PUE IN TANZANIA

Energizing Livelihood Through Mini-grids
Event in Dar-es-Salaam, 19\textsuperscript{th} November 2018
Introduction

The Energy Change Lab (The Lab) is a program of the Humanist Institute for Cooperation with Developing Countries (Hivos) and the International Institute for Environment and Development (IIED). The Lab works with pioneers and changemakers to establish energy systems that are sustainable, resilient, and people-centered. We do this by developing leaders, incubating prototypes\(^1\), building evidence, connecting people, and sharing ideas.

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\(^1\) A prototype is a small intervention, with the aim of fostering learning on ‘what works’, before scaling up to larger interventions/projects.
The Lab’s Productive Use of Energy (PUE) programme aims to enable pioneers in and outside the energy sector to design, test and learn about interventions that promote PUE.

- The design of the core energy service (e.g. business model, tariffs, customer marketing)
- The support measures needed to boost local demand (e.g. SME development, skills training, customer access to finance)
- The wider enabling environment (e.g. policy, funding, skills, cross-sector linkages)

Over the past year, the Energy Change Lab have been implementing small interventions to test what works in terms of fostering PUE in Tanzania, in partnership with mini-grid developers (Power Corner and Rafiki Power) and other actors in the PUE ecosystem. As the initiatives are coming to an end in both mini-grid sites, we brought together key actors in the PUE ecosystem to showcase our PUE activities and share experiences and approaches while identifying possible linkages and partnerships for the purpose of unlocking collaboration.

The workshop also aimed to provide participants an overall understanding of the current and future state of PUE in Tanzania and look to identify promising ways to further energize livelihoods through mini-grids.

Objective

This one day event aimed at showcasing PUE in Tanzania, seeking collaborations and solutions.

Expected outcomes

At the end of the workshop, participants were expected to:

- Have an overall understanding of the current and future state of PUE in Tanzania
- Establish how economic activities at mini-grid sites and off-grid systems can be further supported and improved
- Establish new personal connections while identifying possible linkages and partnerships

Methodology

The workshop in Dar es Salaam targeted policy-makers, energy providers, energy practitioners, local entrepreneurs, and other key actors in the PUE ecosystem. Participants discussed and learned from each other’s work on how to successfully advance productive uses of energy in rural areas.

The Energy Change Lab introduced partners Power Corner and Rafiki Power to participants and the PUE prototyping work for mini-grid PUE supply chains and capacity building.
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Dear Workshop Participants,
Invited Guests,
Ladies and Gentlemen,

At the very outset, I would like to express my sincere gratitude on my own behalf and on behalf of Alvaro Rodriguez, the Resident Coordinator of the UN System in Tanzania.

Let me thank you for the honour to officiate this meeting; Opening of the Productive Uses of Energy Workshop: Energizing Livelihood through Mini-grids.

I would like to congratulate the Energy Change Lab team for their efforts in the past one year to unlock collaborations and innovation by decentralized energy providers and other stakeholders in the productive uses of energy. I believe this workshop is providing an opportunity for an intended common understanding of the current and future state of PUE in Tanzania.

I hope that the workshop will also realize the intended objectives to establish partnerships, and agree on mechanism to tap into the mini-grid sites as well as off-grid sites to support productive use activities and income generation. These efforts as demonstrated by the Energy Change Lab are not only contributing to the achievement of the Sustainable Development Goal number seven 7 (which is about affordable and clean energy) but a good number of SDGs as well, that in one way or another are affected by the availability and accessibility of energy for direct use in productive sectors.

There’s also a clear synergy and contribution towards achievement of Sustainable Energy for All Initiative that was launched by the then Secretary General of the United Nations, Ban Ki Moon to help mobilize the achievement of universal energy access, improve energy efficiency and increase the use of renewable energy.

