to their uncertain income.
3. The people’s desire to receive capital assistance from the government.
4. The main obstacles lay upon the people’s welfare that are still low, especially in three hamlets of Moyo Island. This is due to the lack of economic infrastructure like transportation and market.



Below is the organizational structure of the KSU in four hamlets:

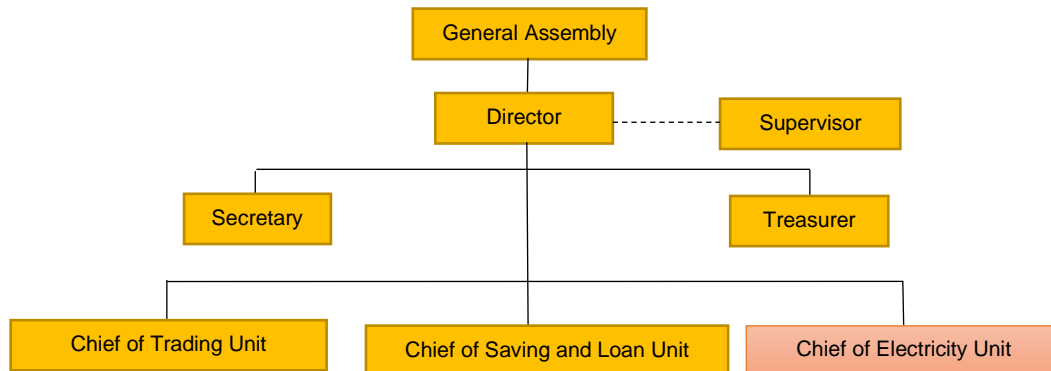


Diagram 3 Organization Structure of Multi-Business Cooperative

During the establishment process of the cooperative, the people also carried out discussion regarding the electricity tariffs. Based on the calculation result towards the fund requirement for operational and maintenance of solar PV power plant and consideration towards low payability of the costumers, the two hamlets agreed to increase the electricity tariffs. The increament was not large, but it shows that there is already awareness and ability of the Village Electricity Management Team to calculate electricity rates. The results are as follows:

Table 9 Electricity Tariffs of the off-grid solar PV power plants

Location	Electricity tariff at the beginning of mentoring (Rp)	Electricity tariff at the end of mentoring (Rp)	Number of Member (families)
Hamlet of Pegadungan	10.000	10.000	79
Hamlet of Brangkua	15.000	15.000	105
Hamlet of Arung Santek	10.000	15.000	104
Hamlet of Lepa Loang	10.000	15.000	63

Furthermore, the chosen cooperative manager are also given training related to the financial administration, so that they have technical ability in doing the book keeping and financial reporting system.

## 5. Strengthening the women role and gender equality

RUMI Model encouraged women participation in the implementation of training at the community level by stipulating that every village must send five (5) women to every training carried out. Prior to the trainings, a series of socialization activities on gender equality were also carried out through poster titled “Work without Gender Boundaries”. Beside posters, the facilitators also carried out approach and mentoring to the people in the four hamlets of solar PV power plant.

These efforts has succeeded to encourage the women participation in various activities, from attending the socialization activities to sumbitting the establishment of cooperative to the notaries. However the level of

participation decreases during the implementation of activities that require special skills and knowledge. At the end, only nine (9) women take place in the management structure of the off-grid solar PV power plant.



Posters about gender equality

Beside the ability factor, the women’s level of attendance was also influenced by the factor of formal and informal leaders. In Hamlet of Pegadungan and Lepa Loang, the influence had positive impact because the level of participation in those two hamlets were the highest compared to the other hamlets. In the hamlets of Dusun Brangkua and Arung Santek, the existing culture gives the dominant role to men. The comparison of the total attendance of women and men in meetings and training during the implementation of the RUMI Model project in the four hamlets is presented in the diagram below:

