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UKaid
from the British people

Off- and Weak-Grid Appliance Market Intelligence and Research Roundtable

Workshop Report

August 2019

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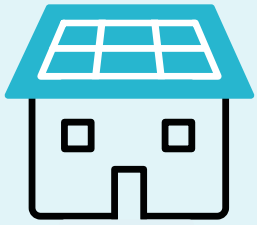
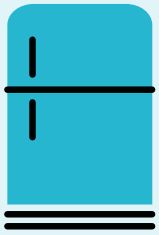
BACKGROUND

Efficiency for Access (EforA) is a global coalition promoting energy efficiency as a potent catalyst in clean energy access efforts. Since its founding in 2015, Efficiency for Access has grown from a year-long call to action and collaborative effort by Global LEAP and Sustainable Energy for All to a coalition of 14 donor organizations. Coalition programmes aim to scale up markets and reduce prices for super-efficient, off-and weak-grid appropriate products, support technological innovation, and improve sector coordination. Current **Efficiency for Access Coalition** members lead 12 programmes and initiatives spanning three continents, 44 countries, and 19 key technologies.



As a member of the Coalition, UK aid is funding the **Low Energy Inclusive Appliances (LEIA)** Programme. Over the next three years, LEIA will work to accelerate the availability, affordability, efficiency, and performance of four near-to-market products (refrigerators, televisions, fans, and solar water pumps) and five cross-cutting horizon and enabling technologies (brushless DC motors, advanced electric cooking, advanced refrigeration technologies, interoperability & compatibility, and connectivity & internet of things).

Highly energy-efficient, appropriately designed and priced appliances have the potential to improve livelihoods and achieve broader development impacts in off- and weak-grid communities. Improved access to services like refrigeration and water pumping can facilitate income-generating activities, enhance crop diversity and yields, improve nutrition and access to healthcare, and reduce time spent shopping, cooking, or collecting water – particularly for female household members. Additionally, access to appliances such as TVs and fans can improve connectivity and quality of life for people living in off- and weak-grid communities.



The global marketplace for off-grid appliances could be significant. According to the forthcoming State of the Off-Grid Appliance Market report, an EforA study developed in partnership with Dalberg, the off-grid appliance market for South Asia and Sub-Saharan Africa could reach 22.6 billion USD by 2030. The market for each appliance type is at a different stage of growth, with TVs and fans being more affordable and their markets currently more mature in terms of market availability and volume sales than refrigerators and solar water pumps.

In order to reach the full market potential, there are several conditions that can support growth, including financing and investment, policy, market intelligence, consumer awareness and innovative business models for appliance distribution. These topics, amongst others, were discussed during the EforA Coalition Market Intelligence and Research Roundtable in Amsterdam on 19th June 2019. The event convened a range of industry and ecosystem stakeholders to discuss the challenges and opportunities facing the market, and to help guide the priorities of the LEIA program's research agenda and programmatic priorities.

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WORKSHOP OUTCOMES

The one-day roundtable on off- and weak-grid appliance market intelligence took place in Amsterdam following the 2019 GOGLA Annual General Meeting, which provided an opportunity to engage more than 45 industry leaders including: on- and off-grid appliance manufacturers, distributers, solar home system providers, researchers, investors, donors, and other development and technology specialists.

The event included an overview of recent EforA activities and research, and attendees also participated in breakout group discussions on six specific topic areas: Market Intelligence, Business Model Innovation, Finance and Investment, Government and Aid Agencies Support, Impact Measurement, and Consumer Protection. Participants collectively identified and prioritised actions in each area for the Coalition to take forward. These are summarised below, with highest-priority activities listed first:

Impact Measurement

- Create standardised approach and metrics for measuring impact of appliances
- Measure unintended consequences of appliance uptake (e.g. over extraction of water, e-waste, indebtedness)
- Provide guidance on how to measure customer progress on the productive ladder
- Leverage IoT & GIS for impact measurement
- Measure impact of connectivity

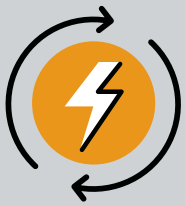
Consumer Protection

- Explore and develop appliance quality standards
- Field test products to gauge product performance and durability
- Develop best practices on warranty & user-facing information
- Engage governments to promote quality standards
- Map reparability expertise (availability of local technicians by product and by region)
- Provide guidance to governments on product quality
- Explore development and application of codes of conduct for appliances

Market Intelligence

- Conduct field trials to investigate consumer behaviour & needs
- Investigate high potential markets for appliances (e.g. criteria, how to replicate)
- Develop case studies and conduct pilots of innovative distribution models
- Characterise technology appropriate for marginal and weak grid users
- Characterise opportunities for appliance use across various value chains

