Promoting the Productive Use of Energy

The GIZ Approach

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How can we attain social and economic impacts?

Energy Supply

Sources:
- Solar, Wind, Hydro, Biomass, Biogas

Useful Form:
- Thermal, Mechanic, Electric

Supply Systems:
- ICS, PicoPV, SHS, Mini-Grid, Grid Extension

Energy demand

Consumptive:
- Communication, Entertainment, Transport, …

Productive:
- Agro-processing: milling, water pumping, …
- Manufacturing: carpentry, welding, …
- Service Sector: lighting, battery charging, …

Social:
- Schools, Hospitals, Centres, …

Expanding electricity access is a necessary but rarely a conclusively sufficient precondition for enabling social and economic development!
# Table of Content

## Part 1: The PRODUSE Toolkit
- **Impact Evaluation Methodology**: Toolkit for the evaluation of energy projects
- **Study**: Insights into the interaction between energy access and productive activities
- **Manual**: Practical guidance on how to promote the productive use of energy
- **Website**: Access to study results, project examples and tools for promotion and evaluation

## Part 2: Promotion of Productive Use of Energy (PUE) in Practice
- **Project Example**: GIZ ESRA Afghanistan

## Part 3: Recommendations and GIZ Activity Plan
- Lessons learnt from PRODUSE activities
- Activities planned for 2015
About PRODUSE

Productive Use of Energy (PRODUSE) started as a joint initiative of:

- Energy Sector Management Assistance Program (ESMAP)
- Africa Electrification Initiative (AEI)
- EUEI Partnership Dialogue Facility (EUEI PDF)
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Available Material

- Impact Evaluation Methodology
- Impact Evaluation Study
- Manual for Electrification Practitioners
- Manual on Productive Uses of Thermal Energy
- Website (www.produse.org)
Impact Evaluation Methodology & Study

Objective

• **Evaluate impacts** of electrification on firms
• **Improve** economic development **impacts** through insights into the interaction between energy access and productive activities

Country Studies

**Benin**
• Farmers attempting to diversify their incomes with part-time employment

**Ghana**
• Light industrial zones for MSME in peri-urban areas

**Uganda**
• Two economically active fishing communities
Impact Evaluation Results

Findings

• **Access:**
  - In the *service sector* businesses tend to connect to the grid
  - In the *manufacturing sector* take-up rates were low
  - In both cases, the overall electricity consumption rate is low

• **Economic Impact:**
  - Electrification *hardly translated into higher profits*, instead it can even *reduce* profitability (due to financial burdens resulting from connection and subsequent bills)
  - Availability of *market outlets* is crucial for successful business development

→ Very limited demand response to physical energy access: Positive economic impacts of electricity access are by no means *self-propelling*!
Manual for Electrification Practitioners

Part 1

A structured approach towards PUE promotion

Objectives

• Provide pragmatic guidelines on how to plan, design & implement activities for productive use promotion

• Offer a structured approach to determine and develop required activities

Structure

• Step-by-step guide to promoting the productive use of electricity

• Module-based approach to cater for diverse needs

• Sequence based on adaptability to local context

• References provided to relevant tools in each module
PHASE I. Feasibility and initial planning

Module 1: Decide whether to engage in productive use promotion

Module 2: Set the cornerstones of the productive use programme

PHASE II. Analysis and programme design

Module 3: Analyse local economic structures and potentials for productive uses

Module 4: Plan productive use promotion activities

PHASE III. Implementation

Module 5.1: Foster energy services

Module 5.2: Raise awareness of productive electricity uses

Module 5.3: Provide technical assistance to MSMEs

Module 5.4: Facilitate access to financing

PHASE IV: Monitoring and Evaluation

Module 6: Ensure monitoring and evaluation (M&E)
PRODUSE Website

www.produse.org

Part 1

The Manual
Step-by-step guidance for designing and implementing activities to promote productive use of energy in the context of electrification programmes. Read more >

The Study
The impacts of electrification on small and micro businesses in Sub-Saharan Africa with case studies in Benin, Ghana and Uganda. Read more >

The Methodology
The PRODUSE methodology allows for a robust but cost-effective evaluation of the productive use impacts of energy projects and programmes. Read more >
Project Example ESRA Afghanistan

GIZ ESRA - Energy Supply for Rural Areas

- **Background**: ~89% of rural population have no access to modern sources of energy
- **Funded by**: Federal Minister of Economic Cooperation and Development (BMZ)
- **Timeframe**: 2008 – 2014 *(since 2015: follow-up via GIZ IDEA)*

