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Policy pointers

Productive uses of energy (PUE) can drive economic development and generate more income for communities and mini-grid developers. But mini-grid developers must design the core energy service around PUE, not just bringing electricity access.

PUE can boost demand for energy in remote communities if developers, governments and partners provide access to skills, finance and equipment, particularly for women.

PUE can support governments' sustainable development plans, if donors and investors catalyse national PUE activities through incentives, policies and a range of finance options.

To rapidly scale up PUE, stakeholders must collaborate to identify common characteristics of successful interventions and apply those broadly.

Off-grid productivity: powering universal energy access

For communities in rural Africa to thrive, energy services must be affordable and reliable. But this is not enough. Energy services must be built around productive uses of energy (PUE) from the start: PUE activities are crucial to boosting demand for off-grid energy systems, while generating valuable income for remote communities and ultimately reducing poverty. Governments, mini-grid developers and partners can boost local demand for electricity by providing capacity building and long-term mentorship, along with customer financing and appliances. These stakeholders must collaborate closely to ensure a supportive policy framework is in place. To help jumpstart PUE, governments and donors should establish credit schemes and concessional loans, and experiment with finance instruments such as improved results-based financing and targeted subsidies for those who need them most. Across this work, women's entrepreneurship must be targeted. Taking these actions to unleash PUE will help drive us to universal energy access.

In this briefing we present evidence and experiences from the Energy Change Lab, a programme led by IIED and Hivos that works closely with partners in Tanzania on productive uses of energy (PUE) for community entrepreneurs.

PUE: essential for energy access

Sustainable Development Goal (SDG) 7 aims for universal access to affordable, reliable and modern energy services. To achieve this ambition, demand for electricity must meet supply when developing mini-grid systems. One promising way to stimulate demand is by promoting community PUE, which also supports a number of global goals, such as inclusive and sustained development in SDG 8 and SDG 9's resilient infrastructure and sustainable industrialisation.

PUE are activities or services that typically use renewable energy (such as solar, biomass and hydro) that can help stimulate a local appetite for electricity in remote communities that usually

express low initial demand, and can ultimately increase the socioeconomic status of local communities. Evidence points towards milling, ice making, carpentry, egg incubation and water treatment as important PUE opportunities for rural people. For instance, electric milling machines can be highly profitable for remote communities, but their use requires careful technical and economic consideration.¹

Governments tend to focus on central-grid expansion, but off-grid systems like mini-grids can reach remote communities that are too costly to connect to the central-grid. International Energy Agency (IEA) modelling shows that for universal access, off-grid and mini-grid systems will supply about two thirds of new electricity connections by 2030, especially for rural areas.² But to reach this level of saturation, off-grid energy services must become commercially viable or be subsidised.

PUE activities can activate demand for electricity while improving livelihoods and generating income for customers

Off-grid developers and governments are finding that installing electricity infrastructure does not necessarily activate PUE activities. Many remote communities are unable to pay for electricity

services or invest in new appliances. This leads to a gap between low demand and electricity supplied in off-grid communities, which threatens the viability of many mini-grid business models.

In this context, PUE activities are critical to improving the commercial prospects of mini-grids — they can activate demand for electricity while improving livelihoods and generating income for customers. In combination with other interventions such as targeted, short-term subsidies, this can translate into greater ability of individuals to pay for electricity, which supports energy systems that can be scaled up across remote communities.

What we know so far: getting PUE to work

The Energy Change Lab started this PUE work two years ago with in-depth research and stakeholder convening in Tanzania.³ In 2017, we moved into action research by piloting PUE approaches with off-grid developers Rafiki Power and PowerCorner. These approaches focused on:

- Linking appliance supply chains to remote communities
- Business training for 60 entrepreneurs in three villages in Lindi and Mtwara
- Training for 24 community members in local PUE promotion as 'PUE champions'.

These approaches show promise and are being documented in a detailed guide that the Energy Change Lab will publish in early 2019.

Our action research identified three essential components that include 'must have' features to support PUE activities (see Figure 1). Designing the core energy service around PUE, boosting local electricity demand and establishing an enabling environment are crucial to quicker uptake of PUE activities and energy access. By no means exhaustive, these components and features highlight the fact that companies, organisations and governments need a comprehensive and interconnected approach to develop off-grid electricity. Box 1 offers examples of projects already incorporating one or more of the essential components.

Innovations around PUE hold great promise, but developers and partners must more swiftly iterate, adapt and expand approaches of PUE activities across diverse communities and contexts if we are to scale up energy access by 2030.

Next steps for realising potential

Based on our action research, below are four strategies that stakeholders can adopt to start addressing the PUE gap and contribute to inclusive, sustainable, local development.