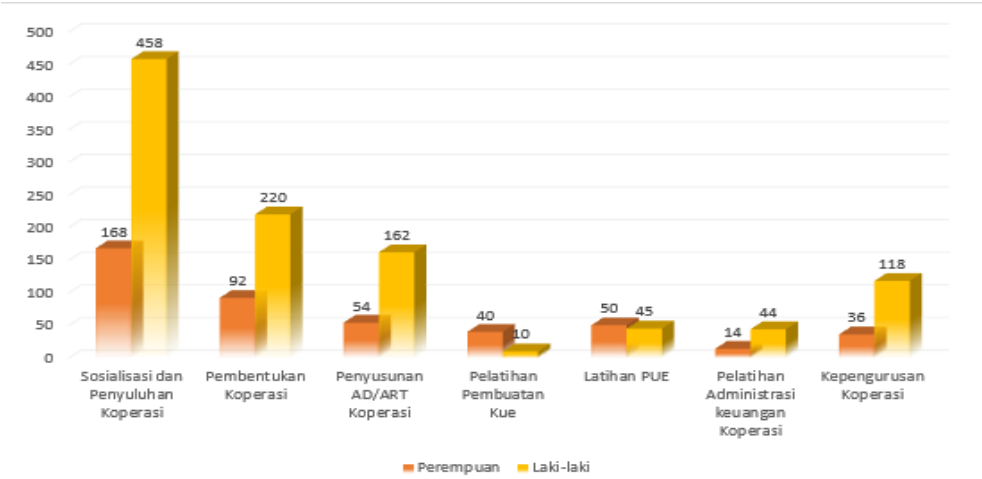


Diagram 4 Total attendance of women and men during the implementation of RUMI Model project

Whereas the participation of women in management of cooperatives are as follow:

*Table 10 Women participation in the management of the cooperatives*

Position	KSU Cahaya Surya Pegadungan (Hamlet of Pegadungan)	KSU Karya Mitra Brangkua Mandiri (Hamlet of Brangkua)	KSU Arung Pulau Santek (Hamlet of Arung Santek)	KSU Karya Moyo Utama (Hamlet of Lepa Loang)
Supervisor	-	-	-	-
Director of Cooperative	-	-	-	-
Secretaries	-	-	-	1
Treasurer	1	1	-	-
Manager	-	-	-	-
Trading Unit	-	-	1	2
Savings and Loan Unit	-	1	1	1
Electricity Unit	-	-	-	-
<b>Total</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>4</b>

Long time and facilitation process are indeed needed to realize the women's level of participation well in every aspect of the activities. However the RUMI Model which lasted only eight (8) months already provided the basic knowledge and understanding regarding the importance of women and men to work together in managing and maintaining the solar PV power plant that provides lighting to their hamlets.

The entire workshop and training carried out during the implementation period of RUMI Model pilot project can be seen in table below:

*Table 11 Workshop and training activities during the implementation of RUMI Model projet*

No	Type of Training	Time	Implementer
1	Workshop on "Role and Support Mapping of the Stakeholder on the Sustainability of Mini Grid Solar PV Power Plant Management in North Lombok and Sumbawa" and training on "Introduction of Mini Grid Solar PV Power Plant"	17 May 2017	Local Government of West Nusa Tenggara, GIZ, Transform Institution
2	Training on "Introduction of Mini Grid Solar PV Power Plant"	18-19 May 2017	Local Government of West Nusa Tenggara, GIZ, Transform Institution
3	Training on "Operasional, Maintenance, and Management of off-grid solar PV Power Plant", at hamlet of Pegadungan, North Lombok District	4-5 September 2017	Local Government of West Nusa Tenggara, GIZ, Transform Institution
4	Training on "SME Development", at Hamlet of Pegadungan, North Lombok District	6-8 September 2017	Local Government of West Nusa Tenggara, GIZ, Transform Institution
5	Training on "Operasional, Maintenance, and Management of off-grid solar PV Power Plant" for three Hamlets of Arung Santek, Moyo Island	25-26 September 2017	Local Government of West Nusa Tenggara, GIZ, Transform Institution
6	Training on "SME Development" for three hamlets at Hamlet of Arung Santek, Moyo Island.	27-29 September 2017	Local Government of West Nusa Tenggara,