Objectives

- Improve the capacities at national and provincial levels for promoting rural energy supply using renewable energies
  - The **supply** of electric power generated from renewable energy sources has improved
    - Develop and introduce sustainable management structures to operate local MHP, …
  - The portion of **productively used** electric power generated in four communities using renewable energy sources is at least 15% in three of the communities (5% in 2008)
Strategy for the Promotion of PUE

Pillars of PRODUSE Promotion in Afghanistan

- Market Assessment
- Awareness raising about PUE opportunities via radio, leaflets, etc.
- Business Development Services:
  - Start-Ups: Courses for individuals / groups (with or without prior entrepreneurial experience) to identify and develop business ideas into realistic business plans are offered
  - Business Growth: Technical advice and vocational training for existing entrepreneurs in running their businesses and appropriate electric machinery is offered
- Access to Finance: Facilitate the access to micro credits for equipment (energy-efficient devices!)
- Follow-up: Monitoring and counselling of entrepreneurs and business persons during the first year of operation incl. marketing support
Business Development Services

Part 2

Steps for Business Start-Up Promotion

• **Awareness creation** for business training
• Business idea generation **workshops**
• **Selection** of potential **participants**
• Briefing and agreement with **business trainer**
• **Logistic preparation**
• **Training Event**
• **Follow-up activities**
• **M&E** of impact at business and area level

Capacity Building for local BDS providers & MFI
Case Study: The Oil-Press in Sangab

Context

- Diesel driven oil presses have driven traditional (oxen-driven) oil expellers out of market
- Nearest oil press 25 km distance (not viable for transport)
- Cultivation of oil crops stopped

GIZ support towards business development

- Idea: Set up a local electrically-driven oil press, press own seeds and seeds of other farmers
- GIZ supported the business idea and signed a MoU
- The operators bought the land, house and provided working capital
- GIZ helped procure machinery, provided training and a soft loan
Recommendations for PUE Promotion

- Practitioners need to know **the market** (esp. local skills and potential barriers) - support business plans that offer a product / service **with a market**
- Sound and solid **business plans** are pivotal for success – working with entrepreneurs who have prior knowledge of operating a business is easier
- Sincere **interest** of partners is very important – prioritise areas where local partners have indicated a true interest in productive use
- Financial assistance is crucial for business development but grants can **distort the market** – apply sound financial assistance interventions
- Firms will choose the cheapest and most reliable form of energy available - Policy-makers can facilitate uptake of RET via regulation and tariffs
- Energy Service Providers have a **vested interest** in productive use promotion – they should be actively involved in PUE promotional activities
Activities Planned for 2015

Catalogue: “Productive Uses of Solar Photovoltaic Applications”
- Compile and present a range of available applications incl. technical and financial parameters that can be operated in off-grid areas

- **Aim**: Improve understanding of status quo, potential and challenges and provide assistance for actors that are working in the field of SPIS
- **Target group**: Agricultural extension services and providers of financial services
- **Farms**: Small and medium sized farms in emerging and developing countries (2 – 15 ha)

PRODUSE Study: “2nd Round“
- Conduct an ex-post analysis of firms studied in the first round (Benin, Ghana, Uganda)
- Replicate Methodology in other regions
Thank you for your attention!

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Sector Programme Poverty-Oriented Basic Energy Services (HERA)

Water, Energy and Transportation Department

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Why promote the PUE?

Grid-load over daytime - MHP Sangab

KWh

Average Maximum Minimum
Why promote the PUE?

Daily Load Profile - Naurangabad

- **Productive User Load Profile**
- **Household Load Profile**

### Load Profile

- **Hourly Load (kW)**
- **Morning**
  - 5am-6am: 0.5
  - 6am-7am: 0.5
  - 7am-8am: 1.0
  - 8am-9am: 2.0
  - 9am-10am: 3.0
- **Afternoon**
  - 10am-11am: 8.0
  - 11am-12pm: 7.0
  - 12pm-1pm: 6.0
  - 1pm-2pm: 5.0
  - 2pm-3pm: 4.0
  - 3pm-4pm: 3.0
  - 4pm-5pm: 2.0
  - 5pm-6pm: 1.0
  - 6pm-7pm: 0.5
  - 7pm-8pm: 0.5
  - 8pm-9pm: 0.5
  - 9pm-10pm: 0.5
- **Evening**
  - 10pm-11pm: 0.5
  - 11pm-12am: 0.5
  - 12am-1am: 0.5
  - 1am-2am: 0.5
  - 2am-3am: 0.5
  - 3am-4am: 0.5
  - 4am-5am: 0.5