As the Government of Tanzania is aspiring to reach mid income status by year 2025, through the wheel of industrialization, affordable and accessible sustainable energy becomes a very important part of the equation. It is efforts like these, what we are having right now of creating partnerships, of strengthening knowledge and experience sharing, such initiatives that enhance an energy system that is sustainable and people-centered are the ones that can really drive us or fast track the achievement of Vision 2025.

I believe the workshop has successfully brought a combination of participants anticipated to enable/facilitate policy decisions, regulations, and provision of services and products for productive uses of energy. I believe all of you will contribute to enriching discussions and bring a very important foundation for yet another level in pursuing and strengthening interventions, incentive, policies, or regulations that are need to support the mission (Productive Uses of Energy in Tanzania) and consequently contributing to vision 2025 and industrial era in Tanzania.
The UN system under its Development Assistance Plan has committed to four thematic results areas i) Health Nation, ii) Inclusive Growth, iii) Democratic Governance including Human Right and Gender Equality and iv) Resilience. To achieve result in all the four thematic areas, sustainable energy is an integral part and so is the productive use of energy angle especially under the inclusive growth thematic result area.

Within Environment, Climate Change and Disaster Risk Management, outcome area the UN system is partnering with the Government of Tanzania and other stakeholders in promotion of renewable energy sources, improving energy standards, energy efficient technologies and clean energy practices to promote the harnessing of available of natural gas, solar, wind and other technologies so as to increase to electricity for majority of the Country predominantly rural population, in support of governments Vision 2025 of ensuring that 75% are able to directly benefit from electricity. So such increases in energy generation and access will also spur development of agro industries in rural Tanzania.

Therefore further collaborations, with the various respective UN agencies as per the areas of focus and specialties is welcomed and direct interaction with these agencies is also encouraged. Just before I do the official opening, I would like to emphasize that innovation, partnership and accountability will accelerate to desired benefits from Productive Uses of Energy in Tanzania and beyond. So let’s join efforts in that direction. With these remarks, let me once again congratulate the organizers and wish you all the fruitful discussions.

I now declare that this event on Productive Uses of Energy is officially opened.

Asante Sana
Clara Makenya
On behalf of the Resident Coordinator of the UN System in Tanzania

The Energy Change Lab PUE Prototypes

The Lab has been working on PUE in Tanzania since 2016, starting with dialogues and workshops with stakeholders. In mid-2017, two key ideas were formed on prototyping and partnering with mini grid developers.
Since August 2017, the Lab has been testing two prototypes with some results as follows:

**Prototype 1: PUE Capacity building and awareness raising framework to support entrepreneurs**

This prototype is jointly implemented with Power Corner, part of ENGIE, which started working in Tanzania in 2015. Most of the systems are 30kWp solar PV with different PUE businesses envisaged. Prototyping includes capacity building methods such as design of PUE training materials, educational videos, and equipment operating manuals in Swahili as well as the training of locally based PUE Champions. Some of the results have been:

- 24 PUE Champions (17M, 7F) selected and trained in 3 villages.
- 14 PUE Champions established their own businesses, and these PUE champions further trained 48 entrepreneurs (29M, 19F).
- In total, there are 33 entrepreneurs currently running 39 businesses (14 PUE Champions, 25 other businesses).
- The established businesses enable the local entrepreneurs to earn a living (between $60 - $200 a month).

**Key lessons learnt are:**

- Local entrepreneurs prefer practical to book-based learning because it offers them an opportunity to test and see how the PUE appliance works. The Lab believes that using appliances during the training and allowing entrepreneurs to test them for a period would increase the willingness of entrepreneurs to purchase the appliances and establish the business.
- The use of PUE equipment and audio-visual tools are important for local entrepreneurs to identify potential business opportunities and to acquire basic operation skills.
- PUE equipment manuals in Swahili have proved essential to proper and safe usage of the appliances based on feedback from entrepreneurs.
- PUE Champions must be compensated for cascading the PUE training to other local entrepreneurs.
- Entrepreneurs are unable to attend formalized training from Small Industries Development Organization (SIDO) and Vocational Education and Training Authority (VETA) because of financial constraints.