Business Model Innovation



- Assess willingness to pay by customer segment
- Conduct research to explore business model viability across product use cases in stand-alone solar systems and mini grids
- Publish case studies on successes and challenges across a range of business models
- Investigate viability of adapting PAYGO for income generating appliances
- Investigate supply chain incentive structures

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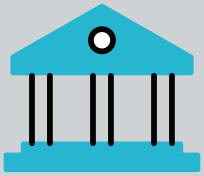
WORKSHOP OUTCOMES

Finance & Investment

- Match business model typologies to ideal investment scheme
- Enable access to finance for product line extension
- Leverage data analytics to de-risk investments
- Investigate role of aggregation in increasing product affordability
- Document existing models for asset financing

Government & Aid Agency Support



- Enhance collaboration between energy and agriculture sectors
- Scale up grant-making and results-based financing for businesses
- Promote inter-operability, so that appliances can be used with different off-grid systems, or with mini-grid/grid power
- Support end-user research to inform business decision-making and design of market development initiatives
- Support capacity building for businesses and end-users

"It was great to hear from the EforA team and see the receptivity for research directions (and very well-run process for voting on them), as well as hear the latest insights on the space from CLASP, Dalberg, and others, and of course network with other ventures in the productive-use space."

- Rick Sheridan, Sunny Irrigation

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LOOKING BACK

This is the third roundtable event organized by the EforA Coalition. The first focused on Solar Water Pumping (May 2018) and the second on Off- & Weak-Grid Refrigeration (June 2018). Across all three roundtables, common themes and priorities included:

- Identifying addressable markets
- Reduce cost on customer acquisition
- Identifying product use cases and undertaking market segmentation
- Assess willingness to pay
- Leverage GIS data analytics for informing business decisions
- Conduct impact research on appliances
- Undertake interventions to de-risk lending and undertake capacity building initiatives for end-users

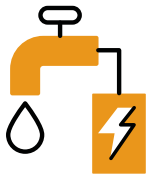
The Coalition has already started to address these priorities through the following activities:

Product Testing & Quality Assurance
The insights from industry at the roundtables have been invaluable for understanding the nuances of off-grid refrigeration and solar water pumps and helping our programme design better testing protocols as a result. We have started to undertake the following:

- Develop a test method and define performance metrics for SWPs to enable evaluation and comparison of product quality.
- Enhance the off-grid refrigerators test methods to better characterise refrigerator performance while reducing per unit cost of testing by 6%.
- Facilitate testing for SWPS and low-volume refrigerators through financing and access to test laboratories.
- Conduct testing on AC/DC appliances to examine the effect on efficiency, performance, and cost from operating appliances outside their native state, such as AC appliances running on a DC connection using an inverter.
- Launch Equip Data, an open access tool that generates third-party verified performance data to scale the market for durable, high-performing, and affordable appliances and equipment.

Research & Development
In the last year, the coalition commissioned several research projects to address the priorities identified at the Solar Water Pumping and Refrigerator roundtables.

Solar Water Pumping:



- Sizing the global addressable market for SWP with initial segmentation by geography. This study will be published (September 2019) as a supplement to the State of the Off-Grid Appliance Market report.
- Undertook a research project with Simusolar to unearth intelligence on irrigation patterns in the Tanzanian horticulture sector and fill important gaps on the adoption of solar irrigation technology, which market actors may use to inform SWP design, promotion, and market development efforts in Tanzania and beyond.
- Collaborated with 60 Decibels to synthesize data from 375 SWP customers in East Africa. This report provides valuable insights on customer purchasing decisions and use cases for SWPs, as well as compelling evidence on their positive impacts on farmer productivity and quality of life.
- A Solar Water Pump Technology Roadmap, published in collaboration with a technical working group, which identifies how remote monitoring systems and brushless DC motors can improve the energy efficiency and performance of SWPs, and outlines areas for future research.
- Collaborated with GOGLA and the World Bank Group's Lighting Global programme to report on global sales and impact data of SWPs sold between July and December 2018.

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Refrigeration:

- Working with the Schatz Energy Research Centre to carry out an in-depth analysis of existing off-and weak-grid refrigeration data to develop a typology of the most common use cases. This included an analysis of the sensitivity of total refrigerator system cost to individual cost components and user behaviour. This information is being used to identify which use case characteristics are most important for affecting affordability and identifying major knowledge gaps that can be addressed as part of LEIA. The study is expected to be published by October 2019.
- An Off-Grid Refrigeration Roadmap, written in collaboration with a technical working group, which identifies the technology improvements that can deliver significant energy efficiency and performance improvements in off-grid refrigerators and recommends a series of supporting actions to smooth out their development. This research has helped to inform the refrigeration focus area of the cooling R&D call launched at the Research Roundtable in July 2019.
- As part of the forthcoming State of the Off-Grid Appliance Market (September 2019), sized the global addressable market for refrigerators with initial segmentation by geography.
- Reported on global sales and impact data of refrigerators sold between July and December 2018, in partnership with GOGLA and the World Bank Group's Lighting Global Programme.

