Innovation for Electrification

Productive Use of Renewable Energy & Industrialisation

24 February 2022
<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:00 – 14:07</td>
<td>Opening remarks</td>
<td>Ms. Ling Ng, Director of Communications &amp; Marketing, ARE</td>
</tr>
<tr>
<td></td>
<td>Facilitator</td>
<td>Ms. Rebecca Bregant, Board Member, ARE</td>
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<tr>
<td>Pitch 1</td>
<td>14:07 – 14:14 The Role of Solar Energy in Africa’s Industrialisation</td>
<td>Ms. Laura Corcoran, Chief Business Development Officer, Aptech Africa</td>
</tr>
<tr>
<td>Pitch 2</td>
<td>14:14 – 14:21 Showcase of a success story in the decentralised water sector in East Africa</td>
<td>Dr. Hamed Beheshti, CEO, WaterKiosk</td>
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<tr>
<td>Pitch 3</td>
<td>14:21 – 14:28 Productive use of micro-hydro renewable energy, for local economic development in rural Nepal</td>
<td>Mr. Bob Carnell, Director of Business Development, Smarter Microgrid</td>
</tr>
<tr>
<td>Pitch 4</td>
<td>14:28 – 14:35 DC SHS based productive use concepts and the importance of Plug and Play AC SHS</td>
<td>Mr. Ulrich Zimmerman, Chief Operations Officer, Zimpertec</td>
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<td>14:35 – 14:55</td>
<td>Audience Q&amp;A</td>
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<tr>
<td>14:55 – 15:00</td>
<td>Closing remarks</td>
<td>Mr. Iain Munro, Board Member, ARE</td>
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The Alliance for Rural Electrification (ARE) is the global association for the decentralised renewable energy (DRE) industry, catalysing private sector-driven markets for sustainable electricity services, creating jobs and powering equitable green economies.

About ARE

#1 Global DRE association

185+ Members

55+ Countries

3 Continents

For more details, see ARE Matchmaking Platform
ARE Members Regional Focus & Expertise

**ARE Members' Regional Focus**

- 55% Asia Pacific
- 39% Latin America & Caribbean
- 86% Africa

**Technologies**

- 23% Bioenergy
- 25% Hydro
- 27% Wind
- 42% Power Components
- 67% Energy Storage
- 79% PV

**Systems**

- 75% Standalone
- 87% Mini-grid
ARE Membership Services

- Market Intelligence & Business Development
- Policy & Advocacy Support
- Communications & Marketing
Facilitated by

Ms. Rebecca Bregant
Board Member
Alliance for Rural Electrification
Ms. Laura Corcoran
Chief Business Development Officer
Aptech Africa
The Role of Solar Energy in Africa's Industrialization

AptechAfrica
Introducing Aptech Africa Ltd.

We are a Solar EPC company operating in 7 countries across Sub-Saharan Africa with 10 years of experience in the solar sector.

- **OUR SERVICES**
  We offer complete assessments, design, supply, installation, and after sales services by our expert team of engineers and technicians.

- **OUR APPLICATIONS**
  We offer solar off-grid and hybrid solutions, energy storage technology, borehole drilling, water pumping, water treatment, irrigation, power transmission, among others.

- **OUR CLIENTS**
  We work with UN agencies/NGOs, C&I, International Companies, Individuals, & Farmers
Industrialization in Africa

- Africa’s Industrial Potential
- Benefits of Manufacturing
- Manufacturing growth in Africa
Role of Solar in Industrialization

- Electrification and industrialization go hand-in-hand
- 10 terawatts of solar potential in Africa
- Uganda is promoting manufacturing (Build Uganda, Buy Uganda)
- Affordability of electricity varies by country
- Huge incentive for manufacturers to switch to solar, cost savings, uninterrupted power, environmental impact
Solar for Productive Use & Industrialization

- Solar water pumping
- Abundance of roof space
- Hybrid systems
- Prolonged working hours due to lighting, improve quality of productive activity, attract more customers
- Used for running basic machinery at plants
- Limitations: machines for industrial manufacturing processes, 3 phase system requirements
- Increased employment
C&I and Sustainability

Aptech’s journey as an EPC Company
Considerations for EPC Companies

• Profiling potential industries
• Understanding load requirements
• The approach to industrial solar projects is completely different—need to emphasize the financial case
• Financial Institutions
Dr. Hamed Beheshti
CEO
WaterKiosk
Best Practice Report;

Productive Use of Renewables

- East Africa
Decentralized Challenges

- Water
- Food
- Energy
- Sanitation
- Farming
Problem
Problem
Problem
Problem

Boreal Light GmbH
Problem
Productive Use of Renewables

- Energy
- Water
- Food
- Sanitation
Burani WaterKiosk®

- Borehole
- WaterKiosk
- Vertical Farm
- Fish Farm
- Waste Water for Toilet
## Trawctions

