Federal Ministry
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Business models and options for RE hybrid systems on islands

Community-based Renewable Energy Conference
October 18, 2016

Facilitator

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Rationale

- The Project Development Programme (PDP) supports the Ministry of Energy (MoEN) to develop Thai-German Renewable Energy Communities.

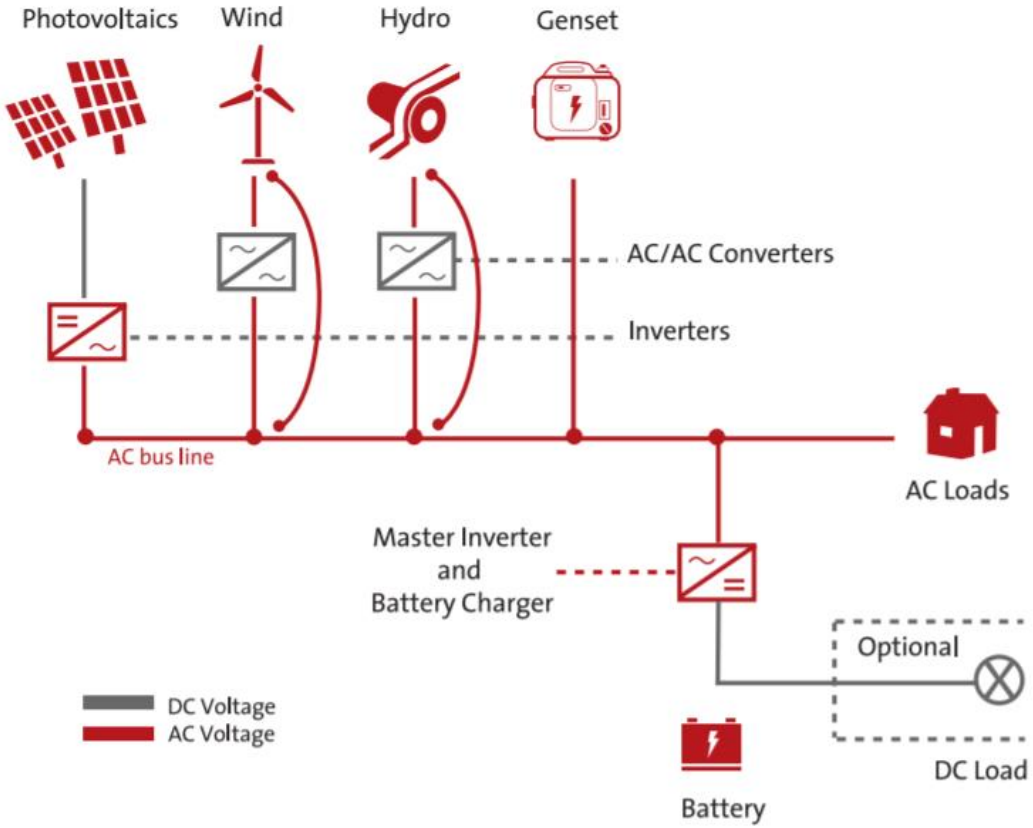
- The aim is to increase access to electricity for off-grid island communities that currently have limited electricity supply by integrating cost effective renewable energy sources.

- PDP's core interest is to develop and implement a sustainable business model for RE- hybrid grids on off-grid islands, that can be replicated to other islands.

Background

- October 2015 — 1st CBRE Conference: PDP was contacted by 2 Thai Islands
- February 2016 — PDP started activities to develop RE hybrid grids on off grid islands
- April 2016 — Visited Koh Jik, a showcase project for community-based RE-hybrid grid systems
- May 2016 — PDP started to develop a general concept to implement community-based RE-hybrid grid systems
- June 2016 — Consortium building to upgrade the system on Koh Jik (include more PV panels, optimizing the existing system)
- August 2016 — Site visit to Koh Jik with project consortium; pre-assessment (technical and socio-economic)

Introduction – RE-Hybrid Grid Systems



Schematic AC mini-grid system [2]

"The desolate technical condition and performance of solar or hybrid mini-grids is often caused by an inappropriate management of the integral system or lack of finance to operate and manage the system." [1]

Caroline Nijland
Director Business Development
Foundation Rural Energy Services (FRES)

