EFFICIENCY FOR ACCESS | energy saving trust | clasp | Transforming Energy Access | IKEA Foundation | Caribou

LOW ENERGY INCLUSIVE APPLIANCES PROGRAMME

Impact Evaluation

October 2026

Executive Summary



This report was authored by Caribou: Chelsea Horváth, Amaal Salie, Giulia Costella, Karin Sosis, and Elise Montano. It was conceptualised, guided, and supported by Sheree Conibear, Bethy Picton, E Feng Tan Loh (Energy Saving Trust), and Charles Miller (World Bank).

Acknowledgements

We are grateful to Emilie Carmichael, Ellie Grebenik, Jakub Vrba (Energy Saving Trust), Martha Wakoli, Enid Nzisa Ngugi, Alba Topulli, and Jenny Corry Smith (CLASP) for their ongoing input and strategic guidance throughout the evaluation. We thank the companies, funders, programme implementers, and investors who contributed their time and insights through interviews and survey responses. Their experiences and reflections were essential in shaping the analysis and recommendations presented in this report.

Finally, we'd like to thank Shelby Brewster and Studio Quercus for copyediting and designing the report.

Disclaimers

This material has been funded by the UK government's Foreign, Commonwealth & Development Office (FCDO) through its Global Research and Technology Development (GRTD) portfolio; however the views expressed do not necessarily reflect the UK government's official policies.

Cover photo

A fishmonger and Savanna Circuit customer using the EcoSav chiller to keep her fish fresh, Kisumu, Kenya.
Photo credit: Energy Saving Trust

EXECUTIVE SUMMARY

Across sub-Saharan Africa and South Asia, off-grid and weak-grid electrification has expanded, but access to the appliances that make that power useful has not kept pace. Off-grid households and small businesses need an estimated 159 million fans, refrigerators, water pumps and grain mills; current sales meet less than 2% of that demand, and only 21% of those who need these appliances can afford them.[1]

Launched in 2017, the Low Energy Inclusive Appliances programme (LEIA) works upstream of end users, funding innovation, testing product performance, publishing market intelligence, building sector skills, and convening the Efficiency for Access Coalition.

This impact evaluation draws on eight years of programme documentation, 44 interviews across the energy access sector, and a contribution analysis of 56 ecosystem outcomes to show how LEIA evolved, its impact on the sector, and what this means for the programme's next phase.



Farmer using a solar-powered milk chiller in Kenya. Photo credit: CLASP

1 Efficiency for Access, *Leave No One Behind: Bridging the Energy Access Gap with Innovative Off-grid Solar Solutions* (September 2024).

Key Finding 1

LEIA's scope broadened, and its niche has become harder to characterise.

Over eight years, funder priorities, implementation learnings, and sector changes have reshaped LEIA on four dimensions:

- → **LEIA's approach to convening** moved from broad donor and investor convening to smaller functional working groups. The Efficiency for Access Donor Roundtable and Investor Network wound down, and the convening that continued ran through smaller functional working groups such as the CROWD platform and Agri-Energy Coalition.
- → **Research** informed the Efficiency for Access Research and Development Fund (R&D Fund) and LEIA's technology priorities, shifting from household appliances to productive use.
- → **Technology and business model innovation** followed three separate paths. LEIA's R&D support broadened; its testing and quality assurance (QA) work built upon Lighting Global's success with solar energy kits; and workforce and skills development was hampered by budget cuts.
- → **Market stewardship** advanced steadily on two tracks, inclusivity from the outset and circularity from 2019, though interviewees continued to identify LEIA with the R&D Fund and with testing and QA work.

LEIA's founding target, to double the efficiency and halve the cost, was de-prioritised as it became clear that appliance efficiency and price do not consistently move together. LEIA's methodology for measuring appliance cost and efficiency improved over eight years, tracked using units surveyed directly from national markets, rather than the smaller sample of tested, best-in-class units used in the programme's earlier years. Yet, the indicators measure the appliance rather than the cost of powering it, and so cannot show whether the total cost to the end user fell.