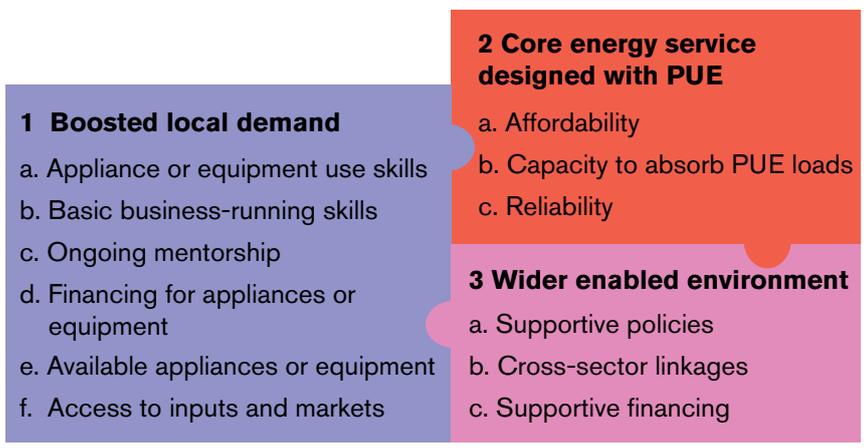
Design the energy service around PUE, not just electricity access. Three possible routes:

Stakeholders providing energy services should build PUE costs, activities and partnerships into their project designs and/or business models. Energy system investment should be communicated to donors and investors as a comprehensive approach, responding to the reality that many remote markets lack certain preconditions to support PUE activities (such as a capacitated workforce, accessible financing and connected supply and value chains). Women's PUE needs and strengths should be targeted to remove gender specific barriers and ensure men do not benefit exclusively; this builds a broader customer base.

Tariffs must be made affordable for PUE users. Entrepreneurs must be able to pay for inputs like appliance loans and electricity while still making a profit. Since central-grid tariffs are mostly subsidised, governments should consider subsidies for higher off-grid tariffs to support remote communities, who are also often the most economically disadvantaged. Investors should also consider more 'patient capital' for mini-grids.

Integrating PUE into existing community value-chains and/or available resources such as agriculture, timber, livestock and fisheries. Building on existing community infrastructure and knowledge can increase electricity uptake by reducing the adjustments needed for entrepreneurs. Deep community engagement, achieved using approaches like Energy Delivery

Figure 1. Three essential components of PUE with 'must have' features⁴



Models,⁷ can help realise opportunities. Identifying and targeting women's opportunities in relation to PUE will ensure they can circumvent gender-specific barriers.

Boost local demand with access to finance and skills for entrepreneurs. Remote communities typically start with low electricity demand, but this can be increased through PUE, which can improve livelihoods. Our work in Tanzania demonstrated several ways to achieve this:

Target the technical and business skills needed by local PUE entrepreneurs, coupled with ongoing support through mentorship and guidance. Government vocational institutes can be strong partners, adapting existing skills training material for off-grid applications. Training of trainers may be an effective tool in Tanzania (see Box 2). Female-only training courses — including female trainers — should be considered for women entrepreneurs.

Developers need to ensure that financing is available for customers, including microfinance, payment plans and grants for those who need financial support the most. Consider working with microfinance institutions (MFIs) that are linked to national credit guarantee schemes and concessionary loan programmes. Also build activities that target gender-specific barriers to finance. In communities without MFIs, developers have successfully offered their own payment plans.

Developers should ensure appliances and equipment are available in communities that are mini-grid compatible (especially for solar photovoltaic (PV) technology) and are highly efficient. The Efficiency for Access coalition is supporting development of highly efficient appliances.¹⁰ Crucially, this equipment needs to be tested in real-life conditions to ensure compatibility.

Catalyse national PUE activities through policy and finance. PUE supports existing government sustainable development frameworks, but policies and financing specific to PUE need to be established and integrated. To kick off and accelerate this process:

Governments and donors should explore finance options for consumers and businesses to extend PUE activities into more remote communities. Results-based financing has the potential to rapidly extend supply chains but may be less suitable for stimulating long-term market development.

Linking national concessionary loan and credit guarantee programmes through MFIs could extend financing mechanisms for PUE, while reducing the risks of lending to entrepreneurs who lack immovable assets and financial track records. Blended finance structures with local

Box 1. PUE innovation in Tanzania: using the 'must haves'

In Tanzania, there are several examples of energy systems designed with PUE at the core, which include either the first one or two essential components described in Figure 1:

- Energy Change Lab is working with PowerCorner and Rafiki Power mini-grids to partner closely with sector stakeholders (training institutes, microfinance institutions, appliance suppliers) to holistically build up PUE in communities³
- Devery is developing modular and technically scalable micro-grids built around individual PUE applications⁵
- Jumeme is establishing amalgamated enterprises that build on: the electricity assets, the existing developer business management capacities, and existing value chains and community resources for PUE⁶
- The European Committee for Training and Agriculture (CEFA) has been working for many years on mini-grid development with integrated PUE, and are looking to adapt and scale their model.³

currency funds, like the African Development Bank's Off-Grid Energy Access Fund,¹¹ have the potential to further stimulate the PUE market.