Common Barriers and Challenges

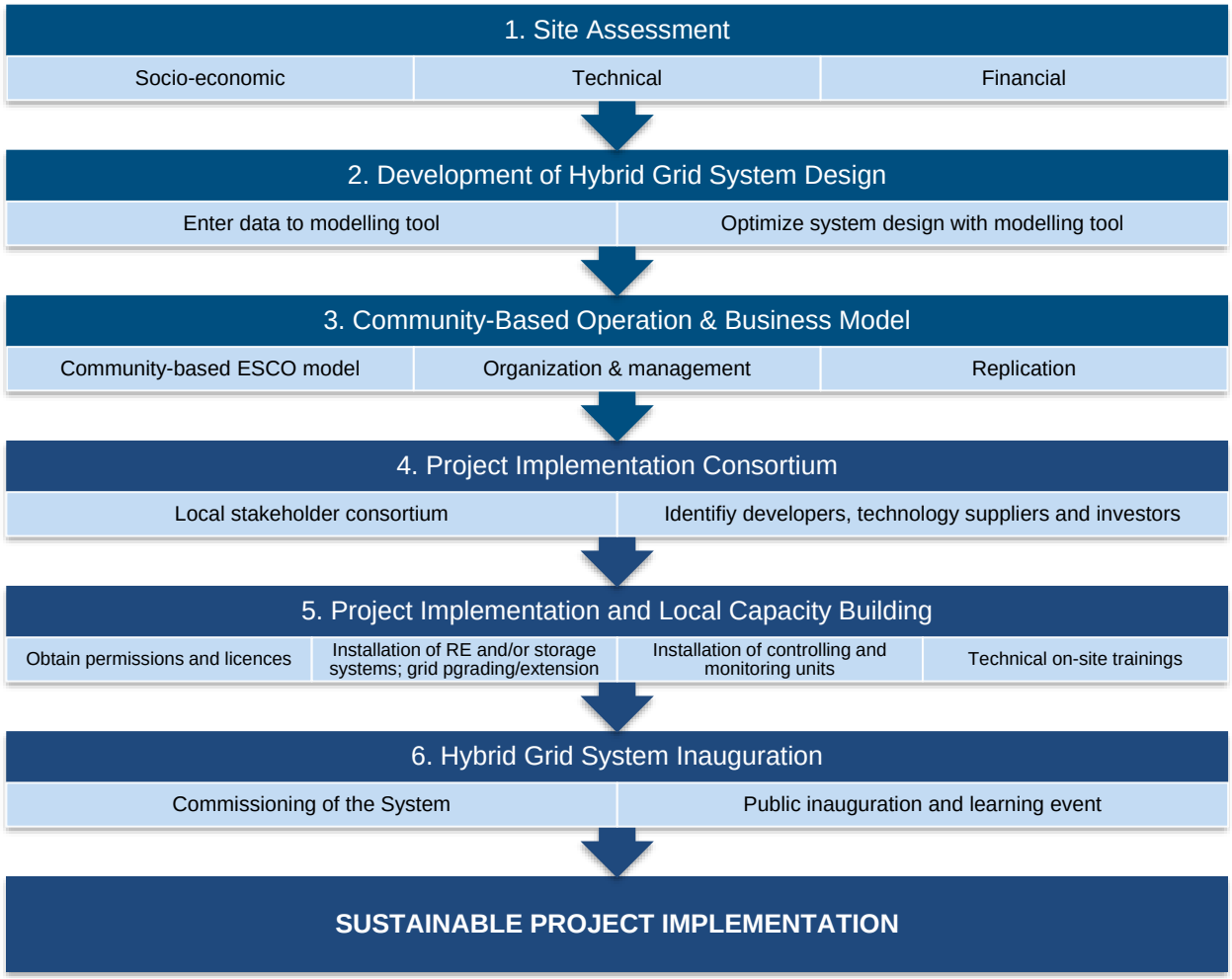
- lack of know-how:
  - technical skills to design, install and maintain the system
  - business skills (to develop sustainable tariff plans, proper management and additional added value)
  - financing resources
- Community-owned systems are often vulnerable to the “tragedy of the commons” effect if they do not define clear regulations for consumption and payment

How to overcome these barriers and challenges?

- Assessment of local conditions
- Gather reliable technical data
- Find right partners and technical equipment
- Proper operation and maintenance structure
- Capacity building and training
- Appropriate electricity tariff and payment arrangements

Sound technical design and business model as well as a suitable project consortium are key to success!

Project Development – Who is doing what?