			GIZ, Transform Institution
7	Technical training on off-grid Solar PV Power Plant for technicians, students, and electrical companies in west nusa tenggara province	4-6 December 2017	Local Government of West Nusa Tenggara, GIZ, TML Energy
8	Technical Assistance on “Local Ingredients based Processed Food” at Hamlet of Pegadungan, North Lombok District	11 July 2017	Office of cooperatives, Industry, Trade and SMEs of North Lombok District
9.	Training on proposal preparation for New Entrepreneur (WUB) at Hamlet of Pegadungan, North Lombok District	10 October 2017	Transform Institution
10	Training on “Book keeping administration technics for Cooperatives” for the management of KSU Cahaya Surya Pegadungan at Hamlet of Pegadungan	11-12 November 2017	Transform Institution
11	Training on “Book keeping administration technics for Cooperatives” for the management of KSU Arung Moyo Island, Karya Mitra Brangkua Mandiri and Karya Moyo Utama at hamlet of Arung Santek, Moyo Island	26-27 November 2017	Transform Institution

### C. Closing of RUMI Model Project



This is the completion stage of the RUMI Model pilot project. At this stage a workshop was carried out with the title of **“Village Development Strategy as the recipient of Mini Grid Solar PV power plant at West Nusa Tenggara Province”** with the participants consisting of all the stakeholders

The purpose of the workshop was to convey the achievement of RUMI Model Project and encourage the cooperation and the synergy of the program among all the stakeholders in the effort of developing the economy in four hamlets as recipient of the solar PV power plant post RUMI Model Project, as one of the prerequisite in ensuring the benefit sustainability of off-grid solar PV power plant.

At the end of the workshop, all workshop participants agreed that **SYNERGY** and **COLLABORATION** were the two keywords that can be realized in the form of **program cooperation and informal communication** among the village officials/managers of cooperatives with the program managers in the districts and provinces.

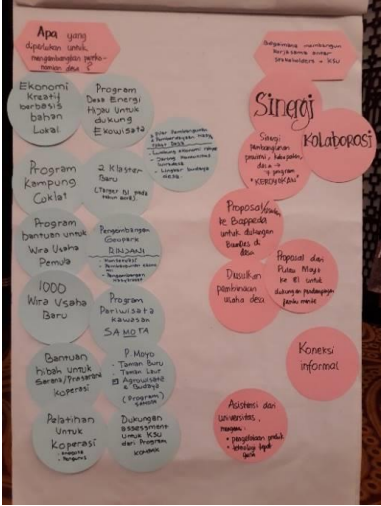
In this case **the managers of cooperatives are encouraged to proactively propose necessary supporting activities.**

Synergy and collaboration need to be realized by **developing good communication network** among all the stakeholders to discuss **who can contribute what** in the context of village development. The people of the village also needs to communicate the potentials of their villages to local government in the form of proposal so it can be used as input in the future development plan.



Another important result was other on going or planned development programs by the local provincial and district government, Bank of Indonesia and KOMPAK project, including:

- 1) New Entrepreneur and Start up entrepreneur Program , training for members and managers of cooperatives from District Office Small Medium Enterprises North Lombok and West Nusa Tenggara Province.
- 2) Creative Economy Program from the Provincial Office of Industry.
- 3) SAMOTA<sup>1</sup> Area Tourism Program.
- 4) Rinjani GeoPark Development Program.
- 5) Bank Indonesia Cluster Program.
- 6) Free halal certification for food products produced by cooperative members.



Below is the table containing the supports of West Nusa Tenggara’s Stakeholders towards the effort of developing the village economy to increase the people’s income in the four hamlets and especially the costumers of the off-grid Solar PV power plant, so that they can maintain thebenefit sustainability of the established solar PV power plant.