<table>
<thead>
<tr>
<th>Membership</th>
<th>Clients</th>
<th>Achievements</th>
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| German Water Partnership | UNIDO, UNHCR | **123** WaterKiosks operational in 8 countries
Kenya, Somaliland, Yemen, South Africa, the Philippines, Indonesia, Zanzibar, Tanzania |
| Future Agro Challenge, European food nexus Startup Challenge | Siemens | **250** New Orders received
Madagascar, Mexico, Kenya, Kenya, Somaliland, Yemen, Colombia, South Africa, the Philippines, Indonesia, Zanzibar, Tanzania |
| Start Up Energy Transition | Oxfam, Irene und Friedrich Vorwerk Stiftung | **1000** WaterKiosks planned for Africa in 2025 |
| Kfw, dena, Gwa | GIZ, atmosfair | Boreal Light GmbH |
www.winture.de
info@boreallight.com
Schichauweg 52
12307
Berlin, Germany

Boreal Light GmbH
Mr. Bob Carnell
Director of Business Development
Smarter Microgrid
Productive use of micro-hydro renewable energy for local economic development in rural Nepal

AGENDA - ARE PURE WEBINAR

1. Project members
2. Location
3. Site information
4. Micro-hydro generator
5. Smart microgrid controller
6. Dashboard
7. LCOE and Capacity Factor
8. Socio-economic development
9. Productive uses of renewables
10. TEAMWORK
Productive use of micro-hydro renewable energy for local economic development in rural Nepal

**Smarter Microgrid Limited (SML)**
- Bristol, UK
- Renewables, software & systems

**Nepal Energy Foundation (NEF)**
- Kathmandu, Nepal
- Capacity building in sustainable energy
- Rural economic development
- Gender mainstreaming
- Policy analysis & Advocacy

**Kathmandu Alternative Power & Energy Group (KAPEG)**
- Kathmandu, Nepal
- Electrical & Electronic Engineering
- Research & Development
Productive use of micro-hydro renewable energy for local economic development in rural Nepal
Productive use of micro-hydro renewable energy for local economic development in rural Nepal

### 1. Jhumka Khola II (Palpa, 30 kW)

<table>
<thead>
<tr>
<th>Distance from nearest city/town/highway (km)</th>
<th>17 km from Butwal, 284 km from Kathmandu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project size in kW</td>
<td>30 kW</td>
</tr>
<tr>
<td>Current Production (kW)</td>
<td>35 kW</td>
</tr>
<tr>
<td>Current use (kW) – Peak Hours</td>
<td>8 kW</td>
</tr>
<tr>
<td>Current use (kW) – Off Peak Hours</td>
<td>3 kW</td>
</tr>
<tr>
<td>What is being done for excess energy (Surplus)</td>
<td>Spill water</td>
</tr>
<tr>
<td>Further plans for surplus or deficit energy</td>
<td>Grid Synchronization</td>
</tr>
<tr>
<td>What type of productive end use is existing?</td>
<td>Furniture, Agro processing mills</td>
</tr>
<tr>
<td>Possibility of new economic activities</td>
<td>Yes</td>
</tr>
<tr>
<td>Is there access to internet connection? Through which source?</td>
<td>Mobile data</td>
</tr>
<tr>
<td>Major occupation of the people?</td>
<td>Agriculture, small scale business (hotel/restaurant, shops)</td>
</tr>
<tr>
<td>What are the major ethnic groups residing in the community?</td>
<td>Magar (98%), Brahmins (2%)</td>
</tr>
<tr>
<td>Are women involved in energy based economic activities?</td>
<td>No</td>
</tr>
</tbody>
</table>

### 2. Jhumka Khola III (Palpa, 68 kW)

<table>
<thead>
<tr>
<th>Distance from nearest city/town/highway (km)</th>
<th>15 km from Butwal, 282 km from Kathmandu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project size in kW</td>
<td>68 kW</td>
</tr>
<tr>
<td>Current Production (kW)</td>
<td>75 - 80 kW</td>
</tr>
<tr>
<td>Current use (kW) – Peak Hours</td>
<td>45 kW</td>
</tr>
<tr>
<td>Current use (kW) – Off Peak Hours</td>
<td>25 kW</td>
</tr>
<tr>
<td>What is being done for excess energy (Surplus)</td>
<td>Spill water, there is no use of excess energy</td>
</tr>
<tr>
<td>Further plans for surplus energy</td>
<td>Plan to reduce tariff for increasing the use of electricity</td>
</tr>
<tr>
<td>What type of productive end use is existing?</td>
<td>Agro processing mills</td>
</tr>
<tr>
<td>What are the possible options for energy based economic activities?</td>
<td>Small scale furniture industry, iron industries and other industries</td>
</tr>
<tr>
<td>Is there access to internet connection? Through which source?</td>
<td>Only through mobile data</td>
</tr>
<tr>
<td>Major occupation of the people</td>
<td>Agriculture and small business (shops) in local area</td>
</tr>
<tr>
<td>What are the major ethnic groups residing in the community?</td>
<td>Magar and Dalits</td>
</tr>
<tr>
<td>Are women involved in energy based economic activities?</td>
<td>No</td>
</tr>
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</table>