Community, technical experts, PEnO, GIZ

Technical experts

Community, GIZ

Community, GIZ, PEnO, technical experts

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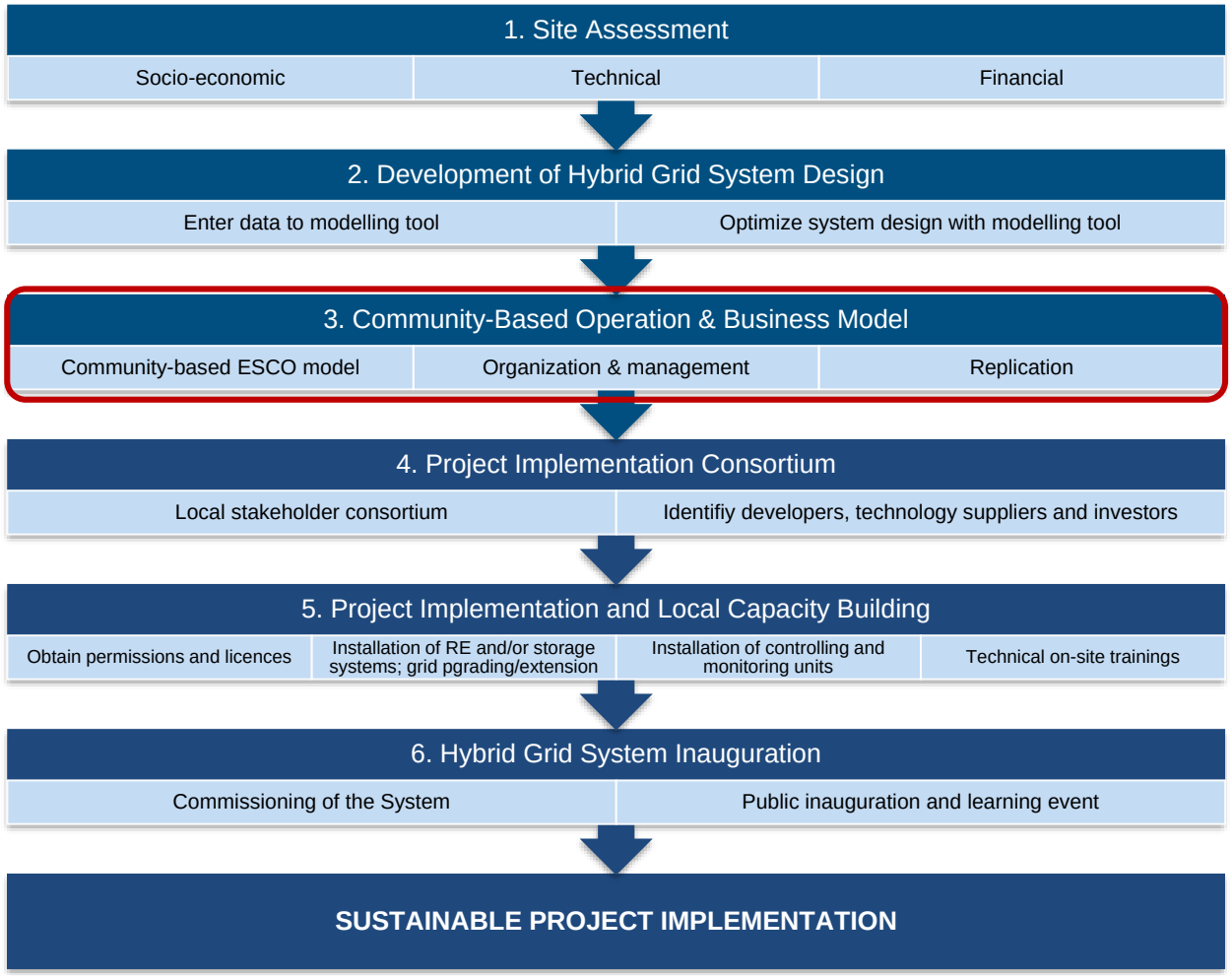

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Business Models for RE Hybrid Grid Systems

- utility model
- private sector-based model
- community based model
- hybrid model

"A mini-grid could consist out of many independent systems. The "link" that makes the mini-grid is the operator, not the copper between users." [1]