Governments should incentivise or mandate warranties for equipment and appliances that last at least one year. In Tanzania many suppliers only offer three- to six-month warranties on equipment and cannot extend claims to rural customers due to high transport costs. Longer warranties can help drive higher quality products into the market and build customer trust. Governments could incentivise suppliers by promoting those who offer warranties, and leverage their procurement contracts by requiring suppliers to extend warranties nationally on all their products.

Governments should offer import and VAT exemptions on super high-efficient appliances and equipment. Importation schemes should be streamlined with clear guidance and quick appeals mechanisms. Super high-efficient products are ideal for off-grid energy systems but can also have

Box 2. Creating and supporting PUE champions in Tanzania

We have trained 24 PUE champions to 'cascade' knowledge within their communities; they explore options with entrepreneurs and others and demonstrate correct appliance usage. They have successfully cascaded PUE knowledge to 43 men and 17 women so far. Building on this success, we plan to pilot mobile units that can work across communities to continue raising awareness of PUE. If these prove successful, they could be adopted by the government or a commercial model could be established through a vocational institute.

We have found practical ways to support the PUE champions, developers and training partners, including:

- English/Swahili appliance operation manuals distributed via WhatsApp groups
- English/Swahili YouTube videos demonstrating correct equipment use.

These materials help entrepreneurs retain and use concepts after the initial training and feedback has been very positive.^{8,9}

Box 3. Expanding the evidence base for PUE activities

Rigorous evidence will help build the case for PUE to donors and investors. Research framings that stakeholders could use to develop a robust methodology for scaling up PUE interventions include:

How should the core energy service be designed? Research should identify characteristics of the most promising business models and partnerships for PUE activities. It should consider: local resources and value chains, partnerships, infrastructure and governance. To build the strongest case, the cost of PUE activities should be compared with the cost of not supporting them.

What support measures are needed to boost local demand? Research should: quantify the ability and willingness of communities to pay; examine socio-economic characteristics of successful communities; review changes in electricity demand over time; understand the contribution of energy systems to livelihoods and demand growth; identify the ideal mix of training, mentorship and access to finance; and identify how to stimulate supply chains.

What is the wider enabling environment? Research should identify important characteristics such as: external factors like market access or availability of infrastructure, national financing opportunities for scaling, and local and national government support mechanisms and opportunities.

What opportunities do women have? What barriers do they face? The research should be viewed through a gender lens to identify the roles and impacts of women in energy systems and their PUE capacities. Research should try to understand the barriers women face and how these can best be overcome.

a big impact on central-grid applications by reducing the generation needs of utilities. Highlighting synergies between off-grid and central-grid will make this more politically feasible.

Government PUE promotion should reflect long-term vision. Rural electrification programmes should target off-grid and on-grid PUE applications for maximum political buy-in. Demonstrations should be facilitated by women to inspire other women to take up PUE activities. They should highlight a range of appliances and equipment to avoid the proliferation of similar PUE activities, which can reduce sustainability.

Special attention should be paid towards the poorest and most remote communities, as developers are unlikely to reach these communities with commercial models. Governments and donors must offer a combination of energy system grants, targeted subsidies and PUE support to ensure remote communities gain energy access.

Use data to experiment and scale up PUE methodologies. The Energy Change Lab's work around PUE activities shows great promise. One way forward is to continue with rapid experimentation of successful PUE interventions in multiple communities. Drawing out the diverse

characteristics that are key to their success in different contexts will determine how to scale them up quickly and effectively; we suggest possible future research approaches in Box 3.

Data and results should be shared widely to establish the best methodologies and strategies. Developers should consider anonymised sharing of system data as essential to escalating development of the industry. The Africa Mini-Grid Developers Association (AMDA), for example, requires the sharing of anonymised data as a condition of membership;¹² however, data of this kind should be made publicly available.

The scaling up of PUE activities will require increased collaboration among funders and implementors and an openness to experiment with new models and ideas, coupled with agile and appropriate government responses.

With a robust framework in place for PUE interventions to accelerate through energy access, communities will be better placed to guide their own sustainable development and we will move closer to achieving universal energy access by 2030.

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Knowledge Products

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Notes

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