There are over 3,500 micro-hydro installations across Nepal
Productive use of micro-hydro renewable energy for local economic development in rural Nepal
Productive use of micro-hydro renewable energy for local economic development in rural Nepal
Productive use of micro-hydro renewable energy for local economic development in rural Nepal

**Smart Microgrid**

Daily Energy Generation Overview (kWh)

- **Energy (kWh)**
  - Min: 211.95 kWh
  - Avg: 406.49 kWh

Active Power (kW)

- **Total Active Power (kW)**
  - Avg: 18.03 kW
  - Current: 17.64 kW
- **Phase 1 (kW)**
  - Avg: 6.17 kW
  - Current: 6.30 kW
- **Phase 2 (kW)**
  - Avg: 6.14 kW
  - Current: 6.69 kW
- **Phase 3 (kW)**
  - Avg: 5.70 kW
  - Current: 5.64 kW
MINIMISE THE LEVELISED COST OF ELECTRICITY (LCOE):

\[
\frac{\text{CapEx} + \text{OpEx}}{\text{Energy Generated}}
\]

MAXIMISE THE CAPACITY FACTOR:

\[
\frac{\text{Actual Energy Output}}{\text{Maximum Possible Energy Output}}
\]
Gender and Social Inclusion Activities in Local Communities

1. Baseline study
   - Study of existing productive use of electricity in the project area and explore possible innovative areas for economic activities.
   - Study on the current status of involvement of women and disadvantaged people on economic activities.
   - Study of the need for type of capacity building activities for enabling them to be involved in economic activities.
   - Assessment of micro finance service to women owned enterprises.
   - Review of Article of Association and policy of MHP Users Committee.
   - Gender assessment of selected mini/micro-hydro projects (decision making process, policies, plans).

2. General capacity building activities for women and disadvantaged people
   - Training to women on gender and energy.
   - Management training to the micro-hydro users and users committee.
   - Master training of trainers on gender mainstreaming in energy.
   - Gender and social inclusion training to MHP users committee.
   - Capacity building and facilitation for gender and social inclusion in policy and article of association of the mini/micro-hydro projects.

3. Development of new enterprises
   - Listing of potential areas for enterprise development based on the baseline study.
   - Market assessment for the listed potential enterprises.
   - Selection of appropriate enterprise having scope of market and availability of resources.
   - Selection of entrepreneur based on developed criteria.
   - Train to the entrepreneur for establishment and better management of enterprise.
   - Continuous advisory support to established enterprises.

4. End-line study
   - Study of the changed/improved scenario in involvement of women and disadvantaged people in economic activities.
   - Study of their involvement in better management of mini/micro-hydro projects.
   - Study of the improved situation of gender responsive policies and programme within mini/micro-hydro projects.
Productive Uses of Micro-Hydro Renewable Energy

- Water
- Lighting
- Cooking
- Heating
- Cooling
- Freezing
- Consumer products
- School
- Medical
- Farming
- Rice milling
- Woodworking
- Shops
- Tailoring
Productive use of micro-hydro renewable energy for local economic development in rural Nepal
Smarter Microgrid

Productive use of micro-hydro renewable energy for local economic development in rural Nepal
Mr. Ulrich Zimmerman
Chief Operations Officer
Zimpertec
Productive Use of Energy & Industrialization

DC SHS based PURE and the importance of Plug and Play AC SHS

Ulrich Zimmermann
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# ZIMPERTEC

## Introduction

Zimpertec made it a corporate objective to provide off-grid solar electrification systems for home and productive use applications, supporting the SDG7. Thereby we want to contribute to a flourishing social life and create equal opportunities for everyone.

### Enabling Societies

We focus on developing and manufacturing highly efficient and long-lasting products fitting the energy demand of people with no access to the national grid. Solar Kits for various application and high flexibility in their component and size combination. Starting with a LSX 98 Wh up to a LS AC 5kWh, all PayGo enabled.