Claude Ruchet
Deputy Director
Studer Innotec

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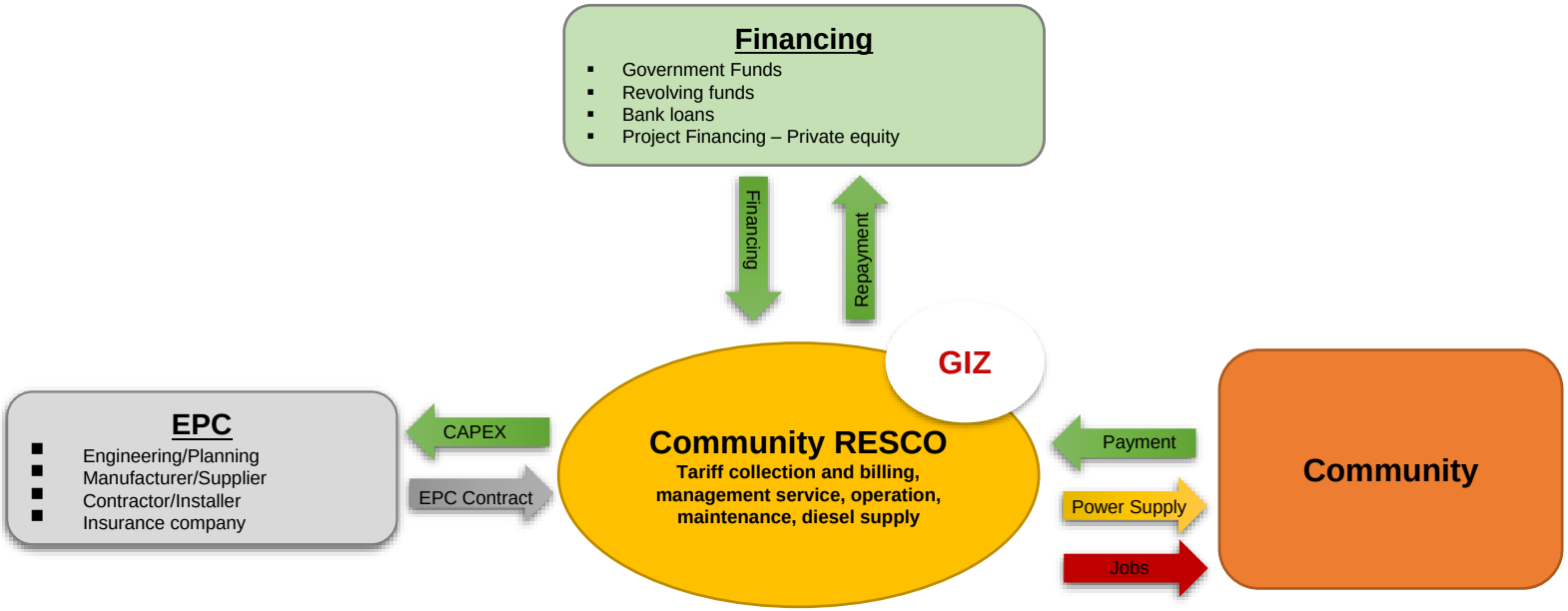