Table 12 Commitment and form of supports of the stakeholders

Stakeholders	Commitment and Form of Supports
1. Local Government of West Nusa Tenggara Province	Facilitate the meetinf with the West Nusa Tenggara’s stakeholders and give opportunity to cooperatives to access handling program for 100 poor villages.
2. Local Government of KLU	Facilitate the meetinf with related offices in North Lombok District, mainly related to New Entrepreneur Program (WUB) that can be accessed by Multi business cooperatives in Hamlet of Pegadungan.
3. Local Government of Sumbawa	Give opportunity to Multi business cooperative in Moyo Island to develop their tourism potential through the cooperation with Gajah Mada University in 2019.
4. Office of EMR West Nusa Tenggara Province	Comited to increase the human resources capacity of the solar PV Power plant’s managers, facilitate the managers of solar PV power plant when the technical failure occurs, and conduct sustainable monitoring.
5. Office of Cooperative and SMEsK West Nusa Tenggara Province	Comited to improve the human resources capacity of cooperative managers and sign up the member of the cooperative in training carried out by the office of cooperative and SMEs.
6. Office of Cooperative, Trade, Industry and SME of North Lombok District	<ol style="list-style-type: none"> <li>1. Committed to improving the capacity of the resources of the cooperative managers by providing technical training, entrepreneurship training and cooperative coaching for the 2019 fiscal year.</li> <li>2. Facilitating the submission of ten (10) WUB proposals proposed by SMEs in Pegadungan Hamlet. This assistance will be realized in 2019.</li> <li>3. Concrete support that has been given to the managers and members of the cooperatives is the training on management of local food in 2017 which was attended by 25 participants.</li> </ol>

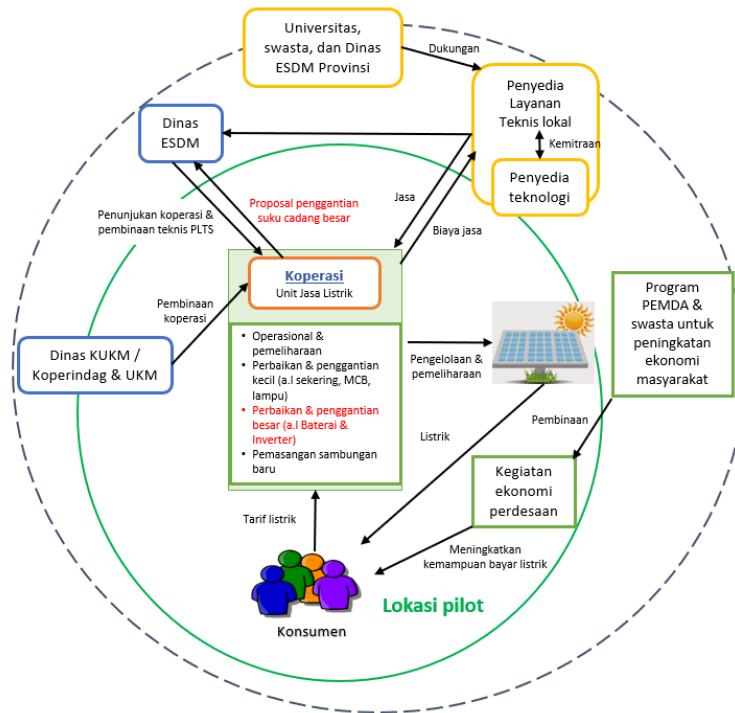
<sup>1</sup> Three tourism area in Sumbawa: Saleh Bay, Moyo Island, and Mt. Tambora

