PAYGOing the last mile?

ESEF 2019
Accra, Ghana

Tom Erichsen
Differ develops and invests in technologies/companies that offer solutions addressing the energy needs of energy poor communities

> Distributed/decentralized PV solar solutions
> Innovative battery/storage solutions
> Energy efficient appliances
> Clean cooking solutions
> DESCOs
> PAYGO-solutions
> (Turnkey) Projects

*Bringing modern energy services to energy poor communities*
Topics

Electrifying the last mile (SDG 7)

> Differ Community Power
  - PAYGO solar for health
Most un-electrified villages should/will get access through distributed solutions.

How large share of the gap is it commercially viable to serve?

With Tier 2+?

Will subsidized grid energy continue to take the most viable customers?
## Financial barriers for DESCOs to serve remote areas

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased cost due to longer distances and lower density</td>
<td>![Store Icon] ![Truck Icon] ![Workman Icon]</td>
</tr>
<tr>
<td>Risk and cost associated with customer quality</td>
<td>![Warning Triangle] ![Up Arrow] ![Down Arrow]</td>
</tr>
<tr>
<td>Limited access to working capital at attractive terms</td>
<td>![Money Icon]</td>
</tr>
</tbody>
</table>
Consequence:
Increasing introversion of growing PAYGO businesses

Introvert sales activities:
> Smaller/larger systems in same area
> New assets to existing customers
> Moving existing customers up the ladder

> How to enable SHS companies to also reach further from each of their current sales hubs, or to establish more hubs?
> BUT without running companies into debt repayment issues
How to ensure that all viable customers get access?

A. Commercially sustainable (20% non-payment rate)

- [V] [V] [V]
- [X]

B. Not commercially sustainable (40% non-payment rate)

- [V] [V] [V]
- [X] [X]

> Uncertainty when targeting new under-served segments:

Will the non-payment rate be 10% or 40%?

< 20% means success

> 20% means unviable

> In case of 40% non-payment, how to effectively allow the private sector to serve the 60% that are paying?
Achieving “bankability” for a larger share of the last mile customers requires new instruments

New guarantee mechanisms adapted to support off-grid projects and distributed solutions

A default risk protection (“insurance”) reducing the cost for companies experiencing lower payment rates and/or higher default rates
Report on distributed solar solutions:

Topics

> Electrifying the last mile (SDG 7)

Differ Community Power

- PAYGO solar for health
Differ Community Power – delivering complete turn-key and PAYGO solutions for community services

<table>
<thead>
<tr>
<th>Health facilities</th>
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</thead>
<tbody>
<tr>
<td>▪ Lighting, TV, radio, computing, charging, air circulation and fridge</td>
</tr>
<tr>
<td>▪ Street and security lights</td>
</tr>
<tr>
<td>▪ Cold and clean water</td>
</tr>
<tr>
<td>▪ Hot water</td>
</tr>
<tr>
<td>▪ Air conditioning</td>
</tr>
<tr>
<td>▪ High-speed connectivity for tele medicine</td>
</tr>
<tr>
<td>▪ Basic medical equipment</td>
</tr>
<tr>
<td>• Sterilizer for instruments (autoclave)</td>
</tr>
<tr>
<td>• Suction pump</td>
</tr>
<tr>
<td>• OP Lamp</td>
</tr>
<tr>
<td>• Basic instruments</td>
</tr>
<tr>
<td>• Microscope</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Basic kit for classroom, incl. lighting, charging and fans</td>
</tr>
<tr>
<td>▪ High-speed connectivity</td>
</tr>
<tr>
<td>▪ Laptops &amp; tablets &amp; projector</td>
</tr>
<tr>
<td>▪ Security lights, water etc (as for health post)</td>
</tr>
<tr>
<td>▪ Training and education/contents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Community centers</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Basic appliance kit</td>
</tr>
<tr>
<td>▪ Clean cold and hot water</td>
</tr>
<tr>
<td>▪ Street and security lights</td>
</tr>
<tr>
<td>▪ Job training and contents</td>
</tr>
<tr>
<td>▪ Business space</td>
</tr>
<tr>
<td>▪ Other community centre facilities</td>
</tr>
</tbody>
</table>
PAYGO often necessary for solar to be preferred to diesel