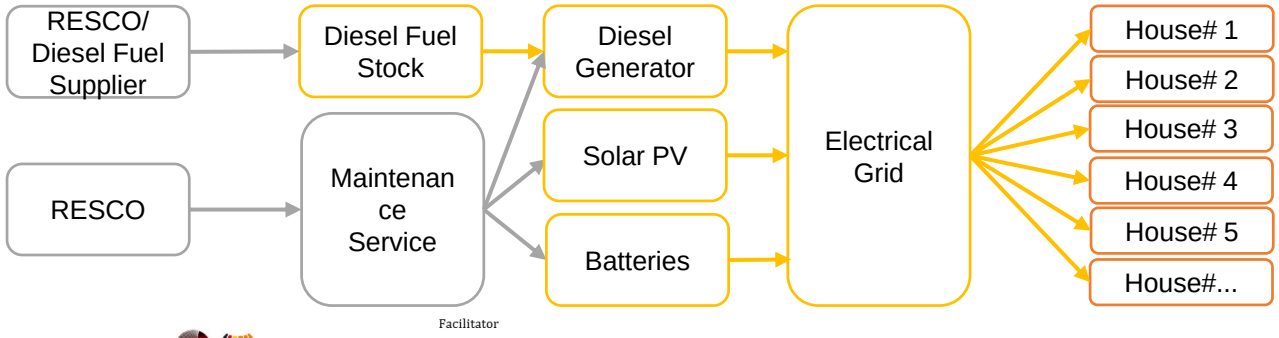
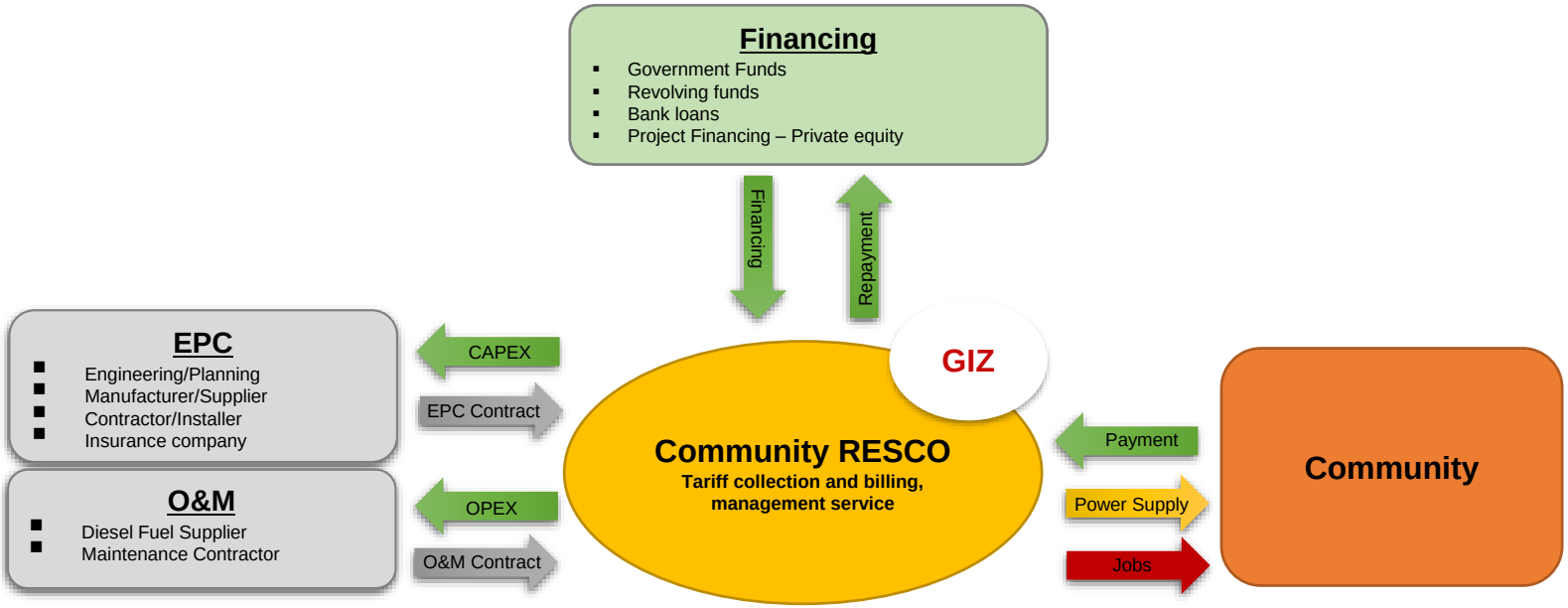
Community-based Model - I



