

Off-grid PV in developing countries



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The Alliance for Rural Electrification



Mission and Objectives

ARE promotes and provides efficient renewable solutions for rural electrification in developing countries.


- The Alliance **attracts and unites** all relevant private actors in order to speak with one voice about rural electrification with renewable energies.
- The Alliance generates **technical and financial solutions** about rural electrification in developing countries.
- **ARE communicates and advocates for rural electrification** using RET and convinces all relevant stakeholders.



Technology: The most common renewable energy options

Technology	Advantages	Shortcomings
<p>Small RE stand alone applications</p> 	<ul style="list-style-type: none"> • High flexibility. • Easy to move and share. • Systems relatively cheap (cash sales model/micro credits) 	<ul style="list-style-type: none"> • Limited to their specific use. • High electricity prices
<p>Mini-grid fed by RE/ Hybrid systems</p> 	<ul style="list-style-type: none"> • Power for economic activities. • Efficient maintenance • Easily expandable • Stable power supply • Numerous opportunities for hybridization • Relatively cheap electricity prices 	<ul style="list-style-type: none"> • If no backup: Battery storage needed. Power shortages in cases of unfavourable weather conditions. • If diesel backup: functioning depends on availability of fuel. Emissions and noise • High investment costs

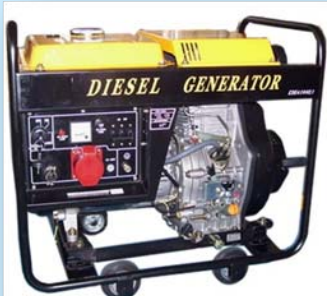
Decentralised renewables vs grid extension

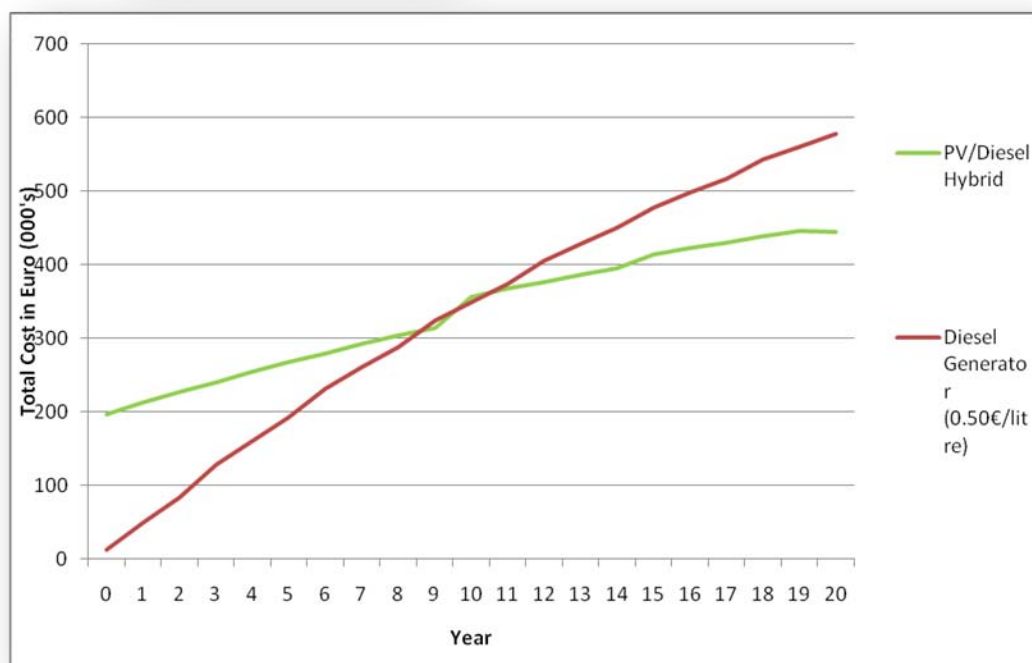
Technology	Advantages	Shortcomings
Grid extension 	<ul style="list-style-type: none"> • Energy for productive use • Maintenance in principle is safeguarded 	<ul style="list-style-type: none"> • Risk of electricity theft • High price of connection for remote areas and limited willingness to pay • Even higher prices over difficult fields • Power supply depends on quality of the grid • Power transmission losses

Country	Labour & other costs	Materials	Total
Kenya	6590	5960	12550
Senegal	5150	10810	15960
Mali	2590	15170	19070

Costs of grid extension in selected countries in US\$ per kilometre

Decentralised renewables vs diesel generators

Technology	Advantages	Shortcomings
Diesel generators 	<ul style="list-style-type: none"> • Easy maintenance • Spare parts easily available. • Steady power source 	<ul style="list-style-type: none"> • Noise, emissions, local environmental/health damage • Continued dependence on external supplies • Exposure to international price fluctuations.



Comparison: Cumulative costs diesel vs. PV/diesel hybrid system

Source: Alliance for Rural Electrification

- **projects must be built around existing business applications or public institutions** in order to increase critical mass, potential profits, and local involvement.
- An alternative is to **support the development of a local private sector** as part of the project to increase the positive impacts on the community and generate the needed revenues.
- **Concentrating energy loads or bundling projects together** in attractive packages is another means of increasing market size and the attractiveness of rural electrification projects.



