PV SOLUTIONS FOR AN ECONOMIC ENERGY SUPPLY

Benedikt Böhm
Donauer Solartechnik Vertriebs GmbH
AGENDA

- Company Overview
- Common Picture of Off Grid
- Modern Off Grid Systems
- Options for rural Electrification
- LCOE PV Off Grid System
- Comparison Diesel vs. PV Off Grid
- Project References
- Challenges
- Summary
DONAUER SOLARTECHNIK

Company Overview

- Founded in 1995
- ~ 250 employees worldwide

Business Divisions

- Specialist Distributor
- Off Grid Solutions
- International Projects
- E-Mobility
- Mounting System
- Services
DONAUER SOLARTECHNIK WORLDWIDE

10 locations in Europe:
- Headquarters Gilching, Germany

Training Germany:
- Nuremberg
- Gauting-Hausen

Subsidiaries:
- Portugal
- France
- Italy
- Belgium
- Oman

Sales Offices:
- United Kingdom
- Austria
- Turkey
- Brazil
COMMON IMAGE OF OFF GRID SOLAR

Prejudices:

- Solar only for smallest appliances
- Expensive technology
- Short lifetime of components
- Missing sustainability
MODERN OFF GRID SYSTEMS

Modern Off Grid Systems have reached industry standards!

- Energy solutions for industrial applications
- High-efficiency and high-quality components
- Optimized system design for maximum lifetime and reliability
- Extendable system configurations
- Price decreased by 50% since 2004

OPTIONS FOR RURAL ELECTRIFICATION

Public Grid
- Grid extension costs
- Instability / Blackouts

Diesel Generator
- Fuel consumption
- Maintenance
- Transportation
- Efficiency
- Lifetime

PV System
- CAPEX
- Location (Irradiation)
PUBLIC GRID IN AFRICA

- Grid extension costs almost **22,000 USD/km**
- Rural areas not in the economic scope of utilities (low consumption, reduced population density)
- Instability of grid (Blackouts)

SOURCE: European Commission Joint Research Centre
ARE Publication – Case studies for renewables in Developing countries
RETAIL FUEL PRICES IN AFRICA

- Crude oil price:
  - 2004: 43 USD/Barrel
  - 2012: 100 USD/Barrel

Price more than doubled!

- High costs for transportation of fuel
- Cost-intensive maintenance and service
PV ENERGY COSTS FOR OFF GRID SYSTEMS

Annual irradiation on module [kWh/(m²·a)]

LCOE in ¢cts/kWh

i = 5 %; PV lifetime = 20 years; PV CAPEX = 2,5 €/Wp; PV OPEX = 2,5 % p.a.; BOS CAPEX = 40 % of PV CAPEX; PR = 0,82
i = 5 %; Battery lifetime = 5 years; Battery CAPEX = 1,5 €/Ah; Battery OPEX = 2,5 % p.a.; PR = 0,82
PV ENERGY COSTS FOR OFF GRID SYSTEMS

LCOE in €cts/kWh

Annual irradiation on module [kWh/(m²·a)]

\[ i = 5\%; \text{PV lifetime} = 20\text{ years}; \text{PV CAPEX} = 2.5\text{ € / Wp}; \text{PV OPEX} = 2.5\% \text{ p.a.}; \text{BOS CAPEX} = 40\% \text{ of PV CAPEX}; \text{PR} = 0.82 \]

\[ i = 5\%; \text{Battery lifetime} = 5\text{ years}; \text{Battery CAPEX} = 1.5\text{ € / Ah}; \text{Battery OPEX} = 2.5\% \text{ p.a.}; \text{PR} = 0.82 \]
PV ENERGY COSTS FOR OFF GRID SYSTEMS

Annual irradiation on module [kWh/(m²·a)]

LCOE in €cts/kWh

Irradiation band Africa

\( i = 5 \% \); PV lifetime = 20 years; PV CAPEX = 2.5 € / Wp; PV OPEX = 2.5 \% p.a.; BOS CAPEX = 40 \% of PV CAPEX; PR = 0.82

\( i = 5 \% \); Battery lifetime = 5 years; Battery CAPEX = 1.5 € / Ah; Battery OPEX = 2.5 \% p.a.; PR = 0.82
COMPARISON DIESEL VS. PV OFF GRID SYSTEM

- Rural electrification with PV off grid systems competitive in major parts of Africa!
- Fuel prices constantly increasing!
SUCCESSFUL PROJECTS - RESIDENTIAL

2.8 + 1.4 kWp PV / SMA Inverter / 12.480 Wh
SUCCESSFUL PROJECTS - INDUSTRIAL

10.5 kWp PV / SMA Inverter / 48,000 Wh
SUCCESSFUL PROJECTS - TELECOM

4.1 kWp PV / Studer / Steca / 28.000 Wh
DIESEL HYBRID SYSTEMS – FUELSAVER

- Reduce running cost of existing diesel generator grids
- No battery storage

Upcoming Events:

- Intersolar Innovation Exchange
  Hall B3, Booth B3.450
  **Off Grid Hybrid Solutions**
  Thursday, June 14, 10:15 am
  Tobias Reiner, Donauer Solartechnik
CHALLENGES

- Overcome negative image of off grid PV and increase acceptance
- Technical understanding of decision makers and consultants
- CAPEX financing
- Professional system layout for sustainable projects
- Well-trained local partners required
SUMMARY

- Grid extension and diesel generators are no alternative for rural electrification
- PV off grid solutions competitive in most parts of Africa
- Prices for PV off grid systems decreased significantly
- Fuel prices increasing constantly
- Wide market for economic off grid solutions
- Expert partners for successful projects necessary

Donauer provides the optimal PV solution!
Benedikt Böhm
B.Eng.
Regional Sales Manager
Phone +49 8105 77 25 – 334
Mobile +49 173 382 8053
boehm@donauer.eu

Donauer Solartechnik
Vertriebs GmbH
Head Office Germany
Zeppelinstraße 10
D-82205 Gilching

Intersolar: **B5.110**

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