The high investment cost of solar PV+storage is often challenging for NGOs

Diesel is often selected due to low CAPEX, spite high OPEX

With technology and financing, the annual cost for the NGO is reduced, including the investment year
Li/LA Hybrid Battery: “LITHIUM PERFORMANCE AT LEAD ACID COSTS”

20-50% lower investment cost compared to pure lithium battery solutions
...but with much longer lifetime compared to lead acid
...and limited maintenance required

*Lowest cost per stored kWh*

*PAYGO-attractive and optimal for health facilities*
HOW?
Lithium extension for daily cycles; lead acid for back-up

"Typical month"
Retrofitting: Solar+Lithium Extension as primary energy source, diesel/lead acid as backup

Lithium is used first and charged last

Risk of sulphating and short battery lifetime

High operating costs & high emissions!
The challenge of PAYGO in the humanitarian sector

With PAYGO, a solar solution can offer savings from day one!

BUT....

> Limitations in terms of longer-term commitments (annual/short budget periods)

    Need for a guarantee to cover this risk

> Tenders are usually not PAYGO-designed

> Revised tender approaches needed
Designing tenders to focus on sustainability

> Key design features of sustainable tenders
  - **Specify energy services, not Watts** – balancing generation capacity and ENEF
  - **Tender energy as a service, not a product** – improving performance and sustainability through payments over time (e.g. 5 yrs) (more than just warranties or a limited payment for after-sale service/O&M)

> Focuses competition on cost effectiveness, not lowest cost alone
  - Optimal balance of **cost vs durability** of system components
  - Optimal balance of **cost vs service level** in after-sale-service/O&M

> Benefits to tendering entity:
  - **Sustainability**: More systems functioning over time
  - **Savings**: No/lower payment for systems not working/under-performing
  - **Innovation**: Investing in smart solutions becomes more interesting
ENEF – investing in efficiency generally pays off

> On system level, investing in efficiency generally pays off

> Example for fridges off-grid:
  - Cost of fridge is 50-70% of cost of appropriate PV+battery
  - Depending on lithium or lead acid

> Efficiencies vary greatly, but..

> ...cost of appliances is not fully correlated to efficiency
  - Super-efficient comes at a premium

> Super-efficient equipment can also be leased
Differ Distributed Energy Fund

A new Norwegian fund investing in distributed energy growth companies

ABOUT DIFFER DISTRIBUTED ENERGY FUND

WHY
- The market for distributed energy solutions is expected to show enormous growth over the coming decade
- Distributed energy solutions are often faster, cleaner and more cost-efficient than grid-based alternatives
- Distributed energy is a global megatrend delivering permanent & reliable solutions in developed and developing countries
- Scaling distributed and off-grid energy solutions is key to achieve both development (SDG7) and climate (Paris) goals

WHAT
- Investments in companies and projects along the value chain for distributed renewable energy solutions
- Companies and solutions with international market aspirations, specifically in off-grid, mini-grid and captive markets in Africa and Asia.
- Primarily targeting the solar market segment
- Targeting technology suppliers, systems integrators, project developers & EPCs, distributors/DESCOs, suppliers of energy efficient products and services, companies with digitalisation strategies & innovative business models within the distributed energy space
- Unlisted growth companies in the commercialisation/roll-out phase
- Investments shall contribute to reduced emissions of GHGs

HOW
- Capital pr investment: €1-4m for 10-40% shareholding
- Equity and other instruments
- Active ownership - board position
- Investment horizon: 3 – 6 years
- Capitalisation target: €30m
- Target closing: Fall 2019

WHO
- Norwegian fund established by Differ Group (www.differgroup.com)
- Differ Group is a Norwegian investment company with 20+ years of experience in the distributed energy space
- Experienced investor with proven distributed energy track-record
- On-the-ground experience from managing and advising renewable energy companies in Asia and Africa

DIFFER DISTRIBUTED ENERGY FUND IS CURRENTLY SEEKING INVESTORS AND INVESTEES - CONTACT:

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