<b>7. Office of Cooperative, Trade, Industry and SME of Sumbawa District</b>	Committed to improving the capacity of the resources of the cooperative managers by providing technical training, entrepreneurship training and cooperative coaching for the 2019 fiscal year
<b>8. Office of Agricultures and Plantation Sumbawa</b>	<ol style="list-style-type: none"> <li>1. Committed to develop the premium Sumbawa chasew nut product in Moyo Island.</li> <li>2. Assistin the development of plantation groups and facilitate program proposals to the Ministry of Agriculture and Plantations in Jakarta for the program in the 2019 fiscal year.</li> </ol>
<b>9. Local Government of Sambik Elen village</b>	Supporting the establishment of Cooperatives and capacity development of the people through the village's budget in 2019
<b>10. Government of Labuhan Aji</b>	Support the establishment of cooperatives and increase people's capacity through the 2019 village budget
<b>11. KOMPAK</b>	Will assist farmers, who are consumers of the off-grid solar PV power plant in hamlet of Pegadungan so they can participate in the BUMDes Mart program in Lombok Utara District.
<b>12. Bank Indonesia</b>	Assist the capacity development of the people in the solar PV power plant area through the people/farmers empowerment programs
<b>13. Acceleration Team of SAMOTA</b>	Will help cooperatives in Moyo Island to sign up for the supporting program of the development of SAMOTA tourism area when the cooperative is already legalized and operating well.
<b>14. Geopark Rinjani Management Agency</b>	To assist in encouraging the development of village tourism in hamlet of Pegadungan which is one of the entrance for hiking to Mt. Rinjani.
<b>15. Office of Marine West Nusa Tenggara Province</b>	Committed to improve the capacity of the members of cooperatives and provide facilities to help them participating in the development of marine tourism in Saleh Bay.
<b>16. Transform</b>	Mentoring and assistance in connecting the managers of cooperatives with the parties who are willing to work together with the cooperatives.
<b>17. School of Engineering University of Mataram</b>	Propose research plant in four (4) Solar PV Power plant where the RUMI Model pilot Project are implemented. This research will collaborate with Ministry of Research Technology and Higher Education in Jakarta.

## TAKE AWAY

Broadly speaking, the cooperation pattern form at the end of the RUMI Model Polot project are as can be seen below:

Diagram 5 Cooperation pattern formed at the end of the project



Some of the important lessons learned from the implementation of RUMI Model Pilot Project are summarized in the following list:

1. This cooperation is very possible when the Village Electricity Management Team has been strengthened into a legal institution. Formal form of the institution can access the programs offered by the government more easily, due to the clear accountability. Two (2) cooperatives has been established and another two (2) are in the process of establishment. The establishment process that took quite long time can not be neglected from the presistence of the facilitators who worked on the field and the big amount of support from the Office of Cooperatives, Industry, and Trade both of the North Lombok District and Sumbawa District
2. There are 23 new business established and 22 old business that are strengthened during the implementation of RUMI Model.
3. The increase in active participation rate of women in the management of cooperative has showed that women possess the same interest and capacity with men in the management of the off-grid solar PV power plant, eventhough the women are lacking confidence in the technical part due to the strong opinion that technical parts are men's job. However the women especially at hamlet of Pegadungan, are starting to grow confidence to enter the power house and help cleaning the PV modules and other parts. It will need more long term effort to convince the women that the management of the solar PV Power plant is not only the men's authority.



- 4. The supports received by the people in the four hamlets are one of the achievements of RUMI Model project, in which act more as the catalyst for cooperation during the series of its activities implementation and as the initiator of the communication and information access among the stakeholders. There were two workshops carried out by GIZ and also informal approaches carried out by the Transform Agency, as GIZ's partner in gathering the support.
- 5. The people who received the off-grid solar PV power plant are very interested in the informations about the local government's development programs. With the availability of the information and requirements as well as the contact addresses, they can start to improve themselves to access those programs.
- 6. An integrated development program that has been started since the early stage of the off-grid solar PV power plant establishment is needed, considering the the targetted location are remote and underdeveloped hamlets who have minimum development capital such as low education level, difficult road access, limited communication devices, and low income. The capital development program is really needed considering the management and maintenance of the off-grid solar PV power plant will become the responsibility of the people receiving it, and the sustainable utilization of the solar PV power plant will contribute to the increasing of the electrification ratio.
- 7. Ideally the development of the off-grid solar PV power plant can be synergized with the village development plan that are developed through Village Medium Term Development Plan that can ensure its sustainability. In this case, local government must carry out or strengthen the facilitations of the villages/hamlets whose task is related to the management of village's electricity. Learning from the experiences, field facilitators are the most significant factor in the success of the implementation of RUMI Model Project.



*Important role of the facilitators in the success of village development program*

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