### Hardware Resilience

We combine reliable designs with highly flexible Plug & Play wiring systems into Kit solutions in order to provide the best performance and simplicity in implementation for our users.
Why Solar Home Systems?
Solar Home Systems

DC LSX
98 Wh to 294 Wh
Applicable for small households to power 12.8V DC lamps, phone, fans, radio, laptop and TV.

DC SHS
320 Wh to 640 Wh
Applicable for households, shops to power 12.8V DC lamps, phone, fans, radio, laptop, TV and fridges.

DC LS*
1.28 kWh to 1.92 kWh
Applicable for large DC 12.8 V/24 V applications. In households, medical centers, and large cooling applications.

LS AC 300-700
0.3-0.7 kW, 0.64 to 1.28 kWh
Applicable for shops, offices, medical centers to power 110/220 AC and 12.8 V DC lamps, phone, fans, radio, laptop, TV and fridges.

LS AC
2kW, 2.56 to 5.12 kWh
Applicable for shops, offices, medical centers to power 110/220 AC and 25.6 V DC lamps, phone, fans, radio, laptop, TV and fridges.

DC LS* is on the roadmap to serial production. At the moment 02.2022 it is only available on special request.
"Enable productive use for everyone, with high energy density plug and play systems rural farms, businesses can accelerate their growth"

Zimpertec
Energy to Enable Food Conservation

The DC SHS & LS DC Family

Through larger Plug and Play Solar Home Systems, families and farmers can improve their standard of living. They get new opportunities in education, security, agriculture, and energy independence. The systems are PayGo enabled and use with LFP battery one of the most long-lasting battery solutions.

**Dual Load Output**

To securely run crucial loads like fridges, the SHS has has a dedicated battery capacity.

**DC Fridge/Freezer**

Energy-efficient solar off-grid powered refrigerators and freezers using high quality, durable long-life components.

Volume: 50/100/160/400L

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Energy to Enable Water and Disinfection

The DC SHS Family

Through the DC SHS 25/50 it is possible to create disinfection materials and clean water in combination with WATA appliances of a Swiss company.

Load Paralleling Structures

Able to parallel load outputs to increase system sizing by demand.

Water Creation

Even after a fountain was disinfected, water can still get contaminated after extraction and storage.

Disinfection Materials

Especially for hospitals it is of great importance to have disinfection materials to reduce bacteria.

WATA Photo Credits © Ghinwa Daher – „What Took You So Long?”

© Zimpertec GmbH & Co. KG
"Continuous power supply, to meet unreliable grids and minimizing grid outages, by solar powered AC-Backup Systems"

Zimpertec
AC Solar Home System
LS AC Series

**UPS Solutions:**
With out LS 2kW it is possible to consume energy from different sources e.g. Solar, Mini Grid, National Grid to ensure uninterruptable and future ready power supply.

**Load Flexibility:**
Supply efficient DC appliances for cooling with full battery autonomy. AC to power offices, medical devices or other productive appliances.

**Health stations:**
Ready to use systems reduce significant installation efforts and avoids safety errors during the installation process. Significantly speeding up hospital electrification.

**Office/ Business Use:**
2 kW AC solar home systems can replace many small-scale diesel gensets back-up systems and hereby improve the financial and CO2 conditions in offices.

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Leveraging the Ecosystem of Appliances & SHS

Partnering:
Collaboration among appliance and SHS manufacturer can ease and strengthen the actual use case by alignment. E.g. dual load output for fridges.

Plug & Play:
Ready to use systems reduce significant installation efforts and ensures the safety of the investment. Ready to use systems help avoiding safety errors during the installation process.

Holistic Approaches:
Think about the complete set up. What is necessary e.g. next to the fridge. Can panels be oversized to run appliances during daytime.
Lessons Learned

Data Logging

The integrated one-year datalogger supports analyzing the systems in the field applications.

Dual Load Output

To securely operation of crucial loads like fridges, the SHS has a dedicated battery capacity.

Reliable Design

Do not assume only solar day: 5.0 KWh/m²/day. Make sure it works also on bad weather conditions like a solar day of 3.0 KWh/m²/day.

Battery Sizing

Consider enough battery backup, but also think about what appliances can be run during daytime.

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Thank You!

Ulrich Zimmermann  
COO Zimpertec GmbH & Co. KG  
info@zimpertec.com
Audience Q&A

Ms. Laura Corcoran, Chief Business Development Officer
Aptech Africa

Dr. Hamed Beheshti
CEO
WaterKiosk

Mr. Ulrich Zimmerman
Chief Operations Officer
Zimpertec

Mr. Bob Carnell
Director of Business Development
Smarter Microgrid
Closing Remarks

Mr. Iain Munro
Board Member
Alliance for Rural Electrification
See you at the next showcase webinar on 'Energy Storage Trends'