In the first R&D call the EforA Research and Development Fund funded an open-source communication protocol conducted by Solaris Off-grid, which is well-aligned with one of the priority areas identified to develop a standard API (assumed Application Programming Interface) for communication between power supplies and load. Other R&D projects funded through the first call also include a project implemented by Sure Chill to optimise a control platform in combination with a compressor for off-grid domestic refrigerators, and testing of cold chain infrastructure in a real-life context by DGrid Energy.

In June 2019, the EforA Research and Development Fund launched its second call focused exclusively on cooling, including fans, refrigeration and cold chain. At least £1m has been made available with the off-grid refrigeration roadmap playing a key role in defining the R&D priority areas identified in the scope of the cooling call.

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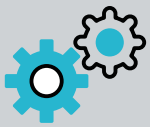
LOOKING AHEAD

There was consensus among participants on several actions the Coalition can take forward, including: improved tracking of sector impacts (both positive and potential unintended consequences); deeper understanding of willingness to pay and perceived risks for end users; field based consumer research; and documentation and dissemination of successful and emerging business models.

The Coalition will use the list of research ideas generated in this workshop to inform the research and programmatic priorities undertaken by LEIA. The following research activities are being investigated by the coalition:



Technology and Product Testing:

- Field Testing Protocols to better understand product performance in real-world settings
- Updated Solar Water Pump Test Method

End-User Research:

- Willingness to Pay
- Consumer preferences
- Cost-Benefit for End-Users
- Social Impact
- Risks of Adoption & Mitigation Strategies
- Drivers of Demand

Business Model Research:

- Sales & Marketing
- Consumer Financing
- After-Sales Service/Support
- Software/CRM
- Business Financing Needs
- Business TA/Capacity Building Needs

Market Research:

- Global Semi-Annual Appliance Sales Data Reporting
- Biannual Off-grid Appliance Market Survey

Interested parties are encouraged to sign up for email updates on the Efficiency for Access website & follow the Efficiency for Access Coalition on LinkedIn, Medium, and on Twitter at @EforA_Coalition. EforA Coalition members are currently engaged in a variety of ongoing activities related to efficient appliances. Please contact info@efficiencyforaccess.org or visit our website to learn more.

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PRESENTATION HIGHLIGHTS

EforA Highlighted Publications

Customer insights from the Global LEAP off-grid refrigeration RBF programme in East Africa highlighted the need for financing to achieve affordability. 100% of the 121 customer interviewed bought their fridge on credit.

Tanzania Market Snapshot: Horticulture Value Chains and Potential for Solar Water Pump Technology: showed there is latent demand for SWP, 90% of the over 400 horticultural farmers interviewed relied on some form of irrigation, but none of them had a SWP.

Use and Benefits of Solar Water Pumps: found that SWPs benefit end users, 81% of customers reported improvements in their quality of life after the purchase.

State of the Off-grid Appliance Market Report – EforA and Dalberg Advisors

Market uptake of off-grid appliances has continued to grow, but penetration remains low. TV penetration in East Africa is estimated at 2-5%, where sales are most advanced.

The obtainable market for fans, TVs, and refrigerators purchased with financing in sub-Saharan Africa and South Asia is 12.6 Bn USD in 2018. This could grow to 22.6bn USD by 2030. If products are purchased in cash, then the 2018 obtainable market shrinks to 1.7 Bn USD.

Productive Use Leveraging Solar Energy (PULSE) – Lighting Global and Dalberg Advisors

PULSE appliances are increasingly available in African markets, driven by early stage firms and specialist distributors. However, large international manufacturers are also starting to take interest. The maturity of PULSE technologies varies by type, geography and system capacity, with solar powered irrigation being the most ready to scale.

The total addressable market for irrigation, cooling & refrigeration, and agro-processing combined is estimated at USD 11 billion today. However, affordability remains a key barrier to growth. When affordability and access to credit are considered the potential market is estimated to by USD 700 million today, but it could reach 3bn USD by 2030.

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ESMAP
Energy Sector Management Assistance Program

Good Energies
POWER FOR A BETTER WORLD

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from the British people

POWER AFRICA

USAID
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Shell Foundation

endev

ACUMEN
CHANGING THE WAY THE WORLD TACKLES POVERTY

LIGHTING GLOBAL
Catalyzing markets for modern off-grid energy

AN INNOVATION OF WORLD BANK GROUP
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