**Prototype 2: PUE Appliances distribution and after sale services supply chain**

This prototype is jointly implemented with Rafiki Power, part of E.ON Off-Grid Solutions to address the main challenges of accessing PUE appliances, aftersales services, and enhancing credit facilities in Dongo and Chang’ombe villages. The prototype focuses on testing a new approach to attract urban based PUE equipment suppliers to rural villages. It includes training and working with local agents (technicians and local sales representatives), connecting actors in appliance distribution chain (suppliers, transporters, distributors, sales agent) to link up distribution chains, and to help customers/local technicians deal with simple maintenance through PUE appliance operating manuals and supplier technical support. Thus far, the results have been:

- 3 equipment suppliers are now interested and 1 is actively distributing to rural areas.
- 1 local agent and 1 technician are working closely with supplier. Delivery of appliances is now possible within 3 days.
- A total of 6 PUE appliances have been supplied (sewing machine, pressure washer, overlock machine, and tailoring machine).
Key lessons learnt are:

- Appliances must be tested in real-world conditions, especially on solar PV mini-grid systems.

- Business cases for local entrepreneurs must be carefully designed with mini-grid tariffs in mind, which are usually non-subsidized and consequently quite high.

- Entrepreneurs are benefitting from developer payment plans, but the 25% upfront cost is difficult for some entrepreneurs to raise. Additionally, many rural entrepreneurs are averse to taking on debt.

- Capacity building is an essential component to building distribution chains for PUE.

Emerging recommendations from the Lab experience:

- Business cases should be explored with local entrepreneurs while mini-grids are in the design phase so that the system installed can cater for those PUE activities.

- Developers and suppliers need to establish a conducive PUE environment by distributing user manuals in Swahili (soft and hard copies) and providing for longer equipment warranty periods.

- Training and capacity building must be hands-on with demonstrations using PUE appliances.

- Consider harvest seasons to market and promote PUE appliances, as communities will have more financial resources and thus, better able to invest.

- Multi-sector approach can unlock financing for PUE, i.e. farmers cooperatives or developers can act as guarantors (by paying 25%) upfront so that the asset financiers can relax their criteria.

- Multi-sector platforms for collaboration and information sharing are essential for PUE uptake, and governments and/or donors should consider funding such platforms.

Typical Components of a Successful PUE Ecosystem
Why has PUE not taken off in Tanzania?

We asked all participants to list what are the key challenges remaining for PUE development in the off-grid sector and why has it not taken off. Following are some insights broadly found to be at four levels - those of developers, entrepreneur/community, financiers, and policy and institutional support organisations:

- **Developers and PUE equipment suppliers**: Costs are high for project development, and developers may be too focussed on electricity access, without considering a PUE approach. Socio-economic assessments and awareness raising campaigns to support PUE are costly. Additionally, developers must balance investment costs with generation capacity, where solar PV systems especially may not be able to absorb larger PUE loads. Suppliers must also provide longer appliance guarantee periods to build distribution chains and consumer trust.

- **PUE entrepreneurs and communities**: Many participants thought that local PUE entrepreneurs and communities need technical and business capacity building. However, professional or vocational training institute fees may be too high and training centres too far. Linking communities with these types of available opportunities, thereby aggregating capacity building demand, could support these types of interventions.

  Participants cited the high cost of PUE appliances and equipment as a major constraint as well as a lack of funds for business promotion, especially for small start-up entrepreneurs. Further, a lack of start-up capital hinders local entrepreneurs in establishing businesses. More support is needed from the formal lending industry, such as raising awareness of how communities can access financing for PUE.