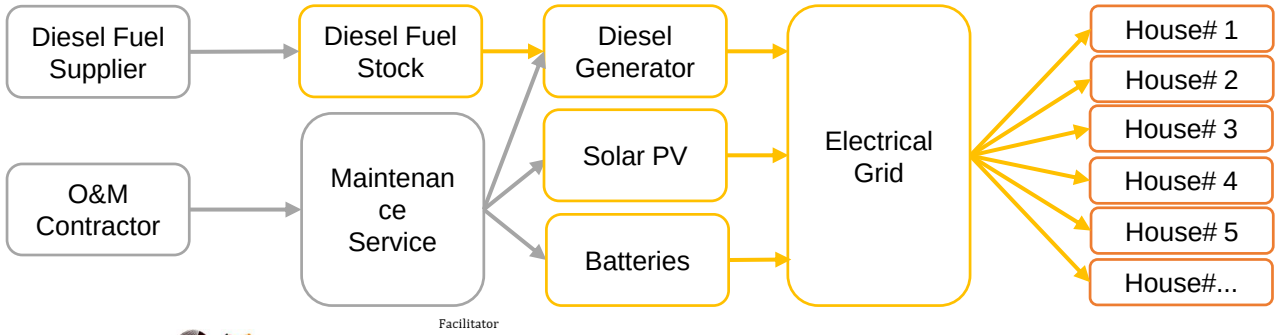
Supply Chain



Community-based Model - II



Supply Chain



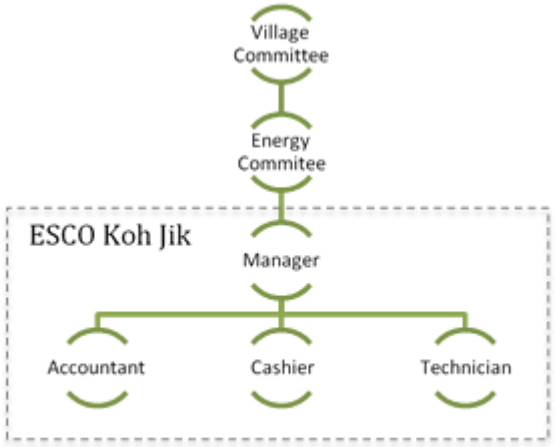
Benefits of the Community-based Model

- the owners are also the consumers: strong interest in the quality of the service
- self-sufficiency and self-governance: quick decision making, less bureaucratic than other models
- generation of jobs in the community (directly linked through O&M, tariff collection and management services of the system, indirectly through productive use of energy)
- possibility to design tailor made tariffs taking local conditions into consideration

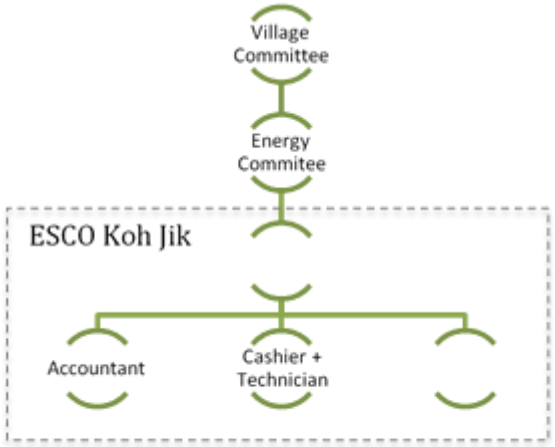
Example – Koh Jik, Thailand

- The community is the operator of the hybrid grid system, Koh Jik RESCO)
  - Collects monthly payment from the users
  - Pays for all operation & maintenance cost
- Revenue – Cost = Profit
  - 80,000 THB - 40,000 THB = 40,000 THB per Month

Initial Set-up, own graph, following [5]



Current Set-up, own graph



Facilitator

Example – Akkan, Morocco [3]

- 3 systems:
  - 5.76 kWp PV, 8.2 kVA single-phase diesel generator, battery bank with 24 elements (48V, for a 4 days of back-up capacity) => large micro grid
  - 480 Wp of PV, 7 kWh of batteries => very small micro-grid
  - 160 Wp of PV, 2.4 kWh batteries => Solar home system
- The entire project includes 35 connections: 31 on the larger grid (27 households + 4 community facilities and public lighting); 3 households on the smaller grid; and 1 household on the SHS
- RE are producing 95% of the power
- 20 % financed by the community

Example – Akkan, Morocco [3]

- operation, maintenance, and replacement costs are financed through the monthly flat tariffs paid by the users ($ 5,8/month for 275Wh/day; $11,6/month for 550Wh/day)
- Binding contracts for the electricity service were signed between the community association and each user (in case of non-payment, the user would be disconnected and would have to repay his debts and a reconnection fee to be reconnected)
- initial connection fee gives a clearer idea of costumers ability and willingness to pay
- a local association was created to be responsible for the O&M, the replacement, and the fee collection
- maintenance responsibilities were subcontracted to a local technician

Example – Diakha Madina, Senegal [3]

- 3,15 kWp of PV, 24 batteries (48V, 4 days storage capacity), backup generator of 3,6 kVA
- The system was installed for public uses, supply of the health center, the street lighting system and the village water pump
- a local leader is responsible for the collection of payment, O&M and for the component replacement
- contracted trained local staff makes regular visits to check the system and perform and necessary repairs

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Thank you for your attention!

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Sources

- [1] – Alliance for Rural Electrification (ARE): Risk Management for Mini-Grids
- [2] – RECP, euei pdf, ARE, REN21: Mini-grid policy toolkit
- [3] – ARE, USAID: Hybrid Mini-Grids for Rural Electrification: Lessons Learnt
- [4] Amics Diakha Madina Blog
- [5] Tsunami Aid Watch & Heinrich Boell Foundation: Renewable Energy Options on the Islands in Andaman Sea, page 52, Figure 39