Together, these four dimensions trace a programme that grew broader, more self-critical, and more ecosystem-aware over eight years.

Adili Solar Hub worker and fish trader treating fish, Lake Turkana, Kenya. Photo credit: Energy Saving Trust



Key Finding 2

LEIA's contribution is most catalytic when funding company pivots, providing testing infrastructure, and operating in markets others won't serve.

- **At the company level, LEIA funds the technical steps that turn an existing business into an investable one.** Devidayal built India's first pay-as-you-go (PAYGo)-enabled solar refrigerator and holds a Government of India patent on its payment technology.[2] LEIA's £98,000 grant paid for developing and patenting the chip, and LEIA brokered the partnership with Angaza, a PAYGo technology provider, and GOGLA, so the chip could work with payment systems already used across the sector. The remote lock-out feature gave Indian banks the security they had been missing,[3] and interest rates for customers who repay on time fell from around 18% to 12%—14%. Devidayal's founder was already seeking equity investment to fund PAYGo development before the grant arrived, so some version of the chip may have been built eventually. Yet, he shared, "There's no one else that I can think of in India who pays for [this type of] tech development." Without the grant, he says, Devidayal would have deferred or dropped the plans.
- This pattern holds beyond one company. The 2026 *Scaling Potential* report found that of 127 companies supported by CROWD members between 2019 and 2024, only 28 (22%) had raised commercial capital, defined as debt or equity, by September 2025. **LEIA's R&D Fund grantees raised commercial capital at a higher rate than the rest of the CROWD portfolio.** The report classified 26 of LEIA's 44 completed-grant companies as productive-use appliance businesses. Eleven of those raised commercial capital, a rate of 42%. Among comparable companies in the CROWD group not supported by LEIA, the rate was 17%. It's possible LEIA's R&D Fund builds companies, or it may select companies already positioned to attract investment. If it picks well, those companies may have raised capital anyway. Founders report that the R&D grant: paid for product development and field trials no grant funder or commercial investor would fund at that stage; worked as a quality signal recognised by later investors; and opened the door to the wider set of support companies pass through before a commercial raise. On that basis, this evaluation treats LEIA's role as associated with later capital raising rather than as its cause.
- **At the sector level, LEIA turns technical work into infrastructure that others adopt on their own terms.** IEC 63437, the first international standard for off-grid and weak-grid refrigerators, was published in November 2025. Re:genT and LEIA funded the underlying technical work the standard rests on. LEIA grantees supplied data that made the standard specific to off-grid conditions. LEIA also convened smaller industry participants who are not included in international-level IEC discussions so they could submit recommendations. It is possible that other organisations, such as the World Health Organization and UNICEF, which both set procurement requirements for vaccine refrigerators, might eventually have driven some form of off-grid refrigerator standardisation. Yet, one committee participant shared that without LEIA's funding, there is a very good chance the standard would never have been developed at all. The next step, whether national governments regulate to the standard over the next two to three years, is beyond LEIA's ability to control.
- **LEIA has extended appliance markets to populations the commercial market has little reason to target.** The Humanitarian Productive Uses of Renewable Energy (H-PURE) project provided appliances to 282 micro-enterprises operating across three refugee camps in Rwanda and their host communities; just over half were led by women. LEIA subsidised 80% of the cost to local distributors, which made the appliances affordable for micro-enterprises in the camps and host communities. Practical Action as project delivery partner, ran the community awareness events and meetings

2 Efficiency for Access, "Devidayal Solar Solutions Develops PAYG-Enabled Solar Refrigerator," LinkedIn, accessed August 13, 2026.

3 Angaza, "Devidayal Solar Refrigeration Solutions Powered by Angaza's PAYGo Platform," December 1, 2025.

that generated demand from local businesses and new entrepreneurs. Without that existing community trust, the market-based approach would probably not have taken hold. LEIA brought the subsidies and introduced energy access sector expertise into humanitarian settings. The influence on the wider humanitarian sector remains modest because this is a single case study, and changing how the sector works would take comparable evidence from several geographies.