  In addition, the lack of awareness of end-users in the communities, of technology as well as financing leads to a greater challenge for the entrepreneurs. Tariffs are very high for mini-grid energy and dissuade locals to start business. Awareness has not reached many electrified villages on how electricity can be used as input to income generation and economic potential rather than traditional use. Often, community members end up as entrepreneurs of same businesses with the number of customers as the same, thus lacking diversification.

- **Financiers**: Financing for PUE appliances and developers seeking PUE promotion is very limited. Participants cited long distances to these remote communities, poor infrastructure, and a lack of understanding around PUE and energy access as some of the reasons why there is still insufficient support from financial sector.

- **Policy makers and other supporting organisations**: Participants thought that weak collaboration hinders the work of policy makers and supporting institutions and that partnerships are not yet effective. PUE is not explicitly mentioned in government policies and acts. Linking existing policies on entrepreneurship and credit guarantees to PUE would help enable energy access. For example, national institutions responsible for entrepreneurship development/small industries development as well as Economic Development have little knowledge an energy access programmes. Energy access and rural development needs better integration. Some participants also found a lack of awareness among energy practitioners on gender mainstreaming and willingness to work with women entrepreneurs. Overall, many felt that PUE programmes should be well understood by relevant government institutions to receive increased support.
Panel Discussion 1 - Setting the Stage: PUE Promotion in Off-Grid Tanzania

Panel members: Representatives from Power Corner, Mwenga Hydro, CEFA and Energy4Impact

The panel had three mini grid developers and one supporting institution Energy4Impact who works with many of the developers to support PUE implementation. Power Corner, the Labs’ partner is now operational in 8 sites in Tanzania with a further 4 in construction; most systems are sized around 16kW. The company has 1500 customers and plans to add 1600 in the next four sites. CEFA has been operating mini-grids in 8 villages starting in 1986, with 550kW of total capacity. Electricity is reaching 1200 customers. Mwenga operates a 4 MW hydro mini-grid that received heavy grant support and is reaching 3200 customers. The mini grid has a high voltage transmission line of over 300km and a low voltage line of 70km.

Stimulating demand through the promotion of PUE appliances and challenges.

- Power Corner mentioned that 80% of revenue comes from only 20% of customers, mostly PUE entrepreneurs. Power Corner and the Lab are implementing different strategies such as capacity building and exploring community characteristics and value-chains to address the needs of entrepreneurs, which can vary drastically. For example, carpentry is more common in southern communities, thus PUE must adapt to local circumstances and value-chains. Equipment suppliers usually have warranties that are limited to 3-6 months, and transporting equipment needing repair from remote communities to urban shops (almost 200 to 500km) is costly. Often, Power Corner’s name is put as collateral, which can be an issue for the company’s reputation if warranty servicing is delayed.

- CEFA works closely with their communities for all activities including PUE and tariff development. A community rural electrification committee meets the mini-grid management every 3 months to discuss issues and solutions. The communities cite high connection fees, and financial affordability to pay tariffs as main concerns. CEFA’s distribution lines are buried, which has increased their costs. CEFA helps establish savings cooperatives in villages and created a credit instrument specifically to support potential users willing to connect to the mini-grid. The residential and businesses can use it to cover up to half of the connection fees. The “Loan” has a lower interest rate and a longer payback period compared to normal loans provided by other financial institutions. The savings cooperatives also give loans for upgrading businesses.
Mwenga hydro installed their system in the southern region. Many customers have successfully transitioned from diesel powered appliances to electricity powered appliances, and company profits have gone up by 70%. They have a lending mechanism for appliances with a 20% down payment. However, challenges remain such as collateral, low skills, and knowledge amongst customers, and payment of tariffs. The company is concentrating on convincing more entrepreneurs to switch from diesel to electricity for PUE. The proliferation of similar appliances has led to stiff competition between entrepreneurs, and is pushing revenues unsustainably downwards.

Similarly, Energy4Impacts’ Rural Electrification Densification programme (REDP) is working with 69 villages on PUE. The Rural Energy Agency (REA) supports by introducing communities to Energy4Impact and PUE. The project provides PUE trainings, clinics and road shows to demonstrate appliances, and opportunities for PUE.