### Load Description
- **Load Profile**
  - **Morning**: Low load from 5am to 9am, peaking at 9am.
  - **Afternoon**: High load from 10am to 5pm, peaking at 11am.
  - **Evening**: Lower load from 6pm to 10pm, peaking at 5pm.
  - **Night**: Low load from 11pm to 5am.
Impact of ESRA

<table>
<thead>
<tr>
<th>Development of mean HH-income</th>
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<tbody>
<tr>
<td>12,000,00</td>
</tr>
<tr>
<td>9,000,00</td>
</tr>
<tr>
<td>6,000,00</td>
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<tr>
<td>3,000,00</td>
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<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2009</th>
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<tbody>
<tr>
<td>Sangab</td>
<td>4,845,34</td>
<td>5,475,74</td>
</tr>
<tr>
<td>Chatta</td>
<td>9,598,79</td>
<td>7,357,14</td>
</tr>
<tr>
<td>Jurm</td>
<td>6,906,25</td>
<td>7,926,83</td>
</tr>
<tr>
<td>Lighting</td>
<td>Agriculture</td>
<td>Service / Retail</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Sales prices, transaction costs, maritime info</td>
<td>Poultry rearing, fishing</td>
<td>night sales, tourist lodge</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ICT</th>
<th>Cooling/heating</th>
<th>Agriculture</th>
<th>Service / Retail</th>
<th>Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales prices, transaction costs, maritime info</td>
<td>Small fridges for dairy etc., large coolstores for agricultural products</td>
<td>small fridges in bars, restaurants, shops, lodges</td>
<td>packaging</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Machines</th>
<th>Agriculture</th>
<th>Service / Retail</th>
<th>Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water pumping, fences, shearing, grain milling</td>
<td>barber,</td>
<td>welding, tailoring, Carpentry,</td>
<td></td>
</tr>
<tr>
<td>Type of productive activity and uptake of electricity use</td>
<td>Economic benefits of electricity use</td>
<td>Allocation of welfare gains</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
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</tr>
<tr>
<td>Energy source switch in existing businesses – e.g. welders working with diesel generators.</td>
<td>Reduced fuel costs ⇒ reduced production cost ⇒ reduced consumer price and/or increased profit and/or increase of production volumes.</td>
<td>Welfare gain shared between consumer and producer (as per demand and supply curve price elasticity);</td>
<td></td>
</tr>
<tr>
<td>Introduce modern energy use in existing economic activities that currently operate without energy input – e.g. rainfed agriculture, tailors.</td>
<td>Increase of production volumes and/or reduced production cost through reduced labour cost (note: in some cases off-set through increased capital cost – electrification trap); Possibly higher-quality goods or services.</td>
<td>Note: in case of export products, part of the welfare gain falls to consumers outside of the target region.</td>
<td></td>
</tr>
<tr>
<td>Type of productive activity and uptake of electricity use</td>
<td>Economic benefits of electricity use</td>
<td>Allocation of welfare gains</td>
<td></td>
</tr>
<tr>
<td>Local production of goods that are currently imported to the area, e.g. high-quality carpentry, processed food.</td>
<td>Shift of value added to the area (but losses in other areas); in some cases reduced consumer prices through elimination of transport cost (if small scale local production allows for level of production costs that is competitive with imported goods).</td>
<td>Shift of value added is absorbed by (new) producer (employment creation); In case of consumer price reduction through transport cost elimination: net gain for consumer</td>
<td></td>
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<tr>
<td>Introduction of new subsectors, goods and/or services for local consumption; e.g. photocopying and internet access.</td>
<td>Overall upgrading of economic activities and structures in the area, and positive effects on other sectors (e.g. IT access for informed decision-making in agriculture); net impact linked to purchasing power development in the area; employment creation.</td>
<td>Welfare gain for consumer through satisfaction of previously unmet demand; Welfare gain for producer / service provider: new business and profit opportunities.</td>
<td></td>
</tr>
<tr>
<td>Uptake of production of export goods; e.g. food processing, as well as tourist lodging</td>
<td>Increase of income to the area; employment creation.</td>
<td>Welfare gain fully absorbed by producers.</td>
<td></td>
</tr>
</tbody>
</table>