Key Finding 3

Where outcomes required several organisations, LEIA supplied capabilities its partners did not hold.

- **Over 35 organisations from the energy, agriculture, water, and nutrition sectors have joined a formal Agri-Energy Coalition**, with a steering committee, a dedicated secretariat, and a strategy running to 2030. With GOGLA, SNV, Wageningen University, GAIN, AGRA, IRENA, and GIZ, LEIA co-developed the *Beyond Silos* report that led to the forming of the Coalition. One investor shared that the Coalition has shaped how the firm approaches investing in the agriculture-energy space. LEIA helped build the Coalition's governance structure and strategy, sits on its 11-member steering committee, and co-leads two action areas: donor-targeted development approaches, and business models and technology innovation. The Netherlands Food Partnership facilitated the governance work, and GOGLA brought the market and policy network that merged with the more technical group around LEIA and Wageningen. Wageningen and GOGLA nonetheless trace the Coalition directly back to *Beyond Silos* and place LEIA at the centre of producing it.
- **KEREA and GOGLA drew on LEIA's sector awareness and convening power for a policy campaign** that contributed to Kenya reversing a proposed tax on solar-powered appliances in 2025 and including renewable appliances in its national energy policy for the first time. KEREA's engagement with LEIA centred on appliance uptake, standards, and sector convening. GOGLA carried out the economic modelling that underpinned the case to the National Treasury. While the outcome is notable, it is not durable; Kenya revisits tax policies in most budget cycles, and the PURE standards the policy inclusion points toward have not yet materialised.
- **The Modern Energy Cooking Services (MECS) programme used LEIA's first R&D call as its own sourcing pipeline,** funding six projects alongside LEIA's nine.[4] MECS had its own funding and could have run its own call, but LEIA's pipeline was already assembled. By MECS's own account, going it alone would have been slower.

Each of these outcomes needed several organisations. LEIA supplied one part and others supplied the rest. LEIA's contribution to the outcome is harder to isolate as a result, but that does not undercut the results.

4 Efficiency for Access, "Open Call," accessed August 13, 2026.

Key Finding 4

Financing, infrastructure, and workforce remain challenges for the energy access sector.

While technological improvements have been made since LEIA was launched, financing, infrastructure, and the workforce needed to support those technologies remain challenges. The evaluation found five themes in interviewees' comments on where they believe the energy access sector is heading.

- **Affordability has overtaken technology as the binding constraint.** Interviewees called for long-term consumer credit, subsidy at point of sale, and support for distributors testing viable price points, rather than further technology efficiency gains.
- **Testing and QA infrastructure remains fragile, even where technology has matured.** IEC 63437 took years to develop, and the only VeraSol-approved lab for it sits in the Netherlands, far from the markets it serves. A product can be ready for market and backed by an international standard, but local testing capacity and enforcement (at customs or point of sale) lag years behind.
- **Early-stage R&D funding is at risk just when the energy access sector needs it more.** Multiple interviewees, independently, identified this concern. As funders shift toward blended finance and near-market scaling, the patient capital that lets a hardware idea survive its first failure is increasingly hard to find.
- **Workforce training and repair capacity remain underfunded, though not unrecognised.** Appliance markets depend on trained technicians and a supply of spare parts; companies in early-stage markets lack the resources to build either alone, so both depend on public or donor investment.
- **Appliance markets belong as much to agriculture and small enterprise as they do to energy.** The same solar-powered cold room is an energy appliance to a funder and a piece of farm equipment to the farmer using it, which points toward cross-sector partnerships and a wider set of policy audiences in agriculture, finance, and planning.

Technician installing a walk-in cold room on a farm in Kenya. Photo credit: CLASP



Recommendations

For the wider ecosystem

1. **Increase funding for testing and QA as sector infrastructure.** Quality assurance now determines which products reach public money, and the laboratories that are responsible for it cannot cover their costs from the markets they serve. Fund equipment, accreditation, and training at laboratories that can serve regional markets.