Discussions: A series of questions were asked and following are some key points made by panellists

- **On PUE appliances (to Power Corner):** The company identifies high-quality and efficient appliances for their customers and seek legal advice given the operational and reputational risks of directly providing appliances to communities. Power Corner coordinates and buys products directly from supplier but the warranty is in the name of the customer. Outside of the developers, so far no finance institute has been able to provide asset financing directly to the communities.

- **On marketing (Mwenga):** The company has marketing officers and assist entrepreneurs in choosing different types of businesses and appliances. In the area they operate, cultural problem is a big challenge because women have access to resources but do not have any control over it. This makes gender mainstreaming in PUE even harder.

- **On tariffs (Mwenga):** Tariffs are offered at different levels with a residential rate of TSh60/kWh (compared to TSh 100 for on-grid), businesses at TSh 240/kWh (compared to TSh 350 for on-grid customers). Electricity is available 24/7.

- **Powering appliances (Mwenga):** All appliances starting from smaller i.e. juice blenders to big industries are connected to the mini-grid, which is largely influenced by its size. The company is currently building mobile distribution lines to power timber harvesting equipments and remove them after timber harvest.
Panel Discussion 2 - Digging Deeper: Policies and Perceptions of PUE from Government, Donors, and Communities

Before the panel discussion, we asked participants to provide their thoughts on whether PUE is a priority in the development agenda and who is active in the promotion of PUE in Tanzania. Many participants felt that on the priority is electrification, with PUE having less of a focus or priority in the government’s agenda for PUE. A majority felt that the government was not playing an active role in PUE and should prioritise it through the industrialization agenda, which would support local developers.

Some participants suggested that beyond the Ministry of Energy, other ministries should be involved such as Prime Minister’s Office (through National Economic Empowerment Council), Ministry of Industries, Trade and Investment, Ministry of Agriculture, Ministry of Livestock and Fisheries as well as local governments. Most participants agreed that PUE efforts are currently being supported by donors including philanthropic associations and foundations via developers and non-profits. Stakeholders must develop PUE further to unlock development in rural areas and that communities need to be trained in order to activate PUE opportunities.

Panel members: Representatives from Small Industries Development Organization (SIDO), Tanzania Traditional Energy Development Organisation (TaTEDO), Tanzania Private Sector Foundation (TPSF), United Nations Industrial Development Organization (UNIDO) and a local entrepreneur from Lindi (Power Corner site)

Tanzania Traditional Energy Development Organization (TaTEDO) is a non-profit organization that has been active for more than 20 years and is working on PUE in communities. The organization trains developers and users, supports with PUE appliances to create business and employment in villages, and ensures that services that are required are available.
The **Tanzania Private Sector Foundation (TPSF)** is active on research and policy and dialogues with the private sector and government agencies in particular to mainly advocate for promoting businesses. The Foundation is currently researching barriers for businesses and establishing solutions and reforms that can be taken up to Parliament.

**Small Industries Development Organization (SIDO)** is an organization that is well placed to catalyze PUE development. SIDO’s core activities are similar to those needed for PUE development such as: business and technical training, technology development, and micro financing linkages (supporting small loan facilities to SMEs in rural areas - TSh 0.5m to 6.5m). If businesses grow, SIDO can also link with other financial institution (e.g. work closely with CRDB - 17% interest for loans over 10m-50m). SIDO works closely with Tanzania Bureau of Standards (TBS) to ensure compliance across services. SIDO has an incubation programme for start-ups and offers services to entrepreneurs via their seven regional offices.

**United Nations Industrial Development Organization (UNIDO)** is an agency of the United Nations, has been active in Tanzania for over 10 years. UNIDO initially supported small and medium enterprises, but have recently focused on energy generation projects, especially hydro and waste to electricity. UNIDO also supports agro-industry entrepreneurs in the country.