- Encourage the development of a local energy private sector (before PPP needs PSD). For investment and operation successful **rural electrification programs have to rely on vast networks of local companies.**
- The **development of local renewable energy companies** can be addressed in different ways: support technology transfer and company agreements, link call for tenders with criteria of subcontracting or alliance with local companies, provide technical and business trainings to local SMEs and support business organizations.
- The establishment of **an industry association** can have many positive impacts on the constitution of a local renewable energy sector





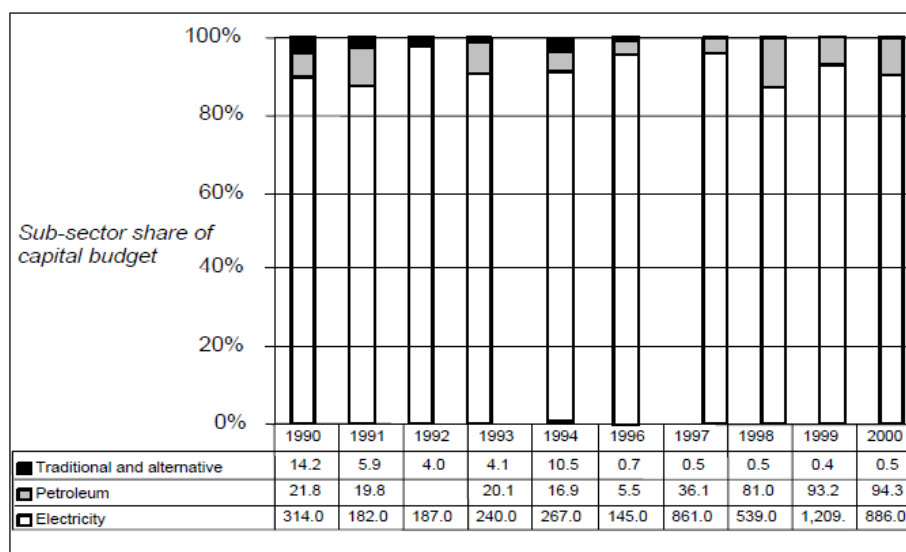
- **The absence of soft or even normal financing products** is one of the primary reason for the absence of investment in the investment in the energy sector and associated services.
- **Address the perceived risk and the misunderstandings:** Information and capacity building campaign on rural electrification with renewable (quality pre-feasibility and feasibility studies; technical capacity and renewables investments costs/benefits/risks).
- Governments should try to **reduce the investment risk or to try to compensate it**. The development of partial risk guarantee and partial credit guarantee schemes is required to encourage private sector banks and investors to accept higher risk levels, longer term exposures and to lower interest rates.

- **Distribution of systems free of charge must be avoided** as it damages existing commercial markets and lead to competitive feelings and unsustainability (lack of ownership).
- rural electrification tariff must be at least **cost recovery**, but profit's opportunity is key to attract private operators. They must also maintain a **balance between commercial viability and consumers' ability and willingness to pay**.
- **Smart combinations of subsidies** are key to attract operators and ensure project sustainability.
- **Subsidies can support the investment, the connection, the operation costs and the output.**
- Other forms of support can also be offered to project developers: **low import duties**; site surveys; market studies; and capacity-building.



- One of the problems of financing is the **low national budgetary allocations** to small renewables in most countries

Figure 14: Energy sector capital budget as a percentage of total budget



- Levelize competition with fossil fuels:**
 - Internalize the externalities as those have manifold positive impacts including costs wise.
 - Stop subsidizing fossil fuels or start subsidizing renewable energies.
 - Apply life cycle costs analyses when it comes to renewables

- **Structure and role of the Rural Electrification agency/fund have to be clarified and reinforced:** “cross subsidization” / refinancing procedures / act as wholesale banker.
- **Regulation has to be an instrument favoring new projects.** It needs to be **light and flexible for small power producer** in terms of standards and tariffs. It also has to protect rural consumers.
- **Basic regulation** must always include system’s quality with controls all along the delivery chain; dissemination of information to end-users; support to the establishment of after-sales services; and ensuring that financing mechanisms are in place to attract more end-users.
- **PPA regulation** is especially important.

- **Information and education** at every level in the society about the benefits of access to energy and of renewables are necessary prior to any project.
- **Marketing the benefits of renewables and the satisfaction of local customers** is essential to continuously expand the demand for these options and ensure that renewables are meeting end-users needs and abilities.
- **Reliable publicity** is is also fundamental to ensure the sustainability of the business model/social structure chosen (avoid disappointment and credit/fee payment failure).
- **Strong and targeted marketing** around the call for tenders and the program are key to increase private sector participation local or not.



- **Within the public authorities themselves** regarding the planning of a rural electrification program and the set up of appropriate business environment.
- **Training the banking sector and financial institution** is essential (evaluation business proposals, the implications of quality standards, the relevance of business models, lessons learned from other projects etc.)
- On the project **development and private operators** side, financial, business and technical skills are the key capacities to develop
- **At the local level**, detailed technical training for end users which must cover both electricity uses and limits. The personnel responsible for O&M should also be trained right from the project implementation, with follow-up training over the long term.



Rural electrification: In most cases off-grid solutions based on renewable energy have lower life cycle costs than pure fossil fuel solutions.

The key factors that should be primarily addressed to ensure programs sustainability are: access to soft finance, political support, capacity building and information.

The fight against climate change and access to electricity for the rural poor can be reconciled in a cost effective manner.

All stakeholders must work together: Only joint action of governments of industrialized and developing countries, the private sector, civil society and the research community can lead to sustainable solutions which make a difference!



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Photo credit: ARE members