2. **Fund the capital rungs between R&D grants and commercial investment.** Scale is not the only route to profitability; for many companies the question is which business model suits the volumes their product actually sells, rather than how to sell more units. Expand end-user financing; bring local banks, insurers, and pension funds into working groups to support post-grant growth; and connect early-stage R&D grant funders with governments and financing facilities behind national electrification programmes.

3. **Design appliance investments around the system the appliance sits in.** Appliance investments that stop at deployment underperform for the people they are meant to reach, and the financing form that works is the one that fits the local ecosystem rather than a default carried in from elsewhere. When deciding to invest in companies, assess whether end users can capture enough value from the appliance, financing terms are fair, users have the necessary skills, and repair and spare parts are available.

4. **Use tax, duty, and procurement policy to make tested off-grid and weak-grid appliances affordable.** Governments can adopt international test methods (such as IEC 63437, for example), then set performance thresholds for products. Donors can fund the development of voluntary productive-use standards. Policymakers can work on extending tax exemption and import duty treatment for off-grid and weak-grid appliances in priority markets.

For LEIA

1. **Protect early-stage R&D funding as the core of the next phase.** LEIA's clearest contribution occurs at the point where technical risk is too early for other programmes or investors.

2. **Use the solar energy kit laboratory policy as a template for appliances.** To aid development of regional laboratory testing capacity, publish laboratory eligibility criteria for appliance and productive-use testing on the model of the existing solar energy kit policy.

3. **Anchor the next theory of change in what the evidence shows worked.** When designing the next phase of LEIA and its theory of change, start with LEIA's strongest contributions: the R&D Fund and the QA infrastructure. Add a commercial capital indicator to the monitoring framework.

4. **Translate evidence into forms each audience can act on.** Maintain a small number of standing outputs, such as an impact dashboard, for decision-makers to skim, search, and return to research material.

From investment to impact

Total programme funding

£50.5M committed

2017—2026

of which **£12.5M** was granted onward to companies and partners. The remainder funded programme delivery, including quality assurance and testing, research, and sector convening.

£8.2M	to 49 companies through the R&D Fund
£3.7M	to 33 research and delivery partners
£618K	to 145 recipients through demonstration and early-stage funds

Key energy access sector benefits

1,170,249
People with improved access to clean energy

975,510 tCO_2e
Greenhouse gas emissions avoided

50+
Programmes or institutions adopted VeraSol recommendations into policy or programme design

£4M
Public finance mobilised for climate change purposes

of which £3.1M mobilised by LEIA-supported companies

£18.9M
Private finance mobilised for climate change purposes

of which £18.2M mobilised by LEIA-supported companies

165
Research reports published

3,340
People trained across the Efficiency for Access Design Challenge, Accelerator Programme, and R&D Fund

Total committed funding is drawn from the programme workplan supplied by Energy Saving Trust and comprises FCDO and IKEA Foundation funding from October 2017 to December 2026. Grants were awarded from 2018 onward.

Methodology note

This evaluation draws on a structured review of 130+ programme documents, 44 interviews, 18 surveys of partners and grantees, and a contribution rubric covering 56 outcomes. Each outcome was assessed against three criteria: significance, strength of LEIA's contribution, and completeness of the evidence. "Contribution" refers to LEIA's role in producing an observed outcome. "Catalytic" is applied only where LEIA was uniquely positioned to bring about the outcome. Examples in this report are drawn from the contribution rubric on that basis, and the full rubric holds the complete picture, including weaker evidence and more marginal contributions. The evaluation rests on a purposive sample weighted toward the people who ran the programme, on impact figures reported by LEIA and its partners rather than independently verified, and on documentation more than firsthand accounts for the early years. Contribution analysis does not establish attribution or rest on a comparison group, so judgements about what LEIA made possible reflect the weight of evidence against competing explanations rather than a counterfactual test.

- 130+ programme documents
- 44 interviews
- 18 surveys
- 56 outcomes

Women farmers transplanting onion seedlings using a solar-powered water pump and drip irrigation system on their farm in Kenya.
Photo credit: CLASP



EFFICIENCY FOR ACCESS