Below is a summary of the question and answer session:

- **Local PUE experiences and challenges**: TaTEDO saw that demonstrating appliances with technical trainings better unlocks community understanding of PUE applications. TaTEDO supports with an initial demand assessment (e.g. agro processing, oil processing, battery charging) and follows with PUE trainings. TaTEDO noted the importance of designing an energy system that can adequately meet entrepreneurs’ demand, while incorporating components of training and business skills.

- **Entrepreneur’s viewpoint**: Dickson is an entrepreneur from Lindi, which is a Power Corner site. He owns a printing and photocopying business. He switched from operating his appliances with a diesel generator to electricity supplied by the mini-grid. He perceived the mini-grid tariffs as too high, but clarified that he spent roughly TSh 2000 per day on diesel but now only spends about TSh. 1000 per day on electricity from the mini grid. His perception on high tariffs is typical of many communities, as they compare electricity from mini-grids to those subsidized on the main-grid. He suggested that reducing taxes and subsidized mini-grid tariffs would enable micro and small entrepreneurs to develop faster in rural areas.

- **Tanzania Private sector foundation**: The foundation currently coordinates with Trademark East Africa, the Tanzania Bureau of Standards (TBS), as well as other Ministries to simplify processes for businesses. Currently working with EALA (East Africa Legislative Assembly) to incorporate an easier certification process although government policies and Acts may not be directly affected.

- **Government support to PUE (SIDO)**: SIDO offers entrepreneur product certification in compliance with TBS. A participant suggested that SIDO could better support PUE by pivoting away from projects and establish a wider programme to support PUE. This programme could include project developers, communities, and REA and linked with the rural electrification strategy. This programme approach could help avoid non-viable business plans, as they would be directly linked with energy access and rural development.

- **Provision of innovative efficient machines in rural areas (SIDO)**: SIDO has seven (7) Technology Development Centers (TDC) to support local technology development and fabrication in Iringa, Mbeya, Arusha, Kigoma, Lindi, Shinyanga and Mwanza. Where no TDC exists, SIDO suggests talking directly to suppliers to establish viable distribution chains.

- **On training materials by SIDO**: SIDO acknowledges the challenges of limited resource and finance access in communities for accessing business development services and trainings. In Dar es Salaam, SIDO is innovating in programmes aimed at establishing graduate internship opportunities. SIDO plans to develop a smartphone application soon to engage with more communities and better target their activities.

- **Households to be part of industrial strategy (SIDO)**: The Government talks about industrialisation and how households can be part of the industrial strategy. In Dar, SIDO trains up to 60 people in business and technical skills, financing, technology etc.

- **Working with other government institutions such as Rural Energy Agency (SIDO)**: SIDO currently does not work closely with Rural Energy Agency (REA) but does work with other institutes such as Commission of Science and Technology (COSTECH). However, SIDO acknowledges that more partnerships are needed. The regional manager suggests approaching the Director General of SIDO with partners to help build a comprehensive approach to PUE.
Some reflections and perspectives from Vocational Education and Training Authority (VETA), Ministry of Energy, and National Economic Empowerment Council (NEEC)

Vocational Education and Training Authority (VETA) has 29 centers offering long and short-term courses. Every year, 15,000 applicants apply, but VETA can only accommodate 4,000. VETA established an app-based digitized learning and training platform called VSOMO. Anyone can download and register for free through the app, in both Swahili and English. The course is split between theory (40%) and practicals (60%). Users must complete the theory portion within the app, and then must register to complete practical sessions at the nearest VETA center. The practical course lasts 2 weeks and covers 60 hours whereas the normal VETA practical courses last 3 months. The costs are also reduced with the 2-week training available for TSh 120,000 compared to TSh 300,000 for the 3-month course. 36,000 users have downloaded the app, with 11,000 registered for the course and 180 students that certified through the VSOMO. VETA currently offers 13 courses with plans to add 10 more. VETA’s app content is mostly static pictures, but VETA is exploring audio and video material.

Ministry of Energy: The Ministry of Energy acknowledged that more support and effort is needed to establish a stronger enabling environment. The Ministry is promoting renewable energy systems and the government is linked to SE4All and other initiatives. The representative from the Ministry of Energy pointed out that mini-grids are perceived as being too costly and that commercial models are still not yet viable. He stated that promoting PUE is important as the government is looking to rapidly expand rural energy access and development. The representative recommended that energy systems start with PUE in the design and that tariff affordability should be closely examined. Communities tend to compare off-grid and main-grid tariffs, which can affect willingness to pay. The representative highlighted cost savings through standardization and cited the small power producers’ framework as an opportunity for stakeholders to give valuable input. The Ministry will seek to balance the needs of end-users and mini-grid developers. The representative ended by noting that the off-grid sector in Tanzania is promising, and the Ministry is keen to propel it forward.

National Economic Empowerment Council (NEEC): NEEC is a government institution under the Prime Minister’s office. The NEEC coordinates, facilitates, and monitors economic empowerment across sectors in the economy. The NEEC sits on various coordination committees that deliberate economic empowerment issues throughout Tanzania’s sectors, and takes issues and solutions to the PM’s office. NEEC also coordinates economic funds (such as Mwananchi Fund) that are used to guarantee loans to small SMES - via Village Community Banks (VICOBA) or Savings and Credit Cooperative Societies (SACCOS). Financial institutions offer concessional loans to support local development. NEEC cited 36 empowerment funds that exist for various types of projects. Detailed fund information is available from the office in Dar es Salaam. The NEEC also facilitates entrepreneurship training through collaborations. Various ministries and government ministries report on economic empowerment activities to show achievements as well as challenges to advice government. NEEC is open to collaboration on economic empowerment, and PUE fits in well with rural development.
SESSION III: EXPERIENCE SHARING

What lessons have been learned in finance, capacity building, and appliance supply

The group work session was focused on financing, capacity development and appliance supply for PUE interventions. Also, the types of incentives and policies/regulations that are needed for each. Below are the discussion points.

Finance: This group looked at the following:

- **What is at hand:** Women and youth funds are available from local governments, NEEC, SACCOS and VICOBA, but there is no specific focus on PUE. Various micro finance funds exist such as through Vision Fund. Some banks, such as I&M Bank, finance mini grid activities, and BOA bank has a renewable energy financing window. Donors and non-profits also assist with funds or technical support for financing, but this support can be ad hoc.

- **What is missing and why has it not scaled:** The group felt that there was insufficient government engagement at the SME level. Local governments often hold empowerment funds but these are often not directly connected to establishing PUE activities. PUE is not explicitly supported in government policies. Energy stakeholders are not coordinated and act through self-interest so aligning incentives is important. Local micro credit institutions also lack capacity and knowledge on the topic.

  A lack of collateral hinders MFIs ability to give business loans especially for PUE entrepreneurs who want to buy bigger machines. In addition, loan interest rates are still high for PUE entrepreneurs and some form of credit guarantee, concessional loan or other subsidy would support development. Suppliers must also explore offering longer warranties. There is no national level mini-grid developers association in the country to coordinate and explore financing issues in-depth.

Appliance supply: This group discussed on logistics (cost of transportation increases if logistics not good), and the fact that most suppliers do not provide longer term warranty and appliances user manuals in local language. The appliances are often expensive with VAT and government taxes added to the cost. Most appliances are not covered under TBS so quality and efficiency can be quite poor. Government importation charges vary month to month, which affects appliances through fluctuating costs and consumer prices.

Capacity Building: This group looked at the following

- **What is at hand:** Formal training institutes such as SIDO, DON-BOSCO and VETA are available in many parts of the country but are not well equipped to support PUE and entrepreneurship development in rural areas. VETA have gone far by establishing an app-based digitized learning and training platform, (VSOMO) to offer distance learning opportunity. Other organization like Energy Change Lab and Energy 4 Impact also build the capacity of entrepreneurs through the Audio visual tools, PUE Champions and Mentorship programs.
• **What is missing and why has it not scaled:** The group felt that there is insufficient engagement between formal training institutes and rural entrepreneurs. Despite the fact that the trainings offered are available for all, the off grid entrepreneurs find it hard to attend these formalized training because of logistics and financial constraints and these institutes does not have outreach programs to serve the rural communities. The NGOs which provides technical and business development skills does that in specific areas only and for a specified period. Additionally PUE is not explicitly mentioned in SME Development Policy, National Entrepreneurship Strategy and National Entrepreneurship Training Framework which provides framework for teaching in informal sector. In addition many capacity building stakeholders are working in Silos, not well coordinated something which calls so activities alignments and coordination under government agency, NEEC.

**What needs to be done further?**

Each of the groups came up with some recommendations to further PUE development in Tanzania as follows.

1. **Finance**
   - More research, and communication accordingly through promotion campaigns.
   - Stakeholder round tables with multi sectoral stakeholders required, local DUP association needs to be formed. However, incentives for stakeholders to attend and be active on round table discussions will need more thought. Example of models from Private Sector Foundation can be taken.
   - Incorporate PUE curriculum in learning institutions (long-run intervention, e.g. VETA).
   - Build capacity on PUE for local government agencies to properly support mini-grids etc.
   - Increase the tax base by expanding PUE activities (government to support PUE sector, they can increase tax base through more businesses in rural areas) could help incentivize local and national governments.
   - Provision of capacity by external partners like SIDO could help expand off-grid opportunities and development by reducing the investment costs for developers and allowing them to concentrate on their core business of electricity provision.

2. **Appliance supply**
   - Having a ready stock of PUE appliances and machines for easy delivery and demonstration purposes would help support more rapid uptake of equipment.
   - Regulators should enforce or incentivize manufacturer to provide guarantee/warranties to at least one year and appliance user manuals in local language
   - Tax exemptions for PUE machines that are used in rural development (e.g. VAT exemptions for PUE machines used in rural areas), however this might be difficult to implement practically.
   - Tanzania Bureau of Standards (TBS) should be better resourced to test the quality of PUE machines. Coupled with better enforcement, this will begin to build trust in the market.
   - Importation charges should be defined at a set rate in the applicable government financial year. This would reduce fluctuating monthly costs.
   - Funds from Government or donors should finance large, PUEs machines through concessional loans or subsidies for the poorest so that remote communities can access machinery.

3. **Capacity:** Existing policies, such as the SME policy, have not been revised to reflect current market demands and conditions. Many institutions do not understand PUE opportunities, and will need sensitization from developers and partners (even of organisations such as SIDO, VETA, DON BOSCO etc). Increased collaboration between institutions, developers, and partners could help better establish the capacity for PUE in the off-grid sector.
In conclusion

There is a consensus that PUE (and off-grid) development in Tanzania is rapidly expanding but challenges and barriers remain. Five key points as we move forward on how it will take off:

1. Blend need and opportunity for PUE from the onset of developing the mini grid for PUE

2. Finance must be tailored to local entrepreneurs and for localised conditions in order to jumpstart local markets

3. Capacity development especially tailored to train women and men at local level (consumers as well as entrepreneurs) that target their distinct needs as well as other stakeholders especially local government and other agencies

4. Availability of applicable appliances suitable for local needs, with warranties.

5. Need for more advocacy showcasing PUE towards economic development with increased collaboration.

The Energy Change Lab will continue to push these PUE ideas forward, experimenting with partners and stakeholders. Recently, we developed manuals, videos and materials including reports as part of the learning process. These are all available on the Lab’s website - Resources and YouTube Channel
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